

# Critical Choices In Financing The Response To The Global HIV/AIDS Pandemic

Costs could rise to \$35 billion a year by 2031—unless the world takes dramatic steps to avert the worst outcomes.

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**ABSTRACT:** The AIDS pandemic will enter its fiftieth year in 2031. Despite much progress, there are thirty-three million infected people worldwide, and 2.3 million adults were newly infected in 2007. Without a change in approach, a major pandemic will still be with us in 2031. Modeling carried out for the AIDS 2031 project suggests that funding required for developing countries to address the pandemic could reach \$35 billion annually by 2031—three times the current level. Even then, more than a million people will still be newly infected each year. However, wise policy choices focusing on high-impact prevention and efficient treatment could cut costs by half. Investments in new prevention tools and major behavior-change efforts are needed to spur more rapid advances. Existing donors, middle-income countries with contained epidemics, philanthropists, and innovative financing could help bridge the likely funding gap. [Health Aff (Millwood). 2009;28(6):1591–605]

**B**Y 2031, THE HIV/AIDS PANDEMIC WILL ENTER its fiftieth year. In 1981 no one expected that the epidemic would become the formidable challenge it is today. Despite progress in responding to the pandemic over the past twenty-five years, there are still thirty-three million people living with HIV; 2.3 million adults became infected with HIV in 2007.<sup>1</sup> Without a change in approach, a major epidemic will still be with us in 2031.

The AIDS 2031 project<sup>2</sup> was established to ask what might be done differently to alter the course of the AIDS pandemic significantly and positively. The goal: that by 2031 there would be few new infections, nearly all of those needing treatment would receive it, and AIDS orphans would be assisted to live normal lives.

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As part of the AIDS 2031 effort, working groups were formed to investigate HIV/AIDS epidemiology, social drivers, leadership, science and technology, financing, and subregional topics. An overall report will be published in early 2010.

In this paper we present findings from the AIDS 2031 Costs and Financing Working Group, which sought to answer key questions, including the following: What are the global resource needs for AIDS through 2031? What factors will be critical in driving costs up or down? What “game-changers” could dramatically affect those costs? What are the long-term sources for the financing required? What mix of sources and channels would be most equitable, efficient, and sustainable?<sup>3</sup> We present the results of modeling several scenarios and the epidemiological and financial impacts of various policy options we face today.

### Estimating Future AIDS Costs

We followed the framework of the Joint United Nations Programme on HIV/AIDS (UNAIDS) Global Resource Needs Estimates, with some modifications. The estimates were first calculated in 2001 and have evolved to include forty-eight interventions across prevention (22), care and treatment (6), mitigation (5), program support (11), and international support (4).<sup>4</sup> Our AIDS 2031 estimates incorporated target population sizes, unit costs, and coverage through 2031, and they considered new interventions that may become available such as pre-exposure prophylaxis, microbicides, vaccines, or cures.

We calculated costs for low- and middle-income countries using this simple equation: population in need  $\times$  coverage  $\times$  unit cost = resources required. The method we used has certain limitations, including inability to account for possible synergistic interactions among variables. But it is intuitive—hence, easy to grasp—and straightforward to apply, and most of the synergies are not yet well enough understood to incorporate in a reliable model.

■ **Population in need.** Data for population in need vary by intervention; details are given in supplemental materials.<sup>5</sup> Prevention efforts in earlier years will affect the number of new HIV infections, and thus the number of people needing treatment, in later years. The AIDS 2031 Modeling Working Group estimated the impact of the different scenarios on new HIV infections for the twenty countries with the most new infections, plus two more countries for geographic representativeness (Brazil and Mexico).<sup>6</sup> These results were scaled up to regional and global levels.<sup>7</sup>

■ **Costs.** Unit costs were based on data from published sources and adjusted for purchasing power parity. The relationship between unit costs and scale was analyzed to project changing unit costs for six interventions: prevention of mother-to-child transmission; counseling and testing; treatment of sexually transmitted infections; and outreach programs for sex workers, men having sex with men, and injecting drug users.<sup>8</sup> For other interventions, no scale effects were considered.<sup>5,9</sup>

■ **Coverage: drivers and scenarios.** Future levels of “coverage”—that is, whether interventions will be made available to populations and how broadly—will

*“The four scenarios frame the possibilities and identify actions that could result in better control of the pandemic at lower cost.”*

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depend on many factors. These include funding availability, political will, health system strength, and household and individual demand (which are in turn affected by information, social mobilization, and cost). Four broad scenarios were developed to explore the financial and epidemiological consequences of markedly different policy choices. In reality, individual countries will follow varying trajectories, depending on how these political, financial, and institutional factors play out at the national level. Note also that the four scenarios are not meant to be predictions of what will happen over the next two decades; rather, they are intended to pose *what if?* questions, helping frame the possibilities and identify actions that could result in better control of the pandemic at lower cost.

*Rapid scale-up.* Political will is strong, and resource availability continues to grow. It is assumed that all countries achieve universal access to key prevention, care and treatment, and support services for vulnerable children by 2015 and continue at that level to 2031. “Universal access” means 80 percent coverage for most interventions, with 100 percent for school programs, blood safety, and safe medical injections and 60 percent for interventions focused on most-at-risk populations where societal factors limit coverage.<sup>10</sup> Given the political and capacity constraints of some countries, the realism of this scenario can be questioned. But it represents an important upper limit to what may be possible.

*Current trends.* Coverage of key interventions continues to expand at recent rates. Coverage reaches about two-thirds of the universal access targets by 2015 and then remains at those levels.

*Hard choices for prevention.* Because of limited resources, it is assumed that countries focus on scaling up only the most cost-effective approaches to achieve maximum impact. This implies greater emphasis on prevention programs for most-at-risk populations such as commercial sex workers, men having sex with men, and injecting drug users. There would be less emphasis on general population interventions such as workplace programs and community mobilization, particularly in countries with low-level and concentrated epidemics. Treatment coverage remains at “rapid scale-up” levels.

*Structural change.* In recognition that AIDS is a long-term problem, there is a focus on structural changes that can reduce vulnerability to AIDS and produce a more sustainable response. This includes programs to reduce violence against women, modify employment practices that separate workers from their families, remove legal and other stigma-related barriers, and strengthen health systems.<sup>11</sup> Changes result in higher coverage for most-at-risk populations and improved effectiveness of prevention programs but take a decade longer to implement.

Further details of the coverage rates by scenario, and a review of the literature

on structural interventions, where data are still limited and more research is needed, are provided in the supplemental materials.<sup>5, 11, 12</sup>

■ **Epidemiologic and cost results.** The number of new infections for each scenario is displayed in Exhibit 1. Historically, new adult infections increased rapidly from the start of the epidemic, reaching three million annually in the mid-1990s before dropping to about 2.3 million by 2007.

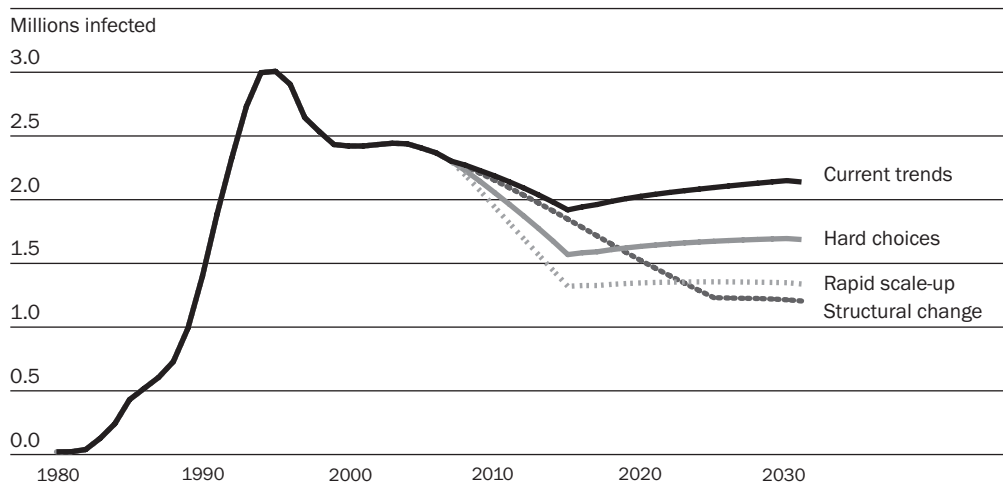
In the “current trends” scenario, new adult infections fall to about 1.9 million in 2015 and gradually increase over the next sixteen years as coverage remains constant but population grows. In the “rapid scale-up” scenario, where the maximum coverage rates are much higher than in “current trends,” new infections decline to a low of about 1.3 million in 2015. In the “hard choices” scenario, the number of new infections falls between these two scenarios, reaching a low of about 1.6 million before experiencing a gradual increase. Finally, if structural interventions result in higher coverage rates for most-at-risk populations, the number of new infections reaches its lowest level, about 1.2 million, but not until 2025.

The underlying message is grim. Despite progress in all scenarios, even scaling up existing interventions to the maximum level feasible cuts new adult infections only by about 48 percent. Under the best of circumstances, more than a million people will still become newly infected with HIV in 2031.

New “game changer” prevention strategies to boost coverage and improve efficacy for high-risk populations will thus be needed. There will also be a need to address the large share of new adult infections that will occur in low-risk populations—for example, men and women in stable, long-term sexual relationships—

#### EXHIBIT 1

##### New HIV Infections Among Adults Ages 15–49 Annually, By Scenario, 1980–2031 (Later Years Are Projected)



**SOURCES:** Authors' calculations.

**NOTE:** For details on scenarios, see text.

as the epidemic matures. Once prevention interventions are scaled up by 2015, the number of new infections in higher-risk groups drops. By 2031 the low-risk group accounts for almost two-thirds of new infections.<sup>13</sup>

The financial resources required to achieve these results under each scenario are shown in Exhibit 2. The most expensive scenario is “rapid scale-up,” at US\$35 billion in 2031 and a total of US\$722 billion over the twenty-two years. Under “current trends” and “hard choices,” expenditures are much lower: about US\$24 billion and less than US\$19 billion in 2031, respectively. Cumulative requirements are US\$490 billion and US\$397 billion, respectively, over the full period.

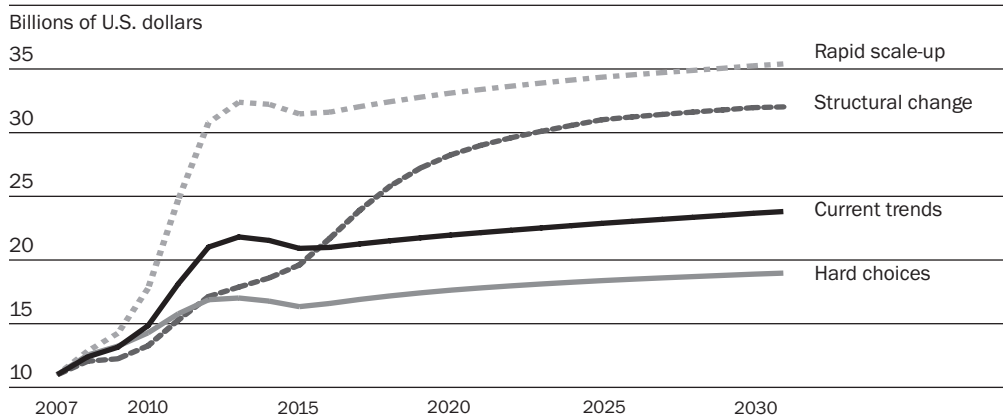
The key message is that regardless of the “scale-up” strategy adopted, AIDS spending in low- and middle-income countries can be expected to rise greatly over the next two decades. This will put pressure on governments, foundations, households, nongovernmental organizations, and companies that will have to bear the burden. Under the “rapid scale-up” scenario, this increase is nearly threefold. And there is no obvious prospect for a decline in spending over time.

A related finding is that different scenarios have dramatically different price tags. A “hard choices” approach to prevention, while maintaining full access to treatment, drops overall requirements by almost half, while achieving nearly the same impact as the other scenarios in terms of infections averted. The “hard choices” scenario is therefore the most cost-effective one, with an incremental cost-effectiveness ratio of US\$1,429 per HIV infection averted. It is followed by “current trends” (US\$6,225), “structural change” (US\$6,803), and “rapid scale-up” (US\$7,594). The last, “rapid scale-up,” averts the greatest number of HIV infections but has the worst cost-effectiveness ratio.

To implement “hard choices,” countries with concentrated epidemics will need

## EXHIBIT 2

### Total Projected Annual AIDS Resource Requirements In Low- And Middle-Income Countries, By Scenario, 2007–2031



**SOURCES:** Authors' calculations.

**NOTE:** For details on scenarios, see text.

to give greater emphasis to prevention for most-at-risk populations, including overcoming barriers related to stigma and discrimination.

Treatment is a sizable portion of the overall cost, absorbing a quarter of required resources. Treatment programs can be made more efficient through reductions in drug costs. Pharmaceutical companies could lower manufacturing costs and improve procurement practices, and possibly “pool” their patents. Less costly delivery models could be developed, such as use of community-based clinics with greater reliance on nurses rather than on higher-paid physicians.<sup>14</sup>

At the same time, there are risks that treatment costs could increase. Drug resistance could force a shift to more expensive products; clinical guidelines could lead to initiating treatment earlier at higher CD4 counts.<sup>15</sup> A 25 percent rise in drug prices, for example, would result in a 3 percent increase in spending under the “rapid scale-up” scenario.<sup>16</sup>

Substantial resources are required in the “rapid scale-up” scenario for the top twenty-two countries. In 2031 these add to about US\$22 billion annually, or two-thirds of overall expenditures required for low- and middle-income countries.<sup>17, 18</sup> Requirements are greatest for countries with the largest populations (China, India) or medium populations and high HIV disease burden (South Africa, Nigeria). By 2031, South Africa is estimated to need US\$3.5 billion annually, followed by China (US\$3.4 billion), India (US\$2.4 billion), and Nigeria (US\$2.0 billion).

Low-income countries with annual per capita incomes under US\$975 in 2008 account for just under half the total resources required between 2009 and 2031. Middle-income countries account for the remaining 53 percent. These middle-income countries may be able to move toward self-financing AIDS programs, unless their disease burden is very high.

■ **New approaches and technologies.**<sup>19</sup> As shown above, scaling up proven prevention and treatment interventions to the maximum level feasible will cut the number of new adult HIV infections in half by 2031. To achieve more significant reductions, new approaches that lead to dramatic behavior change or new technologies will have to be implemented.

*Male circumcision.* Male circumcision has recently been shown to be an effective prevention measure, and several countries plan to expand circumcision services.<sup>20</sup> Such expansion is included in the scenarios described above. In Zambia, for example, only about 16 percent of adult males are circumcised. In the “rapid scale-up” scenario, this increases to 60 percent by 2015, leading to 30,000 fewer new infections in 2031.

Several new technologies are also under development. These include pre-exposure prophylaxis and microbicides, which may become available in the next five to ten years. Additional potential game-changers are an AIDS vaccine, which is not anticipated to be available until at least 2020; and treatment leading to a cure, with unknown feasibility and availability. We explore the impact of these new technologies by adding them to our epidemiological models.



*Pre-exposure prophylaxis.* The impact of pre-exposure prophylaxis is modest, in part because of the underlying assumption that it would be provided only to high-risk populations. Because in the “rapid scale-up” scenario a sizable percentage of these populations are already using condoms and clean needles by 2015, the additive effect of this intervention is small.

Although pre-exposure prophylaxis might not “change the game” for AIDS globally, it could be important in countries such as Mexico, where the epidemic is concentrated among men having sex with men and injecting drug users. Adding prophylaxis to the “rapid scale-up” scenario for that country results in a reduction from about 15,000 new infections in 2031 to fewer than 10,000 instead.

*Microbicides.* The impact of microbicides is also limited, as a result of our assumption that microbicides would be used along with condoms. In some cases, microbicides might substitute for condoms, which would increase the number of infections averted by microbicides but not the joint impact of condoms and microbicides. We assume that microbicide use among low-risk couples would not exceed 20 percent for the same reasons as for condoms: low perceived risk and reluctance to imply that a partner is unfaithful. The impact of both pre-exposure prophylaxis and microbicides would be higher if extensive testing to identify discordant couples (one HIV-positive, one not) led to wider use.

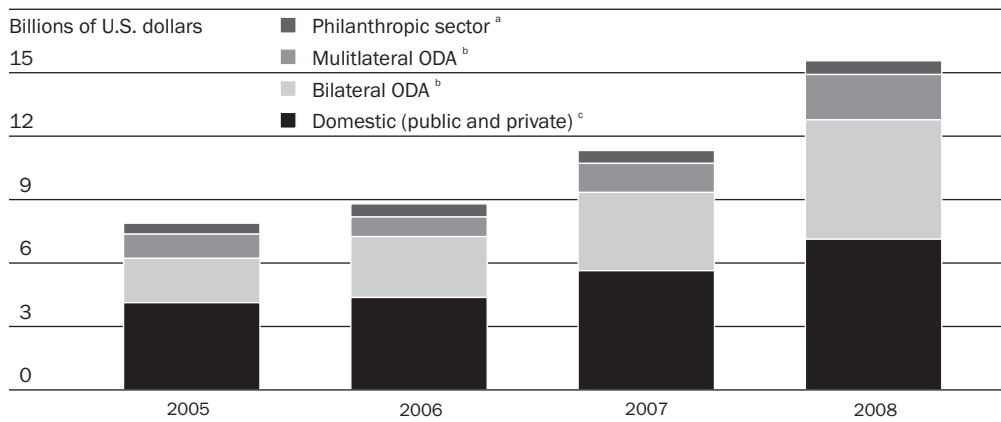
*Vaccine or cure.* The major technology game-changers would be an AIDS vaccine or a new treatment that eliminated the HIV virus from an infected person. We modeled both as part of the AIDS 2031 project. Neither technology is close at hand, however. Investments in research and development for these products need to be intensified.

*Nontechnological innovations.* The other area for major innovation in prevention would be via behavioral change interventions that focus on reducing multiple and concurrent long-term sexual partnerships and promotion of the regular use of condoms in those relationships. Recent analyses of the decline in HIV infections in Uganda in the 1990s suggest that widespread societal change, supported by the government’s “zero grazing” campaign to reduce people’s number of sex partners outside of committed relationships, was an important factor.<sup>21</sup> More research and bold experiments in this area, underpinned by high-level political leadership, are urgently needed.

## **Financing Challenges**

The long-run costs of AIDS in developing countries will be large. Where will the money come from? How much can and should developing-country governments pay for their own AIDS programs? What can be expected from affluent countries and other outside sources?

In 2008, US\$15.6 billion was spent on AIDS programs in low- and middle-income countries, up sharply from US\$7.9 billion three years earlier (Exhibit 3). Despite the many headlines concerning major financing from international

**EXHIBIT 3****Resource Availability For AIDS In Developing Countries, By Source, 2005–2008**

**SOURCES:** See below.

**NOTE:** ODA is official development assistance.

<sup>a</sup> Combination of reports from Funders Concerned about AIDS (2008) and the European HIV/AIDS Funders Group (2008).

<sup>b</sup> Organization for Economic Cooperation and Development (OECD) Development Assistance Committee (2005–2007); Kaiser Family Foundation/UNAIDS (2008).

<sup>c</sup> UNAIDS (2008).

sources—including the Global Fund for AIDS, Tuberculosis, and Malaria and the U.S. President’s Emergency Plan for AIDS Relief (PEPFAR)—the largest share (52 percent) actually came from domestic public and private sources, followed by external funding from bilateral agencies (31 percent), multilateral institutions (12 percent), and the philanthropic sector (5 percent).<sup>22</sup> Nevertheless, AIDS programs remain heavily reliant on outside funding in many high-prevalence, low-income countries.

Over the next few years, financing for AIDS programs in developing countries will suffer major strains from the global economic crisis and the pressures to spend more to achieve high levels of treatment coverage as part of “universal access” programs. These strains will be partly alleviated by the availability of earmarked funds from the Global Fund and PEPFAR, which were replenished and reauthorized by the U.S. Congress just before the economic slowdown began.

Over the longer run, several factors could favor increased financing for AIDS. Economic growth will resume in both developed and developing countries, providing an expanding base from which to pay for AIDS programs out to 2031 and beyond—if the political will exists to do so. Awareness of AIDS is already widespread, including growing recognition that spending has produced positive results, especially in treatment. Support from civil-society groups, including AIDS activists, could maintain positive pressure on governments. There are also prospects for increased financial contributions from philanthropy. “Innovative financing” mechanisms such as global taxation on airline ticket sales (being implemented under UNITAID) hold some promise for expanding the resource envelope



for AIDS.<sup>23</sup>

Other countervailing factors could lead to funding shortfalls for AIDS. Critics allege that AIDS programs get a disproportionate share of domestic spending and donor assistance, shortchanging other health and social development programs.<sup>24</sup> Governments and donors are pressed to provide more resources for other critical issues such as global climate change, which could further limit AIDS spending.

■ **Long-run prospects for domestic financing.** How much will developing-country governments be able to pay for the AIDS effort, and will it be enough? These questions lead to the assessment of the “fiscal space” in affected countries—the budgetary resources from taxation that will be available, and the portion of those resources that can be used to prevent, treat, and mitigate AIDS. Fiscal space is determined by the size of a country’s economy and by policy choices concerning taxation and spending priorities.

The World Bank and International Monetary Fund (IMF) periodically update projections of gross domestic product (GDP) per capita and population.<sup>25</sup> These data, combined with cross-sectional information on health spending and government revenue excluding grants, can be used to estimate future public revenue and health spending for individual countries.

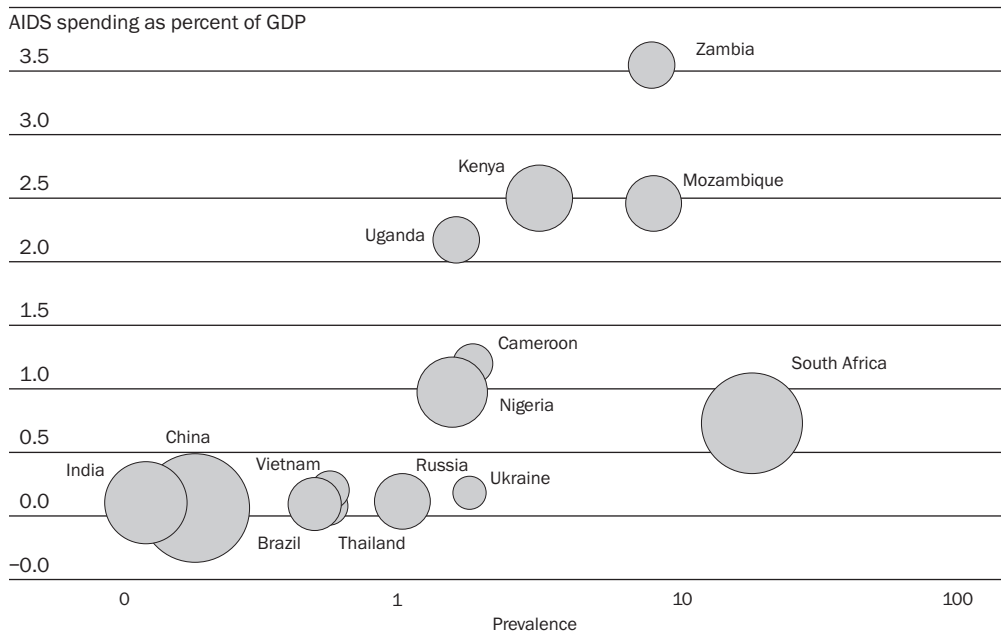
When these results are compared with expected AIDS financial resource needs derived from our earlier cost projections (Exhibit 4), a heterogeneous pattern emerges. Countries fall into four groupings.

(1) Middle-income countries with expected low prevalence in 2030 (less than 1 percent of adults), which will have to devote less than 0.2 percent of GDP to their national AIDS programs. These countries (including Brazil, China, India, Mexico, Russia, Thailand, Ukraine, and Vietnam) have strong chances of paying fully for their AIDS response, without recourse to external financing.

(2) High-prevalence middle-income countries in southern Africa (South Africa, Namibia, Botswana, and Swaziland), where 15–20 percent of adults will still be infected with HIV in 2031, resulting in high AIDS spending (US\$50–\$70 per capita annually). However, in these countries, economic growth will be strong enough to keep AIDS spending at around 1 percent of GDP. These countries can make a large contribution to their AIDS spending, although perhaps they will be unable to meet their full financial needs without external support. This may be especially true over the next decade, when AIDS expenditures will peak at up to 2 percent of GDP as treatment and prevention efforts expand rapidly.

(3) Low-income countries (including Burkina Faso, Cameroon, Ethiopia, and Nigeria), where a significant epidemic (1–5 percent of adults infected) will persist and economic growth prospects are modest, leading to future AIDS funding needs of around 1 percent of GDP. These countries can also make important contributions to their national AIDS spending (US\$5–\$15 per capita). But external partners may need to be called upon to share the costs.

(4) Other countries in eastern and southern Africa, which will face the most se-

**EXHIBIT 4****AIDS Spending As A Share Of Gross Domestic Product And Adult HIV Prevalence, Selected Countries, 2030**

**SOURCES:** Authors' calculations.

**NOTES:** Size of bubble is in proportion to each country's projected AIDS spending in the "rapid scale-up" scenario (see text), in billions of U.S. dollars. Prevalence is calculated as the percentage of people ages 15-49 who are infected with HIV.

were constraints because of high prevalence (5–12 percent of adults), low income levels, and modest growth prospects. These countries (including Kenya, Mozambique, Uganda, and Zambia) confront projected AIDS spending needs equivalent to 2–5 percent of GDP in 2031—a very heavy burden. They will remain dependent on donor financing. Zambia's AIDS spending needs, for example, could reach US\$24 per capita in 2015, consuming 5.6 percent of its GDP, and will continue to rise to about US\$30 per capita in 2031.

■ **Outlook for donor financing.** Over the past decade, the countries in the Organization for Economic Cooperation and Development (OECD) have greatly increased their assistance for health and AIDS. In 2006, about US\$15 billion funded health overall and about US\$6 billion supported AIDS programs in low- and middle-income countries. Yet it is unclear whether this upward trend will continue.<sup>26</sup>

Projections using World Bank data point to a total GDP for high-income countries of just under US\$61 trillion in 2031, based on a 2 percent average annual growth rate. If rich countries continue to provide the current average of 0.27 percent of GDP for development assistance (our pessimistic scenario), total aid will reach US\$155 billion in 2031. If they increase their assistance to the European Union (EU) target of 0.7 percent of GDP (the optimistic scenario), total flows could

*“Competing demands from climate change, energy, and food security may make it difficult to maintain development aid for AIDS.”*

reach US\$425 billion by 2031. If the share for AIDS remains at its current level of 7 percent of all aid, about US\$8 billion in 2015 and US\$11 billion in 2031 would be available for AIDS programs under the pessimistic scenario. This would represent less than 30 percent of the funds needed in those years, compared with 43 percent in recent years. Under the optimistic scenario, development assistance for AIDS could reach US\$22 billion in 2015 and US\$30 billion by 2031, covering 85 percent of future requirements.

Although it is impossible to predict whether actual donor assistance for AIDS will come closer to the optimistic or the pessimistic versions, several factors point toward the lower numbers. First, given the current global economic crisis, it is unlikely that donor commitments will come close to the 0.7 percent target for 2015. Second, competing demands from climate change, energy, food security, and other global health issues may make it difficult to maintain the share of development aid for AIDS at 7 percent.

The adequacy of donor assistance for AIDS programs will depend not only on the aggregate amount involved, but also on how these funds are earmarked for countries and for different services. If much of external funding flows to middle-income countries, which in reality could be financially self-sufficient, there could be serious shortfalls in low-income countries with higher HIV prevalence.

■ **Philanthropy and innovative financing.** Philanthropy by individual donors, foundations, companies, and other private organizations has been an important source of financing for AIDS in developing countries. Funding now amounts to about US\$1 billion annually, with US\$500 million from U.S.-based foundations and corporations; US\$115 million from European-based foundations and companies; and the remainder from individuals, charities, churches, and service organizations worldwide.<sup>27</sup> Philanthropy has been especially useful in catalyzing early action and innovative approaches, and in supporting AIDS-related biomedical research. An example is the hundreds of millions of dollars in recent grants from the Bill & Melinda Gates Foundation for the development of vaccines, microbicides, pre-exposure prophylaxis, and other new HIV prevention technologies. The challenge for the future will be to sustain support from these private sources and to appeal to the new philanthropists who are emerging—not only in North America and Europe but also in China, India, Mexico, and the Middle East.

Global AIDS programs have pioneered innovative financing over the past decade and are well positioned to test and implement new approaches. Such past initiatives, mostly involving the Global Fund, have included voluntary contributions through the (PRODUCT) RED retail shopping campaign, which has garnered US\$130 million;<sup>28</sup> debt swaps under the “Debt2Health” program, in which

Germany has agreed to forgive up to US\$300 million in debt owed by Indonesia and Pakistan, if the latter governments allocate a negotiated portion to their national AIDS efforts; and the French-led airline solidarity tax levy, which has generated US\$718 million over the past two years for expanded treatments for AIDS, TB, and malaria.<sup>29</sup>

Going forward, the Taskforce on Innovative Financing for Health Systems has recently proposed other mechanisms that could be tapped for AIDS, including a currency transactions tax.<sup>30</sup> Other ideas, such as using government-guaranteed bonds to finance global health research and development, could pay for work on an AIDS vaccine, cure, and other prevention technology game-changers.

## Conclusions

The global AIDS pandemic has continued for nearly three decades and will be a major health, social, and financial issue for many years to come. Modeling and analysis under the AIDS 2031 project can shed light on where the epidemic, its costs, and its financing may be heading, and can point to key policy options today to make a positive difference in the long run.

We recognize that in reality, all developing countries will not follow the same set of policies or scale-up patterns as portrayed in the four scenarios explored here. Further, a combination of country-specific factors—income and economic growth, institutions, social movements, and political forces among them—will determine the actual course each will take on AIDS program scale-up and spending over the next two decades. Nevertheless, we argue that the scenarios and modeling presented here are valuable in framing the future possibilities and contributing to policy discussions and spending decisions.

Our key findings related to costs are that AIDS resource requirements will increase rapidly over the next five to eight years and will continue to rise over the following decade and a half. Needs vary between US\$19 billion and US\$35 billion annually by 2031, and between US\$397 and US\$722 billion over the twenty-two-year period. The difference in price tags is substantial, but in some cases it results in only modest differences in health impact.

■ **Policy actions to spend effectively.** The choices that governments, international organizations, foundations, and civil-society groups make today will have a large impact on how much we will have to spend on AIDS in the future. There are several important policy implications.

First, the “hard choices” scenario shows that major savings are possible if efforts are focused on high-impact prevention for most-at-risk populations—sex workers, men who have sex with men, and injecting drug users—who suffer from stigma and discrimination and from governments’ limited willingness to channel resources their way.

Second, although broader structural changes may increase costs, they could also have the largest effect over the long run in lowering the number of new infec-

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tions. This effect would be in addition to their other benefits not measured here, such as improvements in women's status and economic productivity.

Third, because treatment programs will drive as much as a quarter of AIDS costs over the long term, it is critical to obtain low drug prices. It is also essential to adopt low-cost, high-quality delivery approaches consisting of tightly supervised local clinics staffed with paraprofessionals as well as doctors.

Fourth, our existing HIV prevention arsenal is inadequate. It must be expanded to include a combination of new technologies such as an AIDS vaccine or treatment leading to a cure. It must also include political and social movements that lead to profound behavior change in severely affected countries—namely, fewer sexual partners and higher condom use in stable, long-term relationships.

■ **Policy actions to expand financing.** Our analysis suggests that mobilizing the enormous sums of money required for AIDS in developing countries between now and 2031 will be difficult. Several important policy actions are required:

(1) Developing (especially middle-income) countries need to expand domestic funding for AIDS in line with their ability to pay.

(2) Donors must be prepared to sustain their financial support over a long period, particularly for high-AIDS-burden countries with low incomes and modest growth prospects.

(3) To maintain political support in donor countries, better monitoring will be needed to demonstrate that current spending yields important benefits.

(4) Donors could also use external financing to encourage governments to strengthen HIV prevention, emphasizing that better prevention now means much lower future treatment costs.

(5) The positive environment for philanthropic giving for AIDS must be further enhanced, through a combination of tax incentives for charitable donations in Europe and elsewhere and expanded efforts by intermediaries such as UNAIDS and the Global Fund.

(6) The AIDS community needs to continue actively exploring innovative financing instruments that can generate additional resources.

Urgent and concentrated efforts to implement these recommended policies in the next few years will help put the global fight against AIDS on a more efficient and sustainable path, leading to vastly reduced suffering over the next two decades.

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## NOTES

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