

# The Global HIV/AIDS Epidemic

Societies worldwide face the challenge of curbing the acquired immunodeficiency syndrome (AIDS) epidemic. The disease has already killed over 25 million people, and currently over 40 million people are living with the human immunodeficiency virus (HIV), the virus that causes AIDS. The impact of HIV/AIDS varies across the world, both in terms of the scale of the epidemic and the ability to treat infected individuals. Less-developed countries are particularly hard-hit on both accounts. Almost two-thirds of all people with HIV live in sub-Saharan Africa, a region that makes up only one-tenth of the world's population. At the same time, few infected individuals in the region receive adequate treatment for the disease. In addition to the devastation from the immense loss of life, the disease also has economic consequences that intensify the humanitarian crisis.

President Bush has made fighting the worldwide AIDS epidemic a priority of U.S. foreign policy, and he has taken bold action against the crisis through his Emergency Plan for AIDS Relief. Understanding the unique challenges presented by this epidemic is essential to designing policies to prevent the spread of the disease and to treat those who are already infected. This chapter discusses the nature of the crisis, its consequences, and what governments can do to create affordable access to existing treatments while encouraging research toward the development of new medical therapies to combat this disease. The key points of this chapter are:

- AIDS is a global problem with far-reaching consequences. While the disease's impacts on human health and mortality are widely recognized, the AIDS epidemic also has devastating economic consequences that exacerbate the humanitarian crisis.
- A comprehensive and integrated approach of prevention, treatment, and care is essential to quelling the epidemic. In poor countries, treatment affordability and the lack of health care infrastructure are major concerns. Compassionate pricing policies and aid from developed nations can play an important role in expanding access to treatment.
- To continue the development of better treatments and to work toward eradication of HIV/AIDS, drug companies need to maintain the highest possible quality of research. Intellectual property laws are important to ensuring appropriate incentives for innovation to create the next generation of therapies and to develop a safe and effective vaccine.

# A Global Crisis

The scale of HIV/AIDS is far worse than forecasts initially indicated over a decade ago. In 2003, there were more new cases of HIV/AIDS than in any other single year since the disease emerged, with almost 5 million people becoming infected around the globe. Roughly 2.9 million people died of the disease in 2003 alone.

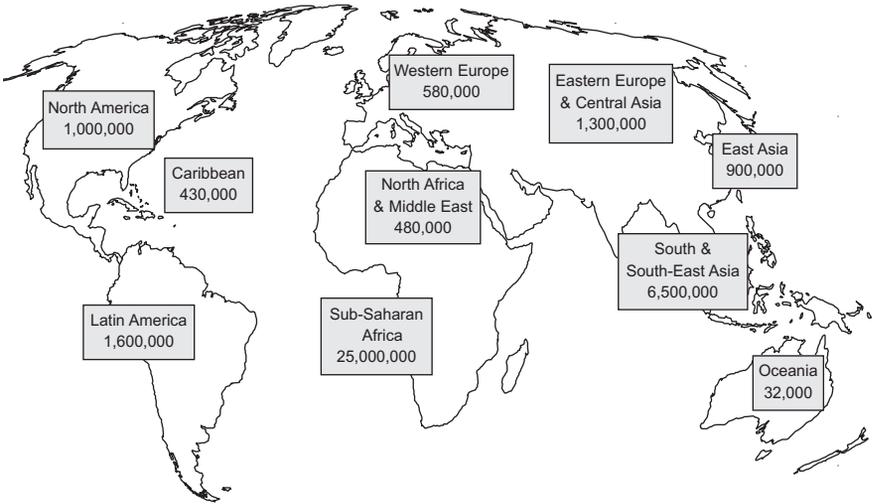
In the United States, AIDS is the fifth-leading cause of death in people 25–44 years of age. The U.S. Department of Health and Human Services (HHS) estimated that over 400,000 people in the United States were living with AIDS in 2003, and approximately 850,000–950,000 people were living with HIV. The number of AIDS cases continues to increase among minority populations, and African Americans accounted for 50 percent of new HIV/AIDS diagnoses in 2003. One of the most disturbing statistics surrounding the disease is that approximately 180,000–280,000 people in the United States are living with an undiagnosed HIV infection. Patients who are unaware of their infection are less likely to take precautions to prevent the spread of the disease and are unable to begin effective treatment. Furthermore, of the estimated 670,000 people who are diagnosed with HIV/AIDS, roughly one-third may not be receiving treatment. Taken together, the estimates of those untreated and untested suggest that close to half a million people in the United States are living with HIV without treatment.

HIV/AIDS infection levels in some parts of the world greatly exceed those in the United States. The Joint United Nations Programme on HIV/AIDS (UNAIDS) estimates that 4.8 million people worldwide were newly infected with HIV in 2003, which is the highest number of new infections in any single year since the beginning of the epidemic in 1981. Approximately 2.9 million people died of AIDS in 2003, and UNAIDS estimates that over 20 million people have died from complications of AIDS since the first case was identified. Estimates suggest that 8,000 people die and 14,000 are newly infected with the virus each day. Because of aggressive prevention, treatment, and care efforts, there has been a decline in the number of deaths among AIDS patients in the United States, while the number of people living with HIV/AIDS continues to increase in the United States and globally.

While the epidemic affects virtually every country in the world, the prevalence of HIV/AIDS varies markedly across regions (Chart 7-1). Close to two-thirds of those infected are Africans, for whom HIV/AIDS is the leading cause of death. In seven countries in southern Africa, at least one out of every five adults is living with HIV. In Swaziland, the HIV prevalence has reached nearly 40 percent among pregnant women; in South Africa, one in four women between the ages of 20 and 29 is infected. HIV/AIDS is predominantly a disease of young people; the majority of people who contract the disease

Chart 7-1 **Estimated HIV Infection Levels, 2003**

The HIV/AIDS epidemic affects virtually every country in the world, and the disease's prevalence varies markedly across regions.



Source: UNAIDS, 2004.

become infected by the age of 25. As a result of its lethality and the relative youth of its victims, HIV/AIDS has reduced life expectancy by more than 20 years in many African countries. Life expectancy in some countries is projected to fall to roughly 30 years within the next decade, whereas in the absence of HIV/AIDS some were expected to approach or exceed 70 years. Chart 7-2 shows this dramatic effect in some of the hardest-hit countries in Africa.

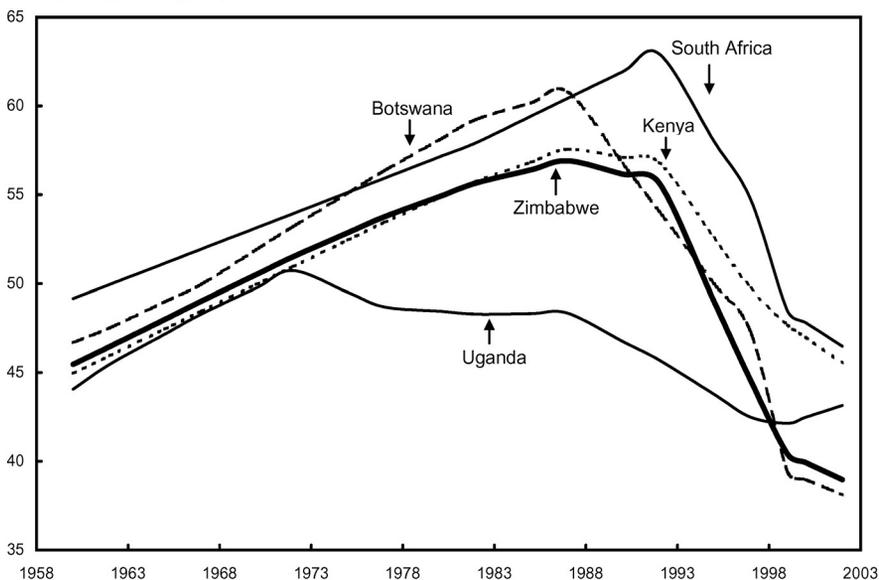
## Disease Characteristics and Treatments

The *human immunodeficiency virus (HIV)* is an infectious agent that damages the body's immune system. As the viral infection progresses, individuals lose their ability to fight secondary infections and certain cancers. The term *acquired immunodeficiency syndrome (AIDS)* describes the advanced stages of HIV infection. The virus primarily infects an important part of the immune system known as the *CD-4* or "*helper*" T-cells, which lead the body's attack against infections. When these cells multiply to fight an infection, they themselves become more susceptible to HIV infection. The HHS definition of a diagnosis of AIDS, established by the Centers for Disease Control and Prevention, includes all HIV-infected people who have fewer than 200 CD-4 positive T-cells per cubic millimeter of blood (as compared to 1,000 or more

Chart 7-2 **Changes in Life Expectancy, 1960 to 2002**

Life expectancy has fallen dramatically in these selected hard-hit African countries.

Life expectancy at birth (years)



Source: World Bank, *World Development Indicators*, 2004.

in healthy adults). HIV-infected individuals with higher CD-4 counts can also be diagnosed with AIDS if they develop one of several types of opportunistic infections or cancers associated with severely compromised immune systems.

The symptoms and signs of opportunistic infections common in people with AIDS can be highly debilitating. Many individuals who have progressed to an AIDS diagnosis find it difficult to work or perform basic household chores, and as the immune system continues to deteriorate, these effects generally worsen. Studies in Western countries have found that the median time it takes for an untreated HIV infection to progress to AIDS is about 10–12 years, though the amount of time varies widely across patients. If left untreated, the majority of patients will die within one year of the progression from HIV infection to full-blown AIDS.

Because no vaccine is available, the primary way to prevent HIV is through the avoidance of behaviors that put a person at risk of contracting the infection. HIV is not spread through casual contact. The virus is most commonly spread through unprotected sex with an infected partner, but it can also be spread through contact with infected blood. Mothers can transmit HIV to their babies during pregnancy, birth, or through breast milk while nursing. In the case of mother-to-child transmission at birth, the administration of certain drugs during labor can greatly reduce the likelihood of infecting the newborn.

There is no cure for HIV/AIDS, though the past decade has witnessed great strides in the treatment of AIDS. Multiple categories of drugs are now available for combating the disease, but the administration of individual drugs alone can render the treatment progressively less effective as the disease develops resistance to the medication. To minimize resistance and maximize effectiveness, health care providers use treatments comprised of a combination of several drugs to suppress the virus. Even though the side effects can be quite severe, this type of therapy is credited with dramatically improving the health and life expectancy of HIV-infected individuals.

Advances in treatments have reduced the number of deaths caused by HIV/AIDS, but despite price reductions by manufacturers and large-scale international assistance, the price of these treatments has so far exceeded what most residents of the developing world can afford. UNAIDS states that, in low- and middle-income countries, death rates for HIV-infected 15–49 year olds are up to 20 times greater than those of people living with HIV in industrialized countries, and differences in access to antiretroviral therapy can largely account for this trend. Limited health care infrastructure and a lack of trained health care professionals in poor countries, coupled with difficulties in accessing even basic care, further increase the suffering of those that cannot afford treatment.

## The Economic Impact of HIV/AIDS

The vast scale of human suffering that AIDS causes and the sheer number of lives lost to the disease make the epidemic a global emergency. Its scope extends beyond the immediate humanitarian crisis as the epidemic affects many aspects of economic and social development. Roughly 90 percent of worldwide HIV/AIDS cases occur in Africa, Latin America, the Caribbean, and Asia, where much of the affected population is already living in poverty. AIDS deepens poverty, intensifies food shortages, and, in some cases, erases decades of economic progress.

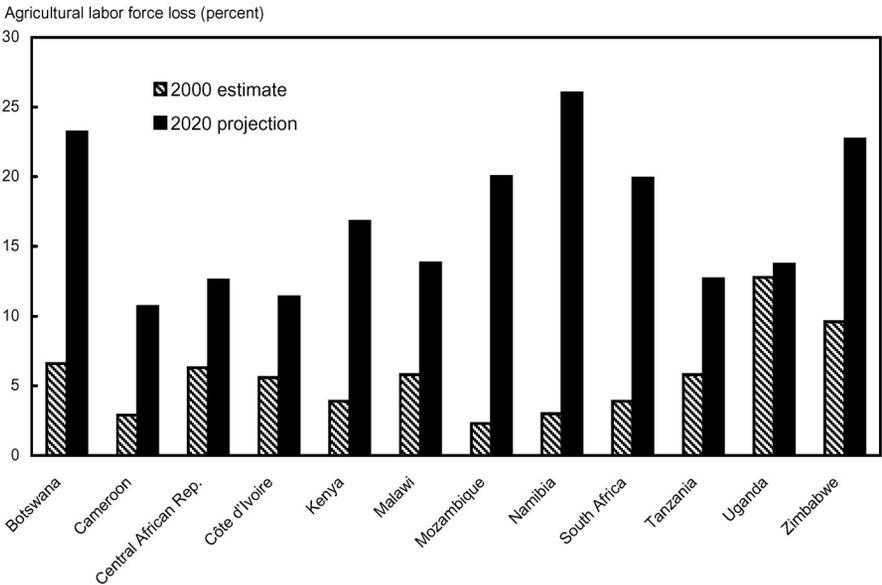
### Direct Economic Impacts on Households

There are several mechanisms by which the disease hinders economic development, particularly in less-developed countries. First, HIV/AIDS-related illnesses directly decrease the income of an affected household. Even if an infected family member is able to work, a sick worker is likely to be less productive than a healthy one. Many people with AIDS are unable to work at all. The disease's eventual lethality and loss of income-earning family members exacerbates this reduction in a family's income. One study estimates that in South Africa and Zambia, for example, income in affected households

typically fell by 66 to 80 percent due to AIDS-related illnesses. Furthermore, 15–24 year olds contract half of all new HIV infections worldwide, so a large percentage of the current and future workforce in the hardest-hit countries is dying. By predominantly affecting the working age population, the disease leaves too few people to support the aging and young populations, both within an individual family and within a society. One heavily impacted sector is agriculture, and failure to produce food can have particularly devastating effects on households and communities. The Food and Agriculture Organization of the United Nations estimated that 7 million agricultural workers died from AIDS between 1985 and 2000, and they projected that 16 million more will likely die by 2020. In some countries, this could mean a loss of over 20 percent of the agricultural workforce (Chart 7-3).

At the same time that AIDS erodes a patient’s productive capacities, it can impose debilitating costs on other members of a household. Medical expenses rise with a patient’s health care needs, while other family members may need to miss work or school to care for a patient. According to the 2004 Report by UNAIDS, AIDS-care-related expenses on average can absorb one-third of an affected household’s income. Many of these households are already poor and face adversities such as chronic food shortages. Coupled with the fact that AIDS patients need more calories than healthy individuals, the AIDS-induced deepening of poverty and the decrease in agricultural workers are intensifying these food shortages.

**Chart 7-3 Agricultural Labor Force Loss Due to HIV/AIDS, 2000 and 2020**  
 The HIV/AIDS pandemic is estimated and projected to have a sizable impact on the agricultural labor force, particularly in some of the hardest-hit African countries.



Source: International Labor Organization, 2004.

AIDS is more damaging to a household's income than other fatal diseases. Several studies have found that adults with AIDS use more health care than those with other illnesses. One study conducted in Thailand showed that the loss of income from an AIDS death is, on average, more than 20 percent greater than if the family member had died of another cause.

## Indirect Economic Impacts on Households

In addition to the direct effect on poverty caused by the decrease in family earnings and increase in family expenditures, HIV/AIDS can have consequences that indirectly affect households' well-being. For example, the disease can change the way that affected families make long-term decisions. Subsistence households may alter their planning horizons because they do not expect family members to live as long and because their needs become more immediate due to pressing health concerns.

When families face the increasing costs described above, children may be pulled out of school in order to supplement the declining family income, resulting in a loss in the children's future earning potential. Moreover, a household might have less incentive to invest in education because of the dramatic decrease in any one child's life expectancy. Private-sector firms, which also invest in human capital through education and training, have similarly diminished investment incentives when human capital is short-lived. Training and education can be expensive, but increased skills lead to long-term financial rewards, which cannot be fully realized when life expectancy declines. All of these factors can combine to create a vicious cycle of increased poverty in the short run and an inability of households to improve their condition in the long run. Shorter planning horizons can potentially lead to a variety of other indirect effects, such as quicker depletion of natural resources and accelerated environmental degradation.

A high prevalence of HIV/AIDS in a community can also place extraordinary stress on social networks. These networks are important because they frequently provide an informal kind of insurance in rural areas of developing countries, where populations lack access to formal insurance markets. These informal markets work by pooling risk across diverse households, so those experiencing good times can help those experiencing bad ones. For example, a household that loses a crop because of flooding can turn to friends in unaffected areas for help. These traditional means of dealing with hardship break down in the case of HIV/AIDS because the disease is so widespread that it can be difficult to turn to friends and family for help, since the disease is likely to be directly affecting them as well. Households also can be burdened indirectly by impacts on local labor markets, such as when labor shortages during planting and harvesting seasons affect agricultural yields, thereby threatening the availability of food for HIV-infected and noninfected households alike.

Academic research has found evidence of these effects and has documented still other effects of HIV/AIDS on individual families. One study finds that in Uganda, HIV/AIDS increases the proportion of female-headed households who are living in poverty. Another study finds that, in parts of Kenya, children in affected families sometimes have no caregivers in their households and “manage their own household activities without the supervision of an adult.” Research conducted in South Africa shows that affected households allocate more resources to food, health, and rent and less to education and clothing than nonaffected households, providing evidence that HIV/AIDS is placing constraints on an entire generation’s capacity to pursue education and higher income in the long run.

## Macroeconomic Impacts

The aggregated effects of HIV/AIDS on individual households can create serious macroeconomic consequences. Because decreased mortality and increased education are two of the most significant factors in determining economic growth, the HIV/AIDS epidemic has the potential to threaten the economic well-being of entire societies. As discussed in the previous section, the disease can decrease the overall level of skills in the workforce through a number of mechanisms, because skilled workers die of AIDS, children drop out of school, and firms and individuals invest less in human capital. This loss of worker skills and capacity reduces economic growth. The disease can also decrease productivity and distort labor market decisions, further slowing economic development.

Although there is still a dearth of data documenting these effects, several economic models estimate reductions in economic growth rates for African countries. Recent studies tend to find more significant impacts than previous estimates, most likely because the macroeconomic impacts become increasingly measurable as the disease affects a larger proportion of households, workers, and employers. A report published in 2004 estimates that, over the period from 1992 to 2002, HIV/AIDS, on average, reduced the rate of economic growth in 33 African countries by 1.1 percent per year. This study reports that by 2020, Africa alone could incur a loss of US \$144 billion.

## Getting Prevention, Treatment, and Care to the Field

Combating the HIV/AIDS pandemic requires both a reduction in new infections and adequate treatment and care for those already infected. Interventions in countries such as Kenya, the Dominican Republic, Thailand, Cambodia, and, most notably, Uganda, that have promoted risk avoidance

and risk reduction have helped reduce the number of new infections and helped reduce the spread of HIV. For example, the Abstinence, Be Faithful, and correct and consistent Condom use, or “ABC” approach, employs population-specific interventions that emphasize abstinence for youth and other unmarried persons, including delay of sexual debut; mutual faithfulness and partner reduction for sexually active adults; and correct and consistent use of condoms by those whose behavior places them at risk for transmitting or becoming infected with HIV.

Another important step toward quelling the AIDS epidemic is the widespread dissemination of currently available treatments and care. Recent developments in drug therapy and other HIV-related disease care can substantially prolong survival and improve the quality of a patient’s life. Indeed, evidence from a recent study suggests that the death rate from AIDS in some developed countries has fallen by about 80 percent since more advanced drug therapies became available in the mid-1990s. Unfortunately, in the world’s poorest countries, where most HIV/AIDS patients live, access to these treatments is shockingly low. As stated by the President in January 2003:

*There are whole countries in Africa where more than one-third of the adult population carries the infection. More than 4 million require immediate drug treatment. Yet across that continent, only 50,000 AIDS victims—only 50,000—are receiving the medicine they need.*

Since the President’s speech, the United States and international partners have made major investments to make safe and effective, low-cost antiretroviral (ARV) treatment more widely available throughout the developing world. Many people are now on life-saving therapy in 15 focus countries as a result of the President’s Emergency Plan, and the Global Fund (one-third of whose resources come from the United States) has also made great strides in placing patients on ARVs through a portfolio of grants to public-private consortia throughout the world.

While as recently as two years ago, many analysts believed the sole problem with access to ARV treatment was that drug prices were too high for most patients to afford, price cuts by brand-name manufacturers and the wider availability of generic versions of ARVs have helped to improve access to these treatments. Nevertheless, drug prices are still too high for most patients to afford and health care infrastructures in developing countries have too few resources for the effective distribution of treatment, even when drugs are available.

Two of the keys to expanding access to treatment in poor countries are low prices and generous international aid. Without low prices, large-scale distribution is probably not possible even with generous amounts of aid. And even at low prices, many of the poorest AIDS sufferers will not be able to afford adequate treatment, since they face still more basic needs such as adequate food and clean water. Thus low prices and generous aid must go together for large-scale treatment dissemination to be possible.

## A Role for Differential Pricing

Charging different prices to different buyers of the same product can be an important way to help poor populations access medical treatment. This practice is pervasive throughout the economy, and ranges from senior citizen discounts on movie tickets to cheaper college tuition for low-income families. Competition in a market and the ability to resell a good make it difficult for firms to charge different prices because of the opportunity for *arbitrage*, the ability to make a profit by purchasing the product at the lower price and reselling it at a higher price. This demand for the product at the lower price and supply of the product at the higher price will cause prices to equalize, a phenomenon that economists refer to as *the law of one price*. However, if a good cannot easily be resold, as with movie tickets and college tuition, differential pricing is possible. It is often in the interest of a profit-maximizing firm to charge high prices to some customers while not relinquishing the ability to sell to other customers who can afford the product only at lower prices. This disparity might seem unfair since buyers of the same product are being treated differently.

Drug companies have the ability to practice differential pricing because they can possess intellectual property rights. When a firm is the first to develop a new treatment or vaccine, it is awarded a patent that allows the company to be the sole seller of the product for 20 years from the date a patent is filed. (This generally works out to be approximately 10–14 years from the time the drug is first available on the market.) Because the development of new drugs requires costly research and development, patent rights provide important incentives for firms to take on the upfront costs of development; the reward for undertaking these risky activities is the promise of high profits should their efforts to develop a new drug succeed. (Patent rights and the ensuing incentives for innovation are discussed at greater length in the next section.)

The market for AIDS drugs is a case in which differential pricing possibly helps to create societal benefits beyond the profits enjoyed by firms with *market power*, by allowing people in poor countries to pay less for their drugs. This is already a common practice for pharmaceuticals, and some manufacturers of antiretroviral treatments have offered the drugs to developing countries at lower prices than those that apply in the U.S. and Europe. The AIDS drug PLC, for example, sells for \$18 per day in the United States, but sells for half that price (\$9 per day) in Uganda. The drug companies can make incremental sales at lower prices without incurring a loss, but if PLC were sold everywhere for only \$9, the companies would not recover their investment in research and the drug would not be available to consumers in either country.

Consumers paying the higher price for a drug may believe that everyone should have access to the drug at the lower price. However, if forced to sell at

only one price, the drug companies will generally need to set the price somewhere between the highest and the lowest prices under differential pricing, thus creating less access to the drug. Patients who could only afford the drug at the lowest price would be unable to purchase it at the standardized price. Therefore, offering drugs at lower prices in impoverished countries can play a vital role in increasing the availability of AIDS drugs in less-developed countries.

## Humanitarian Aid

Even with drugs available in developing countries at prices far below those charged in the United States and other advanced economies, severe poverty levels will continue to prevent many AIDS patients from receiving adequate treatment. Effective new treatments can be produced at an incremental cost of \$600 per year, but most individuals in sub-Saharan Africa live on less than \$730 per year. Furthermore, the actual distribution of treatment requires more than just an affordable supply of drugs; it requires a health care infrastructure that can adequately implement safe treatment programs. This is a particular challenge for people living in remote rural areas.

The Bush Administration has laid out the President's Emergency Plan for AIDS Relief (the Emergency Plan), a five-year, \$15 billion commitment to fight the disease globally. The President's Emergency Plan works in over 100 countries around the world while focusing on 15 of the countries most affected by HIV/AIDS, with the goal of treating 2 million HIV-positive individuals, preventing 7 million new infections, and caring for 10 million infected or affected by the disease, including orphans. It prioritizes treatment, care, and prevention activities as the interventions most likely to mitigate the disease's consequences and reduce HIV infection. By prolonging life and restoring health, treatment and care interventions can increase the productive capacities of individuals, reduce the direct and indirect costs of care, and allow those infected and affected by HIV/AIDS to focus on priorities such as work and school, thereby securing the future of families and nations. The Emergency Plan's health care approach also sets out to work within host-country strategies to strengthen and develop health care networks that will increase access to prevention, care, and treatment services, since the President recognizes that all are crucial to winning the fight against HIV/AIDS.

The President's plan also works with international partners to intensify the worldwide response to the epidemic and to develop sustained collaborative efforts. The Emergency Plan devotes \$10 billion over five years to 15 of the most afflicted countries in the world. It also commits \$4 billion to HIV/AIDS programs in an additional 85 countries, including international research in support of new tools for combating HIV/AIDS, and it increases the United States' pledge to the Global Fund to Fight AIDS, Tuberculosis, and Malaria by \$1 billion over five years. The President made the inaugural pledge to the

Global Fund in May of 2001, and at the end of 2004 the United States remained the Global Fund's largest donor, responsible for over 37 percent of its pledges and 33 percent of its contributions. One success upon which these efforts can build is the intervention strategies in Uganda, which successfully turned around the HIV/AIDS crisis in that country. (Box 7-1).

### **Box 7-1: Uganda's Success Story**

A broad-based national effort and firm political commitment to fighting the HIV/AIDS epidemic yields results, and no case illustrates this point better than Uganda's experience. Uganda was one of the first nations to suffer the disease's impacts, and now it has become one of the earliest and greatest success stories. As elsewhere in sub-Saharan Africa, AIDS has caused immense suffering in Uganda, reducing its population's life expectancy and thwarting its development. However, the country has experienced substantial declines in infection rates during the past decade, even as the rate of new infections continues to increase in most other countries in the region. The percent of Ugandans infected with HIV peaked at around 15 percent in 1991, and by 2001 it had fallen to 5 percent. Prevalence among pregnant women, which is used as a key indicator of the epidemic's progress, has fallen by more than half in some areas since 1993, and infection rates among men have dropped by more than a third.

Under the leadership of President Yoweri Museveni, Uganda's government brought together groups and leaders from all sectors of society to address the need to prevent further spread of the disease and to provide treatment and care for those affected. In 1986, President Museveni directly addressed the epidemic with a commitment to prevention, and asserted that fighting AIDS was a patriotic duty of Ugandan citizens. Calling for openness and communication, he was joined by religious and traditional leaders, community groups, and nongovernmental organizations (NGOs). In 1992, the President created the multi-sectoral Uganda AIDS Commission to oversee the national HIV/AIDS strategy.

Interventions in Uganda began with an aggressive public media campaign to change risky behaviors and the establishment of a surveillance system to track the epidemic. The campaigns have been aimed at both the general population and key target groups, particularly older men and youth, while aggressively fighting stigmatizing and discriminating against people living with the disease. Sex education programs in schools and on the radio have encouraged youth to delay the age at which they first have sex, have encouraged monogamy, and have

### **Box 7-1** — *continued*

focused on the need for safe sex. Since 1990, a USAID-funded program has contributed to increases in condom use from 7 percent nationwide to more than 50 percent in rural areas and over 85 percent in urban areas. In addition, Uganda's HIV/AIDS surveillance system has trained thousands of community-based AIDS counselors, health educators, and other specialists. Further testimony to the government's commitment are the many innovations that have been pioneered in Uganda, such as HIV/AIDS testing with same-day results and accompanying counseling services.

The open networks throughout Ugandan society for acquiring information about HIV/AIDS have resulted in behavioral changes in its population. The decline in the number of sexual partners of the average Ugandan is perhaps the most important determinant of the nation's success in curbing the epidemic, and some have dubbed this experience a "social vaccine." The country's success suggests that high-level political commitment coupled with diverse, multi-sectoral participation can turn the tide in the global fight against HIV/AIDS.

## Development of New Treatments and Vaccines

While affordable treatments and their effective dissemination are immediate needs, pharmaceutical companies need to continue to work toward the development of newer and better treatments as well as vaccines. This is important not only to improve patients' lives but also to strive toward the eventual eradication of the disease. In the United States, the principal reason that the number of AIDS cases began to decline in the mid-1990s was the introduction of new drugs for treating HIV. Researchers must continue to innovate in order to make even better treatments available and develop safe and effective vaccines. The development of resistance to existing medication, rendering treatment less effective over time, underscores this importance.

## Incentives for Innovation

Research and development of new drugs is a costly endeavor, and once developed, new products must go through extensive testing and marketing. On average, a new drug takes 12 years to develop and costs \$800 million to introduce to the market. For each new drug, the bulk of these costs are generally paid before production begins. Since their magnitude does not depend on how much of the drug is produced, they are known as *fixed costs*.

Once companies have incurred the fixed costs and a drug is available in the marketplace, it is often inexpensive to produce the drug; that is, the *marginal cost*, the additional cost of producing one more unit of the drug, is low. It is similarly low-cost for other companies to copy and produce the drug, thus avoiding the high fixed investment in research altogether while reaping the benefits from a lucrative market with low marginal costs of production. In the absence of intellectual property rights, no company would want to bear the enormous fixed costs of research and development if they could simply profit from other firms' inventions. But without any company investing in these fixed costs, innovation would be thwarted.

Patent rights provide an important means of giving firms the incentive to bear the expensive costs of innovation. A *patent* grants a company the right to be the sole producer and seller of a product it develops for a limited period of time (20 years in the case of pharmaceuticals); thus, a patent protects the innovator from direct competition so that it can recoup the money it has spent in developing the new product. This intellectual property right makes it possible for the pharmaceutical company to sell the new drug at a price above its marginal cost of production, thereby generating a high enough profit on its sales to recover its initial investment.

Diseases prevalent in poor geographical areas might not have lucrative enough markets to provide incentives for private-sector companies to develop treatments. For example, tropical diseases such as malaria, which generally occur only in low-income countries, can have a drug market in which patients are unable to pay enough for their treatments for firms to recover the high costs of drug development. The degree to which private companies invest in research and development could therefore fail to be commensurate with the social and economic costs of these diseases, including HIV/AIDS. There are, however, alternative ways to provide incentives for innovation. Prizes for successful drug invention, patent buyouts, and advance commitments to purchase the drugs are a few alternatives that are particularly promising because they encourage research without disallowing competition once a drug is developed (Box 7-2).

### **Box 7-2: Creative Ways to Encourage Innovation**

Patent rights and direct government funding are currently the two primary means by which the United States government spurs research. To drive development for an AIDS vaccine, the Bush Administration endorsed the Global HIV Vaccine Enterprise this past June at the G-8 summit. This initiative will accelerate HIV vaccine development by

**Box 7-2 — *continued***

enhancing coordination, information sharing, and collaboration globally. There is also a critical role for the private sector to play in promoting innovation, especially in the development of a commercially viable product such as a vaccine.

When a disease predominantly affects a poor population, the private return to investment in vaccine research is likely to be quite low, even under well-established patent laws, and even if the social value of developing a vaccine is high. In other words, society as a whole may place great value on the lives saved by a new vaccine, but the ability to pay for vaccines by poor patients will not adequately represent this social value and will be insufficient for firms to recover their research expenditures. Patent rights alone can therefore, in some contexts, provide insufficient incentives for innovation. They can also create strong incentives to imitate existing successful inventions rather than to take on new problems, because competitors can slightly alter a patented approach in order to develop a competing product. While this “free-riding” off initial research investment creates competition and drives down prices, it also prevents the original developer from recouping its research expenditure. Furthermore, imitation of existing drugs may not be the socially optimal use of scientific research, since the benefits of saving additional lives with novel products may very well outweigh the benefits of lowering the prices of existing drugs.

Direct government funding of basic research can have an important role but is inefficient when the motivation of the research is a commercially viable product. It is difficult to know the best projects to fund and pharmaceutical firms have an advantage over government officials when it comes to evaluating the potential of vaccines. Moreover, organized interests can influence the allocation of government funding resources, and academics may be more interested in novel scientific discoveries than in the technical challenges of commercial development.

Advocates of exploring alternate systems for encouraging pharmaceutical innovation argue that patents and government funding alone have had difficulties stimulating sufficient research to develop vaccines for diseases such as malaria, tuberculosis, and HIV/AIDS. Most research on HIV/AIDS drugs is currently focused on treatments that will likely be sold in rich countries, instead of on vaccines, which would likely be less expensive and could be disseminated widely in poor countries. Indeed, the research that is currently being conducted toward an AIDS vaccine focuses predominantly on strains of the disease prevalent in rich countries rather than the strains most common in Africa, even though two-thirds of all new infections occur there.

**Box 7-2 — *continued***

Several mechanisms have been suggested by economists as promising ways to further encourage new research and development in pharmaceuticals. For example, foundations can offer monetary prizes for vaccine development in order to encourage innovation without restricting competition in the market once the product is developed. However, a prize alone would not ensure access to the vaccine by those who need it. Alternatively, a foundation could “buy out” a patent (that is, it could essentially compensate a firm for letting its patent expire early). Like a prize, the patent buyout would provide incentives for innovation that are not tied to the market for purchasing the drug, thereby promoting research and development even in markets of poor patients. However, the buy-out may similarly fail to ensure large-scale access to the vaccine since there is no guarantee that competition in the vaccine’s market will be attractive to other producers. Particularly if the vaccine is technically difficult to produce and if safety regulations are burdensome, firms may not wish to enter the market for a new vaccine.

Some scholars have also suggested that another approach to encouraging vaccine research would be for a foundation or group of foundations to make an advance commitment to purchase a vaccine at a pre-specified price and quantity. Pharmaceutical firms then would have a secure financial incentive for researching vaccines and treatments, even if a disease affects predominantly poor populations, and, once developed, widespread production of the vaccines could be ensured.

Despite years of both private and government-sponsored research, an HIV vaccine remains elusive. Although the disease’s many strains and their ability to evolve rapidly over time present scientific obstacles, there is also reason to be optimistic that a vaccine will one day be possible. Some candidate HIV vaccines have already been shown to protect monkeys against infection and could induce immune responses in humans. To enhance coordination of research efforts, the President, with other G-8 leaders, endorsed the establishment of the Global HIV Vaccine Enterprise and announced plans to establish a second HIV Vaccine Research and Development Center in the United States. The Administration has also urged fellow G-8 leaders to similarly expand their commitment to vaccine development.

## Conclusion

The United States and countries around the world must continue to fight the spread of HIV/AIDS, aid those who are suffering as result of the epidemic, and work toward eventual eradication of the deadly disease. Interventions are particularly critical because the far-reaching economic consequences of HIV/AIDS threaten the well-being of entire societies. The President has developed a generous aid package with the Emergency Plan and with donations to the Global Fund, and the Administration supports the protection of intellectual property rights. Many other members of the international community have taken action against the HIV/AIDS crisis, and the United Nations General Assembly Special Session on HIV/AIDS in 2001 has affirmed the international community's commitment to make progress in the struggle against HIV/AIDS. Governments, donors, and private enterprise around the world must continue to build upon the successes of these actions to win the global fight against AIDS.

