Botswana

I. Introduction

Botswana is among the countries with the highest level of HIV prevalence in the world. According to the Joint United Nations Programme on HIV/AIDS (UNAIDS 2010a, 2010b), prevalence among the population aged 15–49 was 24.8 percent, and 320,000 people were living with HIV. As a result of HIV/AIDS, key health indicators have deteriorated catastrophically—life expectancy at birth has declined from 66 years in 1990 to 50 years in 2002, recovering only partly to 54 years by 2008 (World Bank 2010a). Consequently, during 2005–10, the probability of reaching age 50 dropped to 55 percent, compared to 88 percent without AIDS (United Nations Population Division 2009b).

The scale of the epidemic in Botswana brings extraordinary challenges for responding to the epidemic. Even though recent survey data point to some decline in HIV incidence, the large number of people already living with HIV, as well as the ongoing new infections, will continue to pose significant challenges for many years (or even decades). For example, the number of people receiving treatment will continue to rise for many years, and a large number of young people will grow up in households affected by illness or death.

The objectives of this study are to assess fiscal policy challenges arising from the HIV/AIDS response, develop tools to better understand the links between the HIV/AIDS program and the fiscal costs of HIV/AIDS, and thus inform the planning of the national HIV/AIDS response and fiscal planning in general.
The study contributes to addressing challenges in three areas:

- Compared to a conventional costing study, this analysis provides value added in two directions: It includes aspects of the HIV/AIDS impact (for example, the implications of the impact on public servants) that are not normally covered by a costing analysis, and—based on the recognition that the fiscal costs of HIV/AIDS are highly persistent—it adopts a long-term perspective to considering the fiscal sustainability of HIV/AIDS costs.

- This analysis of the fiscal dimension of HIV/AIDS is embedded in a discussion of the fiscal context and outlook. The study complements the ongoing Public Expenditure Review being conducted by the World Bank, describing the fiscal costs of HIV/AIDS as one of the significant challenges for public finance for the near future and potentially decades, contributing to the challenges of fiscal adjustment as mining revenues slow down.

- The study develops improved tools to analyze the trade-offs inherent in HIV/AIDS programs, capturing the persistence of the costs incurred. In addition to projections of current HIV/AIDS spending, these costs are attributed to HIV infections that occurred much earlier, and the evolving fiscal costs are directly linked to HIV incidence.

Section II takes stock of the the HIV/AIDS impact in Botswana to date. It starts with a discussion of the state and course of the epidemic and its most direct consequences on health outcomes. Following is a review of the macro-economic consequences of HIV/AIDS that is based on substantial studies that have been conducted in Botswana. Finally, there is a disconnect between economic and human development—whereas economic development (measured, for example, by gross domestic product [GDP] per capita) has been positive over the last two decades, health indicators such as life expectancy have deteriorated sharply. As a result, comprehensive development indices such as the Human Development Index (HDI) show a decline over this period.

Section III sets the ground for the fiscal analysis by describing the state of public finances—drawing on, among other sources, available budget data and the national development framework—and summarizing available data on overall health spending and financing and on the costs and financing of the national HIV/AIDS response.

Section IV provides the substance of this analysis. It starts out with a summary of the demographic and epidemiological projections that this
analysis builds on. Based on the objectives of the national strategic framework of HIV/AIDS and available spending data, the fiscal costs of HIV/AIDS are calculated and projected. This study’s cost projections are complemented by three subsections providing further analytical content: a discussion of HIV/AIDS as a long-term fiscal commitment that has many features of a fiscal liability, using tools normally applied to debt sustainability analysis; an analysis that allocates the costs of HIV/AIDS to the time an infection occurs, providing additional tools to analyze the link between HIV incidence and the costs of an HIV/AIDS program; and a discussion of the role of external aid.

II. The Impact of HIV/AIDS in Botswana

To provide context for this study’s analysis of the fiscal dimension of HIV/AIDS in Botswana, this section provides a general review of HIV/AIDS impacts. Some HIV/AIDS impacts have implications for public finance that are not captured by the estimated costs of the HIV/AIDS response. For example, the epidemic affects public servants as well as the general population, and a slowdown in GDP would affect domestic fiscal revenues. In addition, the impact of the epidemic and the response to it intersect with key public policy objectives, such as improving health, increasing access to education, and reducing poverty. The broad macroeconomic effects of HIV/AIDS (for example, on economic growth) also have fiscal repercussions.

This discussion of the HIV/AIDS impacts in Botswana sets out with a brief review of the course and the state of the epidemic. The discussion then turns to health, the area where the epidemic’s impacts are most apparent. The broader macroeconomic and development repercussions of HIV/AIDS are then explored, including a review of studies that analyze the macroeconomic impact of HIV/AIDS in Botswana. This review is then complemented by a discussion of the broader development impacts, using the United Nations Development Programme (UNDP) Human Development Index as a point of reference.

The course and state of the epidemic

HIV/AIDS in Botswana has a relatively short history. The first case of HIV was diagnosed in 1985, although studies analyzing the demographic impact
of HIV/AIDS (for example, NACA [2008] or CARe [2006]) assume that the first cases occurred somewhat earlier. In 1986, HIV prevalence reached 1 percent of the population aged 15–49 (and 0.5 percent of the overall population). The epidemic escalated to current levels in the 1990s, with HIV prevalence increasing from 4.7 percent in 1990 to 25.9 percent in 2000 among those 15–49 years old (figure 2.1a). In this period, HIV incidence (the number of new infections) peaked at 2.3 percent of the population and close to 4 percent of the population of aged 15–49.

As the number of people living with HIV/AIDS increased, AIDS-related mortality also increased: crude mortality attributed to HIV/AIDS increased from 0.1 percent in 1990 to 0.8 percent in 2000, and peaked at 1.0 percent in 2002. Although HIV incidence has declined strongly since the mid-1990s (to about half of its peak level in absolute numbers by 2008), HIV prevalence continued to rise through 2001, as HIV incidence remained higher than AIDS-related mortality. Starting in 2002, a new development became apparent (figure 2.1a): crude mortality declined from 1.0 percent to 0.35 percent in 2006, reflecting the impact of increased access to antiretroviral treatment. Figure 2.1b complements the estimates of HIV prevalence among pregnant women from antenatal clinics, which are the primary source of data on which the demographic estimates in figure 2.1a are based. These data suggest that HIV prevalence has been higher in urban areas, peaking at 47 percent in 2003 in urban areas, and at 37 percent in 2002 in rural areas.

Figure 2.2 summarizes the findings of the recent 2008 Botswana AIDS Impact Survey (CSO 2009) and, for prevalence, compares them with the outcomes of the earlier 2004 survey (CSO 2005). For women, HIV prevalence accelerates rapidly between age groups 15–19 and 30–34, where it peaks at 49 percent in the 2008 survey, and at 44 percent in the 2004 survey. For men, prevalence is much lower for the young cohorts, peaking at 36 percent (ages 30–34) in the 2004 survey, and at 44 percent for ages 40–44 in the 2008 survey. The patterns are consistent with a decline in HIV incidence among young adults; for women and men, HIV prevalence in this age group has declined considerably between the two surveys. HIV prevalence, according to CSO (2009), is higher in urban than in rural settings (17.9 percent compared to 17.1 percent), this can be attributed to the gap in prevalence rates for women (21.2 percent compared to 19.3 percent), whereas prevalence is somewhat lower in urban settings for men (13.8 percent compared to 14.6 percent).
Figure 2.1: Evolution of the HIV Epidemic

**a. Percent of the population, 1970–2009**

- **HIV+ population (left scale)**
- **prevalence, NACA (15–49, left scale)**
- **prevalence, UNAIDS (15–49, left scale)**
- **HIV incidence (right scale)**
- **AIDS-related deaths (right scale)**

**b. HIV prevalence among women at antenatal clinics, 1990–2006**

- **urban sites (median)**
- **rural sites (median)**


Notes: Prevalence (15–49) is shown in percent of the population aged 15–49, all other variables are shown in percent of the total population; missing values for 2004 have been proxied by interpolation. NACA = National AIDS Coordination Agency.
An important element of Botswana’s response to HIV/AIDS is the national antiretroviral treatment program (MASA). Launched in 2002, MASA was the first program in Sub-Saharan Africa to provide no-cost antiretroviral therapy nationwide. The number of people receiving treatment has risen rapidly, from 10,000 in 2003 to 145,000 in 2009 (NACA 2008; WHO 2010; figure 2.3). As of end-2007, about 80 percent of the 92,000 persons on treatment were receiving it through the public sector. The balance was split between patients enrolled through the private sector and patients whose treatment was outsourced to the private sector.
Implications of HIV/AIDS for health outcomes

Figure 2.4 summarizes the available data on mortality and morbidity. The United Nations Population Division (2009b; see figure 2.4a) estimates that HIV/AIDS has resulted in a substantial increase in child mortality (as a result of mother-to-child transmission). For adults, mortality increases sharply starting with the cohort of ages 20–24. For women, it peaks in the 35–39 age group at 3.1 percent annually (compared to only 0.2 percent in a no-AIDS scenario), and subsequently declines until mortality rises again because of old age. For men, HIV/AIDS-related mortality peaks later, between ages 40 and 44, at about 2.6 percent. While HIV/AIDS-related mortality then tapers off, mortality for other reasons increases with age, so that mortality remains high at over 2 percent.

While the estimates by United Nations Population Division (2009b) are model generated, figures 2.4b and 2.4c provide estimates for mortality and morbidity from two waves of the Botswana AIDS Impact Survey (CSO 2005, 2009). These survey data, collected over a period in which treatment access improved significantly, also offer an indication of the health impacts of the scaling-up effort. Mortality among young adults declined sharply between
Figure 2.4: HIV/AIDS, Mortality, and Morbidity

Sources: a. Authors’ calculations, based on United Nations Population Division (2009b); b. authors’ calculations, based on CSO (2005, 2009); c. authors’ calculations, based on CSO (2005, 2009).
2004 and 2008, most notably for the 30–35 age group, dropping from 3.5 percent in the 2004 survey (CSO 2005) to 1.5 percent in the 2008 survey (CSO 2009). However, mortality among young adults remains very high, at about three times the level of the counterfactual “no-AIDS” estimates prepared by United Nations Population Division (2009b). Morbidity, measured by the share of household members who were bedridden, has declined, though not as sharply as mortality, and remains elevated among young adults.

A significant outcome of the increased mortality among young adults is a disproportionate increase in the number of orphans, especially double orphans. According to NACA (2008), about 15 percent of the population aged 0–17 were orphans (that is, had lost at least one parent) in 2007, including 11 percent of the youth population who had been orphaned as a result of AIDS-related mortality. Among the children orphaned by AIDS, 36 percent were double orphans, whereas the corresponding share was only 5 percent among children who lost a parent for other reasons.

The consequences of increased mortality over a life span are illustrated in figure 2.5, showing estimated survival curves. Life expectancy at birth was estimated at 55 years for 2005–10 (United Nations Population Division 2009b), representing a loss of 13 years. Correspondingly, the probability of surviving to age 50 has declined to 55 percent, compared to 88 percent without AIDS, and the median life expectancy from the mid 70s to the mid 50s.

**Macroeconomic impact**

The macroeconomic impact of HIV/AIDS in Botswana has been analyzed in numerous studies. An obvious starting point for this discussion is the BIDPA (2000) study, which is the earliest of these studies and—because of its wide scope—a useful reference point. Building on a neoclassical growth model adapted by Cuddington (1993) to capture some of the impacts of HIV/AIDS through the labor market, and featuring a formal and informal sector and two types of labor (skilled and unskilled), BIDPA (2000) estimated that as a consequence of the HIV/AIDS epidemic, GDP growth declined by about 1 percentage point, so that the GDP is 23 percent smaller by 2021 than it would be without the impacts of HIV/AIDS. Because lower population growth results in an increase in the capital-labor ratio, which more than offsets the negative impacts of HIV/AIDS on GDP per capita, BIDPA (2000) suggests that the rate of growth of GDP per capita increases by 0.4 percentage points.
There are two dimensions that distinguish the BIDPA (2000b) study from most other studies of the macroeconomic impact of HIV/AIDS. First, it provides a thorough discussion of the HIV/AIDS impact on the fiscal balance (discussed below), and, recognizing that HIV/AIDS impacts are highly uneven across households, it discusses the HIV/AIDS impacts on poverty and inequality because of increased expenditures and shocks to household income.9


Using a fairly simple macroeconomic model, Masha (2004) analyzes the macroeconomic repercussions of Botswana’s National Strategic Framework (NSF) on HIV/AIDS. Masha predicts that, as a result of the interventions programmed under the NSF, the decline in GDP growth

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**Figure 2.5: Survival Rates from Age 0 by Sex, 2005–10**

Source: Authors’ calculations, based on United Nations Population Division (2009).

Note: a. Share of cohort reaching age 50 down by over one-third; b. Median life expectancy declines from about 75 to around 55.
by 2015 will be reduced by 0.8 percentage points (compared to a decline of 2.2 percentage points without interventions). Additionally, Masha (2004) estimated HIV/AIDS fiscal costs under the NSF and that indirect fiscal savings from the reduced impact of HIV/AIDS also result in a decline of certain expenditures.

Jefferis, Siphambe, and Kinghorn (2006) set out to update and build on BIDPA (2000). Reviewing the predictions made by BIDPA (2000), they concluded that the model was largely appropriate. However, economic growth was higher than predicted by BIDPA (2000), partly because of major developments that occurred after the study, most important, the scale-up of antiretroviral treatment.11

Regarding the macroeconomic impacts of HIV/AIDS, Jefferis, Siphambe, and Kinghorn (2006) contrasted their estimates not only with a no-AIDS scenario, but also with a scenario that includes HIV/AIDS impacts with no scale-up of antiretroviral treatment.12 Overall, they estimated that annual GDP growth is reduced by about 1.2 percentage points, compared to 1.5–2.0 percentage points in the absence of widespread access to antiretroviral treatment, implying a moderate increase in the rate of growth of GDP per capita of about 0.4 percentage points.

Similar to BIDPA (2000), Jefferis, Siphambe, and Kinghorn (2006) also provide a substantial analysis of HIV/AIDS impacts on the fiscal balance (discussed later) as well as an analysis of HIV/AIDS impacts on poverty. Increased household expenditures as a result of HIV/AIDS add about 1 percentage point to the poverty headcount. Assessing the income effects is more complicated, because one household’s loss due to the death of an income earner (as suggested by microeconomic studies) may be another household’s gain (because of increased employment opportunities), so that the macroeconomic effects are smaller than the immediate household level impacts of HIV/AIDS. Dependency rates are projected to increase, and Jefferis, Siphambe, and Kinghorn (2006) suggest that the household impacts are disproportionally large for the lowest income quintile.

**Disconnect between economic and human development**

Although economic development and improvements in health indicators normally go hand in hand, this link is broken in Botswana because of the impacts of HIV/AIDS. The disconnect between Botswana’s economic
status and health status is illustrated by figure 2.6, which plots life expectancy against the level of GDP per capita for a large number of countries. Overall, life expectancy increases with GDP per capita. While there is a great variability in life expectancy for countries with GDP per capita below US$2,000 (purchasing power parity, 2005 prices), very few of these countries have a life expectancy exceeding 65 years. Conversely, very few countries with GDP per capita exceeding US$2,000 have a life expectancy below 65 years. However, along with a small number of other countries affected by high HIV prevalence, and two countries that have recently acquired great (oil) wealth, Botswana is an outlier: life expectancy is about 20 years lower than in the countries with similar GDP per capita (Turkey, Romania, Malaysia, and Argentina), and at about the same level as in Kenya (GDP per capita one-ninth of Botswana’s) and Ethiopia (GDP per capita one-sixteenth of Botswana’s).

NACA (2003) relatedly points out that “high morbidity and mortality rates due to HIV/AIDS have seen Botswana slip down the UNDP Human Development Index (HDI) rankings from 71 in 1996, to 122 in 1999/2000.” Since then, Botswana’s ranking has slipped further to 125 as of 2007 (UNDP 2009). This is primarily the consequence of the devastating impact of HIV/AIDS on life expectancy: Botswana ranks 60th in terms of

Figure 2.6: Life Expectancy and GDP per Capita, 2008

GDP per capita, but ranks 159th (among 181 countries covered) in terms of life expectancy. These developments—and the fact that the composite HDI masks large differences in underlying trends in GDP per capita and life expectancy—are illustrated in figure 2.7. Among the seven countries covered (Bolivia, Botswana, China, the Arab Republic of Egypt, Guatemala, Indonesia, and the Islamic Republic of Iran), Botswana starts out at about the midpoint in 1980 (figure 2.7). Driven by high rates of economic growth, Botswana had risen to the top of these seven countries by 1990. However, Botswana’s HDI declined in absolute terms from 1990 to the lowest level among the seven countries, and has remained there until 2007. Figures 2.7b and 2.7c show the underlying trends for life expectancy and for GDP per capita: while the Botswana experienced the largest increase in GDP per capita among the countries covered, the catastrophic decline in life expectancy between 1990 and 2000 was sufficient to drop Botswana’s HDI rank from the top to the bottom.

III. HIV/AIDS and Public Finance

Before presenting the estimates of the fiscal costs of HIV/AIDS and an analysis of how the fiscal burden evolves over time, this section takes stock of the state of public finance and the role of public health spending. Then, it reviews data and estimates of the fiscal costs of HIV/AIDS and the response to HIV/AIDS so far.

The state of public finances

This review of the state of public finance serves as a reference point for assessing the magnitude of the challenges in financing the costs of HIV/AIDS and the HIV/AIDS program. Beyond the immediate fiscal situation, for which this study draws largely on budget data, this discussion is informed by the National Development Plan (NDP) 10 (Botswana 2010) and the World Bank’s Botswana Public Expenditure Review (2010b).

Several aspects of the fiscal context are relevant for assessing the fiscal implications of HIV/AIDS. First, because of large mineral revenues, government spending is relatively high in Botswana. Second, Botswana was hard hit by the recent global financial crisis and responded by adopting an expansionary fiscal policy, with budget deficits reaching 16 percent of GDP in 2009/10.
Figure 2.7: Human Development Index and Underlying Factors, Seven Countries

Sources: UNDP (2009); World Bank (2010a).
This needs to be taken into account for when assessing fiscal developments (including health spending) between 2008 and 2010, and the coming years will see an adjustment from the very high fiscal deficits in 2009/10 and budgeted for 2010/11. Finally, the role of the mineral sector and the corresponding fiscal revenues are expected to slow down over the coming years; longer-term fiscal projections need to consider this shrinking resource envelope.

Table 2.1 summarizes recent fiscal developments. Between 2006/7 and 2010/11, mineral revenues declined (or are projected to decline) by about...
two-thirds, a trend that began before, but was accelerated by, the global crisis. Because nonmineral revenues and grants did not change by much over this period, this translated into a decline in government revenues from 40 percent of GDP to 30 percent of GDP. However, the government followed an expansionary fiscal policy through the economic crisis, with total expenditures increasing from 31 percent of GDP in 2007/8 to 48 percent of GDP in 2009/10 (and 41 percent of GDP in the 2010/11 budget).

Looking ahead, the immediate challenge is fiscal stabilization, and this has been addressed in the draft NDP 10 (through 2015/16; Botswana 2010), and the assumptions regarding the fiscal outlook in this analysis reflect the projections included in NDP 10. For the following period, the government assumes a decline in mineral revenues. This study’s fiscal projections follow Clausen (2008) and Kojo (2010), the latter based on the ongoing Public Expenditure Review conducted by the World Bank (2010b). In the longer run, the projections assume that part of the decline in mineral revenues is offset by revenue measures in other areas, as envisioned under the enhanced revenues scenario described in the Public Expenditure Review. Regarding expenditures, much of the expected adjustment occurs through 2014 (in line with the NDP 10 [Botswana 2010]). Subsequently, this study expects expenditures will decline very slowly relative to GDP (but still increasing in absolute terms), broadly in line with fiscal revenues (figure 2.8).

Health spending and financing

Because much of the challenges in the response to HIV/AIDS occur in the health sector, and because most antiretroviral treatment in Botswana is delivered through the public sector, a brief outline of some aggregate data on health spending and financing provides useful context.

Figure 2.9 illustrates the evolution of health expenditures based on data compiled by WHO (2010a). Domestically financed public health spending dominates health spending in Botswana, and accounts fully for the increase in health spending that has occurred since 2001. Before 2001, public health spending accounted for just over half of total health expenditures, with total expenditures hovering just above 4 percent of GDP. Among private health spending, nongovernmental organizations (NGOs) account for the largest share (about 60 percent), followed by private out-of-pocket spending (one-third). Between 2001 and 2005, public health expenditures accelerated rapidly relative to GDP, to about 5 percent, before falling back to a level of less
than 4 percent. Because some of these developments occurred during a period of rapid GDP acceleration, this study also includes estimates of health spending in absolute numbers (transformed into U.S. dollars). From this perspective, public health spending increased from a level of about US$125 million in 2002 ($110 per capita) to US$473 million in 2005 ($388 per capita), and has remained at about this level. External financing played a subordinate role (less than 1 percent of total health spending), at least until 2002, but increased to around 5 percent of total spending during the most recent years.

One of the strengths of the data compiled by the WHO is the wide country coverage—for 2007, data on 191 countries are available (WHO 2010c). Total health spending in Botswana is comparable to other countries in its income bracket, although public health expenditures play a relatively large role (figure 2.10).

Costs of national HIV/AIDS response
The bulk of HIV/AIDS-related spending is covered by the National Strategic Framework on HIV/AIDS and coordinated by the National AIDS Coordination Agency (NACA). Estimates of HIV/AIDS-related spending
are available from National AIDS Spending Assessments, covering the years 2003–05 and the United Nations General Assembly Special Session (UNGASS) reports for 2008 and 2010 (Ministry of State President and NACA 2008; NACA and UNAIDS 2010).19

Table 2.2 summarizes the data available on HIV/AIDS-related spending. HIV/AIDS-related spending increased from 1.9 percent of GDP in 2003 to 2.6 percent of GDP in 2008. As noted before, this increase took place at a time when GDP was rising rapidly—real GDP grew at a rate of 4 percent annually, and nominal GDP in U.S. dollar terms grew at a rate of 11 percent annually. The increase in HIV/AIDS-related spending relative to GDP is therefore equivalent to a nominal increase from US$150 million to US$348 million.
Table 2.2 summarizes funding sources for the HIV/AIDS response financing by broad category. Much of the increase in HIV/AIDS-related spending has been financed by external support, which increased from 0.1 percent of GDP to 0.8 percent of GDP (and from US$12 million to US$112 million in absolute terms). Of this, the bulk was accounted for by bilateral financing (mostly from the United States, specifically the President’s Emergency Plan for AIDS Relief), which accounted for about two-thirds of external support in 2007 and 2008. Notably, about 30 percent of external support came from other international sources, reflecting high levels of support from private international
sources. Meanwhile, spending from domestic sources (dominated by public spending) has remained flat relative to GDP. Public spending remained at about 1.7 percent of GDP, but increased from US$136 million to US$229 million per year in absolute terms.

From the perspective of public finance, the increased burden of HIV/AIDS, as far as it is evident from these HIV/AIDS line items, has therefore been met from two sources—the benign economic environment allowing the government to raise allocations toward the HIV/AIDS program in line with high rates of GDP growth, and the increase in external support. Looking forward (and considering the global economic development since 2008), it is not clear whether either of these sources will continue to meet the fiscal burden of HIV/AIDS. Botswana was hit hard by the global crisis, experiencing a decline in real GDP of 6 percent in 2009 and a depreciation against the U.S. dollar, so that GDP in U.S. dollar terms contracted by 14 percent.

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<th>Table 2.2: HIV/AIDS-Related Spending</th>
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Sources: Ministry of State President and NACA (2008), NACA and UNAIDS (2007, 2010) for spending data, and IMF (2010a) for GDP. Note: — = not available.
In addition to the estimates of actual spending under the umbrella of the national HIV/AIDS response, which also identify the costs to the government, a number of studies have estimated further aspects of the fiscal costs of HIV/AIDS. BIDPA (2000) embeds an analysis of the fiscal costs of HIV/AIDS in a very comprehensive macroeconomic assessment. On the expenditure side, BIDPA distinguishes between employment costs (such as an increase in skilled salaries, death benefits and pensions, and training and recruitment costs), health spending (treatment), education spending (fiscal savings resulting from smaller cohorts), and social expenditures. While methodologically the BIDPA study remains an important benchmark, the estimates included are now obsolete.

More recently, Jefferis, Siphambe, and Kinghorn (2006) assessed the fiscal impacts of HIV/AIDS, building in part on the framework developed by the BIDPA (2000) study, but refining the analysis in some directions. On the expenditure side, they itemize the costs of antiretroviral treatment, hospital inpatient costs, home-based care, prevention, program management, orphan support, and old-age pensions. According to their estimates (figure 2.11), HIV/AIDS-related expenditures are projected to peak in 2010 (at 3.4 percent of GDP) and gradually decline to 2.8 percent of GDP by 2021. Much of the initial increase is driven by the costs of antiretroviral treatment, whereas the cost of inpatient treatment declines.

Two additional studies are narrower in scope, but offer some relevant lessons for the context of this study. Picazo and David (2008) take stock of HIV/AIDS-related expenditures and financing needs implied by the National Strategic Framework (NSF). While their study adopts a much shorter time horizon, it provides a thorough analysis of the effectiveness of different types of HIV/AIDS-related interventions. They stress the need to increase funding for prevention measures, and identify inefficiencies resulting in higher costs for certain interventions.


The NSF envisages a substantial allocation of resources to fighting the epidemic. However, through its demographic and macroeconomic effects, which in themselves are highly desirable, it also helps contain certain categories of expenditure, and, by mitigating the adverse effects of
HIV/AIDS on the tax base, it mobilizes domestic revenue to offset some of the fiscal costs of the program.

This study’s analysis incorporates many of these indirect effects.

**HIV/AIDS impact on government employees.** The most visible HIV/AIDS impact on government capacity is the increase in morbidity and mortality among government employees. Increased absenteeism and sick leave, increased attrition, and the need to recruit new staff affect the ability of the government to conduct business and provide services, and these factors,
along with medical and death-related benefits, also add to the fiscal costs of HIV/AIDS. The evidence available on these costs in Botswana is very limited. Two early studies of the education sector (Bennell and others 2001; Chilisa, Bennell, and Hyde 2001) document the upward trend in mortality and sick leave among staff (and students) through 1999, and a decline in mortality in 2000 attributed to the provision of antiretroviral treatment to public servants. These studies, however, are now outdated, cannot easily be generalized, and do not fully cover the costs relevant for this study.

The most tangible indicator of the impact of HIV/AIDS on public servants is the increase in mortality. The Ministry of State President and NACA (2008) reported 472 deaths among public servants in 2006/7, 460 in 2007/8, 400 in 2008/9, and 508 in 2009/10. This translates into mortality rates among public servants of about 0.4 percent for 2005/6 (applying an estimated number of government employees of 120,000, as reported by IMF [2007]), much lower than available estimates for mortality among the population aged 20–59, which was around 1.5 percent in 2005–10, according to the United Nations Population Division (2009b). In the absence of more specific data on HIV/AIDS impacts on public servants, this study used the mortality figures of the United Nations Population Division to assess the costs of increased mortality on public servants.

Regarding the costs of increased sick leave, government employees are assumed to take 90 days of sick leave in the year preceding death. Additionally, government employees receiving antiretroviral treatment are assumed to take 10 days of sick leave annually, which would cover the occasional visit to a clinic and illness. Public servants may also use sick leave to care for sick dependents, but there is not sufficient data to include this factor in the calculations.

The costs of HIV/AIDS-related medical benefits are included in the estimates of the costs of the national HIV/AIDS program; however, these costs represent a significant share of the costs of the HIV/AIDS impact of on public servants. Therefore they are included here as a memorandum item. The number of government employees is about 120,000 (IMF 2007), and medical benefits schemes usually also cover the immediate family, therefore this study assumes that the scheme would cover about 200,000 adults, corresponding to about 20 percent of the population of aged 20–59. If, accordingly, 20 percent of the costs of treatment and care under the national HIV/AIDS program can be attributed to medical benefits for government
employees and related costs, this would correspond to about 0.2 percent of GDP, or 3 percent of wages and salaries.

Attending funerals for AIDS-related deaths is an important reason for absenteeism for government employees. Chilisa, Bennell, and Hyde (2001) reported that the amount of leave taken for funeral attendance equaled about two-thirds of the leave taken for illness, for both students and staff. Bennell and others (2001) reported similar findings for staff in primary and secondary education in Botswana. To estimate the extent of absenteeism to attend funerals, Haacker’s (2004) assumption was used, whereby each death results in 40 person-days for funeral attendance.

When discussing HIV/AIDS impacts on increased mortality among government employees, two other significant fiscal costs are pensions and death-related benefits (such as funeral grants). In Botswana, pensions for government employees are administered through the Botswana Public Officers Pension Fund, which operates a defined-contribution scheme. This means that contributions are paid into an individual account. In the event of death or retirement, the balance from the account is paid out or transformed into an annuity, either to the retiree or to surviving dependents. Consequently, increased mortality because of HIV/AIDS does not increase the costs of pension-related benefits to the government of Botswana.28

Costs resulting from increased turnover of government employees include administering the exit (due to death or retirement) of employees; advertising and filling a position, including financial costs such as advertising, but also staff time for selecting candidates and processing appointments; and productivity losses because new employees, or people moving to a new assignment, are learning on the job. Regarding the costs of administering the exit/filling a vacancy, this study assumes that these costs correspond to one month’s salary of the position filled.29 It is also assumed that the productivity of a new employee is 25 percent lower during the first year due to learning on the job, which is at the lower end of the range reported by Rosen and others (2004) for the private sector.30

Vacancy periods associated with increased attrition can also add to the disruptions of public services. The Directorate of Public Service Management (2009) indicates that it takes about two months to fill an advertised post. Because some time often elapses from the moment the need to fill a position arises to the time at which it is advertised, a vacancy period of three months appears plausible. However, unlike absenteeism, there are no salary
costs incurred during a vacancy period. Therefore it is not included in estimates of the financial or productivity costs of HIV/AIDS.

Finally, increased staff turnover because of HIV/AIDS-related attrition results in additional training costs. These costs are difficult to quantify, and thus, as a memorandum item, this study includes a training cost of half a year of working time in the estimates of increased attrition costs.

Table 2.3 summarizes the estimates of the costs of the HIV/AIDS impact on government employees in 2008 based on an HIV/AIDS-related mortality of 1.5 percent and 11 percent of employees receiving treatment. The costs of the impact of HIV/AIDS on public servants (excluding medical costs) account for 2.6 percent of wages and salaries and about 0.23 percent of GDP. The biggest cost item is sick leave, accounting for about half of the nonmedical costs. Including medical and related costs, the costs of the impact of HIV/AIDS on public servants reach 0.5 percent of GDP, or 5.6 percent of wages and salaries, of which medical costs account for almost three-quarters.

### IV. Modeling the Fiscal Dimension of HIV/AIDS

This analysis of the fiscal dimension of HIV/AIDS combines three elements: (1) estimates and projections of the state of the epidemic; (2) estimates and projections of the fiscal costs of HIV/AIDS; and (3) a simple model and assumptions describing the macroeconomic and fiscal context. The estimates and projections of the state of the epidemic were generated

### Table 2.3: Costs of Impact of HIV/AIDS on Public Servants, 2008

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<thead>
<tr>
<th>COSTS</th>
<th>IN PERCENT OF . . .</th>
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<tr>
<td></td>
<td>WAGES AND SALARIES</td>
</tr>
<tr>
<td>Sick leave</td>
<td>1.1</td>
</tr>
<tr>
<td>Funeral attendance</td>
<td>0.3</td>
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<tr>
<td>Increased turnover</td>
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</tr>
<tr>
<td>Training</td>
<td>0.8</td>
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<tr>
<td></td>
<td>0.7</td>
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<tr>
<td>Medical benefits (imputed)</td>
<td>2.9</td>
</tr>
<tr>
<td>Total</td>
<td>5.6</td>
</tr>
</tbody>
</table>

*Source: Authors’ estimates.*
from a spreadsheet-based model that builds on assumptions regarding the number of new adult infections, and derives estimates of the number of people living with HIV/AIDS, people needing and receiving treatment, and HIV/AIDS-related deaths. Additionally, the model estimates and projects the number of children living with HIV/AIDS and of orphans. Assumptions regarding the state and course of the epidemic were taken from NACA (2008) and Stover and others (2008), and updated in a number of places (for example, to incorporate the latest estimates of access to treatment). Underlying estimates of the size and the structure of the population were taken from United Nations Population Division (2009b). Looking forward, certain assumptions (for HIV incidence and coverage of a number of interventions directly affecting the course of the epidemic, such as treatment access and prevention of mother-to-child transmission) were calibrated in line with targets contained in the draft National Strategic Framework for HIV/AIDS 2010–16.

The estimates of the fiscal costs of HIV/AIDS are based on coverage rates of key interventions included in the draft National Strategic Framework 2010–16, available estimates of actual HIV/AIDS-related spending (notably NACA and UNAIDS 2009), and studies of the macroeconomic impact and costs of HIV/AIDS (such as Jefferis, Siphambe, and Kinghorn 2006). Additionally, this analysis includes an allowance for the costs of the impact of HIV/AIDS on public servants, as discussed earlier.

The assumptions regarding the fiscal context have already been explained in this paper and summarized in figure 2.7. Because the projections extend over two decades, they incorporate expectations regarding declining government revenues from mining, a decline that—according to NDP 10—is projected to occur starting around 2015 (in the period that would be covered by NDP 11). As government revenues (relative to GDP) slow down, government expenditures correspondingly grow more slowly (and decline relative to GDP).

Especially over the longer run, the fiscal analysis also needs to take into account the macroeconomic consequences of HIV/AIDS. Notably, the working-age population grows more slowly as a consequence of HIV/AIDS, and the studies of the macroeconomic impact of HIV/AIDS discussed earlier indicate that this translates into lower GDP growth and thus lower government revenues. To capture these macroeconomic consequences of HIV/AIDS (and their fiscal repercussions), the analysis builds on a simple macroeconomic framework (discussed in the appendix).
The state and course of the epidemic

Figure 2.12 summarizes the estimates and projections of the course of the epidemic for the population aged 15+. The critical factors driving changes in the number of people living with HIV/AIDS—HIV incidence and HIV/AIDS-related mortality.

Figure 2.12: Estimates and Projections on the State of the HIV Epidemic, 1980–2030

Source: Authors’ estimates and projections.
and HIV/AIDS-related mortality—are summarized in figure 2.12a. Until
the mid-1990s, increasing HIV prevalence was driven by escalating HIV
incidence, which peaked at 3.6 percent of the adult population in 1995.
HIV/AIDS-related mortality did not yet play an important role in this
early phase, but accelerated sharply from 0.1 percent of the population
aged 15+ in 1992 to 1.7 percent of this population in 2005. Meanwhile,
HIV incidence declined between 1995 and 2005, and for two years, fell
below the level of mortality, so that the number of people living with
HIV/AIDS declined in absolute terms. Between 2005 and 2010,
mortality declined sharply, reflecting the increased availability of treat-
ment. This study’s projections envisage further gradual declines in HIV
incidence rates and in HIV/AIDS-related mortality (except for a small
rebound in 2011–13). Because incidence remains higher than mortality,
the number of people living with HIV/AIDS continues to increase slowly
over the projection period, from 280,000 in 2010 to 320,000 in 2030.

One result of the increased access to antiretroviral treatment is the sig-
nificant increase in the number of people living with HIV/AIDS, who on
average survive much longer compared to the period before 2002, when
access to treatment was still very limited. While HIV prevalence
decreases steadily from a peak of 24 percent in 2002 and 21 percent in
2010 to 18 percent in 2030 (figure 2.12), the number of people receiv-
ing treatment increases sharply, rising from close to zero in 2000 to 8.6
percent of the adult population in 2010 (40 percent of people living with
HIV/AIDS) and 9.6 percent of the adult population (52 percent of people
living with HIV/AIDS) by 2030.

During this time, there is a shift among people receiving treatment
(figure 2.12b). The number of people receiving first-line antiretroviral
treatment peaks at 8 percent of the adult population by 2013 and subse-
quently declines slowly to 6.8 percent by 2030. Meanwhile, the number of
people receiving second-line therapy rises sharply, from 0.4 percent of the
adult population in 2010 to 2.8 percent in 2030, corresponding to 29 per-
cent of people receiving treatment.

One important demographic aspect of HIV/AIDS is its impact on the
youth population (figure 2.13). Mortality drops sharply (by two-thirds)
between 2002 and 2008, reflecting not only increased access to pediatric
treatment, but also—even more important—a reduction in mother-to-child
transmission, lowering the number of new infections in utero or at birth.
The number of orphans, however, continued to increase between 2005 and 2010. This reflects lower HIV infection rates among children from mothers living with HIV and longer survival rates among children living with HIV, as well as the fact that orphan numbers depend on adult mortality over an 18-year period, and mortality in 2005–10 was still high relative to the 18-year average.

**Assumptions regarding fiscal costs of HIV/AIDS**

In addition to the macroeconomic and fiscal assumptions summarized above, and the estimates and projections of the state of the epidemic, this study’s estimates of the fiscal costs of HIV/AIDS are based on the draft NSF 2010–16. Estimates and projections of the costs of implementing the NSF were not available at the time of writing. Instead, estimates were derived from data on actual HIV/AIDS-related spending (for example, NACA and UNAIDS 2009), available estimates of the costs of some key components of the HIV/AIDS program (for example, Marlink 2009), prior and ongoing work (for example, Jefferis, Siphambe, and Kinghorn...
The Fiscal Dimension of HIV/AIDS in Botswana, South Africa, Swaziland, and Uganda

[2006], or Jefferis [2010], and some international data, for example, projected drug prices. The most important targets under the NSF included are:

• Proportion of persons aged 15–49 years who have tested within the last 12 months and know their HIV status: rising to 60 percent.

• Proportion of HIV-positive pregnant women accessing universal HAART (highly active antiretroviral treatment): rising to 90 percent.

• Proportion of HIV-positive persons accessing integrated HIV, tuberculosis, and sexual and reproductive health services: rising to 80 percent.

• Proportion of HIV-positive children and adolescents accessing a package of HIV/AIDS treatment, care, and support: rising to 90 percent.

• Proportion of population in need who access comprehensive quality community- and home-based care services: rising to 80 percent.

• Percentage of households with orphaned and vulnerable children receiving free basic external support for care and support: rising to 70 percent.

Because treatment costs account for a substantial proportion of the fiscal costs of HIV/AIDS, it is useful to spell out the relevant assumptions in some more detail (see also figure 2.14). This study assumes that the government of Botswana will gradually assume the full costs of drugs that are currently donated (in line with Marlink [2009]). For this reason, the costs of first-line antiretroviral treatment and pediatric treatment are increasing over the first years of the projections, from P 3,800 to P 6,600 by 2015 (full costs, including drugs and any other expenses), and P 6,900 by 2030 (including a small allowance for real wage increases). The costs of second-line drugs are assumed to decline through 2016 (in line with Stover [2009]), and remain at about that level through 2030 (again, making a small allowance for real wage increases).

The second key factor driving the unit costs of treatment is the increasing role of second-line treatment (also figure 2.12b). This is playing a subordinate role in 2009 (4 percent of people receiving treatment), but the share of people receiving second-line treatment is expected to rise steadily, because an increasing number of people reach a stage at which first-line treatment is no longer effective. With the increasing role of more expensive forms of treatment, the average unit costs of treatment increase.38
In addition to the different components of the NSF, this analysis covers certain budget line items that are not covered by the NSF, but nevertheless form part of the fiscal costs of HIV/AIDS. Specifically, certain allowances for the costs of HIV/AIDS on government employees, which are covered in more detail in the section on the impact of HIV/AIDS on government employees.

However, for lack of data availability, this analysis does not capture certain social expenditures (other than orphan allowances) affected by HIV/AIDS, such as old-age pensions and destitution allowances. Because increased mortality among the working-age population reduces the probability of reaching age 65, HIV/AIDS reduces expenditures on old-age pensions. However, with total costs of old-age pensions at about 0.2 percent of GDP, these fiscal savings are a small share of HIV/AIDS costs. Because HIV/AIDS increases the risk of poverty, it does have an impact on the uptake of destitution allowances. However, increased mortality also reduces the number of people qualifying for destitution allowances, so that the net costs are lower than the gross fiscal costs of HIV/AIDS.
Fiscal dimensions of HIV/AIDS and the HIV/AIDS program

Figure 2.15 summarizes this study’s projections of the fiscal costs of HIV/AIDS. In absolute terms, the costs increase steadily over the projection horizon, almost doubling from P 3 billion in 2010 to P 5.5 billion in 2030. The biggest component of the fiscal costs of HIV/AIDS, and the factor that dominates the increase in costs, is the cost of care and treatment, which increases from P 1.3 billion (43 percent of total) to P 2.5 billion (46 percent of total), reflecting the increasing number of people receiving treatment (rising from 119,000 in 2010 to 168,000 in 2030), and the increasing use of second-line treatment over this period. Another important factor is the increase in the costs of mitigation, which reflects the increase in the number of orphans through much of the projection period (discussed above), increasing from P 0.8 billion to P 1.5 billion (25 and 28 percent of total, respectively), whereas the costs of prevention programs increase from P 0.2 billion in 2010 to P 0.4 billion in 2030 (remaining at 7 percent of total). The impact of HIV/AIDS on public servants (excluding treatment and other costs already counted in the other cost categories) amounts to about P 0.3 billion throughout the projection period, and declines from 0.3 percent of GDP in 2010 to 0.2 percent of GDP in 2030.

As the macroeconomic and fiscal context evolves over the projection period, the fiscal costs of HIV/AIDS are also related to GDP (figure 2.15b) and government revenues and expenditures. Between 2010 and 2014, the economy is expected to rebound from the economic crisis.\(^1\) While the costs of HIV/AIDS increase sharply over this period in absolute terms, they remain at about 3.5 percent of GDP. While the fiscal costs of HIV/AIDS continue to increase through 2030, the fiscal burden declines slowly, so that the fiscal costs of HIV/AIDS account for 3.3 percent of GDP by the end of the projection period.

Meanwhile, the fiscal burden of HIV/AIDS—measured against the scale of government operations—changes considerably. This is because government revenues are highly dependent on rents from resource extraction, and decline more than proportionally as the share of resource extraction in GDP contracts. Following the projected economic recovery, the fiscal costs of HIV/AIDS therefore rise from 10.8 percent of government revenues in 2013 to 12.2 percent of government revenues in 2021. Relative to current expenditures (which fluctuate less than government revenues), the shift in the fiscal burden of HIV/AIDS is even more pronounced, because fiscal
Figure 2.15: Projected Costs of HIV/AIDS Program, 2010–30

Source: Authors’ estimates and projections.
costs are projected to increase from 12.1 percent of current expenditures in 2010 to 13.7 percent of current expenditures by 2021.

**HIV/AIDS as a fiscal liability**

Because the impacts of HIV/AIDS incur fiscal costs that are highly persistent, these costs in any given year are a very incomplete and imperfect measure of the epidemic’s impact. For this reason, the previous section discussed how the projected fiscal costs of HIV/AIDS evolve over time (figure 2.15). The persistence of the costs of HIV/AIDS also means that these costs are similar to a debt that needs to be served over a long period of time. This means that instruments commonly used to analyze a country’s indebtedness and debt sustainability can be adapted to assess the implications of HIV/AIDS and of alternative HIV/AIDS policies for the government’s fiscal space and fiscal sustainability.

With these considerations in mind, figure 2.16 provides estimates of the present discounted value (PDV, the most common summary indicator of the magnitude of a liability) of the fiscal costs of HIV/AIDS.\(^{42}\) Because the PDV

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**Figure 2.16:** Present Discounted Value of the Fiscal Costs of HIV/AIDS, as of 2010

![Figure 2.16: Present Discounted Value of the Fiscal Costs of HIV/AIDS](image_url)

Source: Authors’ estimates and projections.
of a liability over long periods is highly sensitive to the discount rate, this study uses estimates of the PDV for discount rates between 0 percent and 10 percent. Using a discount rate of 3 percent (not unlike the real interest rate at which the government would be able to borrow), the overall fiscal burden of HIV/AIDS corresponds to 197 percent of GDP.

Because a large share of HIV/AIDS costs are for infections that occurred in the past, and because projected new infections also depend on the success of HIV/AIDS-related policies, another useful indicator is the PDV of infections that have already occurred. At 94 percent of GDP, these costs account for about half of the projected fiscal burden. This burden, like social security obligations, can be interpreted as a quasi-fiscal liability, restricting fiscal space in the future in a way similar to public debt. While it does not raise any immediate issues regarding the sustainability of the state of public finance (because of Botswana’s high level of external reserves and very low public debt), it does illustrate the extent to which the fiscal burden of HIV/AIDS compresses fiscal space in Botswana.

To place these estimates into perspective, these costs can be compared to those of natural disasters. Rasmussen (2004) estimated that natural disasters have, “on average, affected over 2 percent of the population each year and caused more than one half of 1 percent of GDP in damage” in developing countries. Richter Hume (2005) estimated that the overall damage (a more comprehensive measure than the fiscal impact focused on in this study) from the December 2004 tsunami amounted to 4.5 percent of GDP in Sri Lanka, 0.5 percent of GDP in Indonesia, one-third of a percent of GDP in Thailand, and less than one-quarter of a percent of GDP in India. Only in Maldives did the overall costs of the impact of the tsunami (about half of GDP) resemble the fiscal costs estimated for the HIV/AIDS impacts in Botswana. In summary, the overall economic costs of natural disasters are normally lower than the fiscal costs of HIV/AIDS that occur in Botswana each year.

HIV incidence and the costs of HIV/AIDS

The 2008 Report on the Global AIDS Epidemic (UNAIDS 2008) highlights intensified HIV prevention as a prerequisite to attaining and sustaining comprehensive treatment access. While prevention, HIV incidence, and treatment need are obviously linked, the long lags between infection and treatment mean that fiscal savings occur only after many years in addition
to being spread over many years, while the costs of increased prevention occur immediately. These long lags make an assessment of the link between HIV incidence and the costs of an HIV/AIDS program difficult.44

The interpretation of the fiscal costs of HIV/AIDS as a quasi-liability, that is, a fiscal commitment, can be expanded to obtain a sharper analysis of the links between HIV incidence (and the outcomes of prevention programs) and the fiscal costs of HIV/AIDS. Analysis proceeds in two steps: first is the impact of one additional infection on the fiscal costs of HIV/AIDS, and second, a macroeconomic analysis is provided that attributes the fiscal costs of HIV/AIDS to the points in time at which they are ultimately incurred, that is, when an infection occurs.

Figure 2.17 presents estimates of the costs of one additional HIV infection, assumed to occur in 2010, including the costs of treatment as well as indirect consequences such as the costs of orphan support and of pediatric treatment (necessary because of mother-to-child transmission).45 Estimates suggest that the expected annual costs caused by one additional HIV infection occurring in 2010 rise to P 6,300 by 2024, and decline subsequently. These costs are dominated by the costs of treatment (also shown in figure 2.17), which peaks at close to P 5,000.46 Overall, the fiscal cost incurred by one additional infection (measured by the PDV, applying

![Figure 2.17: Costs of One Additional Infection](source)

**Source:** Authors’ calculations.
a discount rate of 3 percent) is approximately P 92,000, that is, about two times GDP per capita.

This microeconomic analysis of the high cost of one additional infection is in sharp contrast with the macroeconomic perspective, whereby changes in HIV incidence affect the fiscal costs of HIV/AIDS only with very long lags. Below, the study attempts to reconcile the microeconomic and macroeconomic perspectives by analyzing the fiscal costs of HIV/AIDS on a “commitment” basis, that is, attributing the bulk of the costs of HIV/AIDS to the point in time at which they are actually incurred, that is, the time of infection. To this end, the costs incurred by one additional infection for each year are calculated, and multiplied by the number of projected infections in that year. To this, we add projected expenditures not linked directly to HIV prevalence (essentially, certain prevention measures targeting the entire population), because these are not captured by the incremental analysis.

Figure 2.18 shows that the costs of HIV/AIDS on a commitment basis are much lower than actual spending on HIV/AIDS (figure 2.18a), accounting for less than half of projected spending. This reflects that most of the current costs of HIV/AIDS address the needs of people living with HIV/AIDS who were infected in the past. Compared to actual expenditures, the lower and declining costs of HIV/AIDS on a commitment basis thus reflect that HIV incidence has slowed down, and—eventually—HIV/AIDS-related spending will decline.

Figure 2.18b takes this point further, showing how the quasi-fiscal liability of HIV/AIDS costs (measured by the PDV of the costs of infections that have already occurred, as described in figure 2.16) evolves over time. Over the first few years of the projection period, it declines sharply, primarily because GDP growth is high, and the value of the quasi-liability is shown relative to GDP. From 2015 on, the rate of decline is much lower, and primarily reflects that the costs newly incurred are lower than actual spending. Overall, the value of the quasi-liability implied by the HIV/AIDS program declines from 94 percent of GDP in 2010 to 50 percent of GDP by 2030.

This analysis of HIV/AIDS as a quasi-liability highlights three important facts: first, the extraordinary magnitude of HIV/AIDS when interpreted as a fiscal shock, which would raise questions regarding fiscal sustainability if the government’s fiscal position was not relatively benign at the outset. Second, the analysis underscores the fiscal necessity in reducing HIV incidence rapidly, with each infection adding the equivalent of about two times GDP
per capita to the fiscal burden. Third, the analysis identifies the changes in the fiscal position that occur over the projection period, largely reflecting the projected declines in HIV incidence, resulting in an improved fiscal position as the quasi-fiscal liability implied by the HIV/AIDS program declines from 94 percent of GDP to 50 percent of GDP. Thus, while the

Figure 2.18: Fiscal Costs of HIV/AIDS, “Commitment Basis,” 2010–30

Source: Authors’ estimates and projections.
fiscal cost of HIV/AIDS is and will remain extraordinarily high over the next decades, the fiscal burden will ease considerably over this period.

The role of external assistance

As observed earlier, external assistance has played an important role in financing Botswana’s HIV/AIDS response. However, unlike most countries facing a severe HIV/AIDS epidemic, Botswana receives very little external assistance. To understand the potential role for external financing to alleviate the fiscal burden of HIV/AIDS in Botswana, this section first puts the external support Botswana’s HIV/AIDS program in an international context and follows up with the discussion of external assistance’s potential to ease the HIV/AIDS burden.

Table 2.4 highlights the role of external assistance in financing Botswana’s HIV/AIDS program. According to NACA and UNAIDS, external assistance accounted for about 30 percent of the costs of the HIV/AIDS program in 2008–10. A unique aspect of external support is the role of private international assistance (notably the Gates Foundation, Merck, and the

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<th>Table 2.4: Botswana: Financing of HIV/AIDS Program</th>
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<tr>
<td>(Percent of GDP)</td>
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<tr>
<td>2006</td>
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<td>Total</td>
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<td>Public</td>
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<th>(Percent of total costs)</th>
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<td>2006</td>
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<td>Total</td>
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<td>Public</td>
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<th>Memorandum item</th>
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<tr>
<td>Total costs (US$ millions)</td>
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Sources: NACA and UNAIDS (2010), and IMF (2010a) for GDP.
Note: — = not available.
Clinton Foundation), which accounted for about one-third of external support, and 10 percent of the costs of the HIV/AIDS program.

To appreciate the magnitude of external support for Botswana’s HIV/AIDS program, it is useful to place it in an international context. Comprehensive data on official assistance (bilateral and multilateral) are compiled for the most important donor countries by the OECD (OECD 2010), but comparable data are not available for private institutions.
Narrowing the focus of cross-country analysis to official assistance, of course, is an important limitation, but it allows the net to be cast much wider than it would be otherwise possible. Figure 2.19 summarizes available data on external assistance overall and HIV/AIDS-related external assistance. Figure 2.19a shows that external aid overall plays a modest
role from a macroeconomic perspective, reaching 2.1 percent of GDP in 2008 (and lower levels earlier). As evident from figure 2.19b, a large proportion of the external assistance received by Botswana in recent years is related to the HIV/AIDS response, increasing from one-third of total aid disbursements in 2006 to 80 percent of total aid disbursements in 2008.

The high levels of Botswana’s external support are also shown in figure 2.19d, which shows HIV/AIDS-related external financing in terms of dollars per capita. In any year covered, external support to Botswana’s HIV/AIDS program was among the highest globally, especially in 2008—disbursements of US$130 per capita represent an outlier, the next highest annual disbursements on a per capita basis accrued to Namibia in 2007 (US$41) and 2008 (US$38).

High levels of external support to Botswana, of course, reflect the extraordinary burden of disease (and fiscal pressures) the country is facing. This becomes clear when external support is related to the costs of the HIV/AIDS program. Figure 2.20 shows external support as a percentage of total HIV/AIDS program spending using data from UNAIDS (2008). It appears that the extent of external support (relative to the costs of the HIV/AIDS program) primarily reflects a country’s level of GDP per capita. While between 80 percent and 100 percent of HIV/AIDS-related spending are covered by external support for most low-income countries, this rate is

Figure 2.20: External Financing of HIV/AIDS Programs across Countries

![Figure 2.20: External Financing of HIV/AIDS Programs across Countries](image)

Source: Author’s calculations, based on UNAIDS (2008) and IMF (2010a).
lower at higher levels of GDP per capita. The high levels of external support enjoyed by Botswana thus reflect the high costs of the HIV/AIDS program, and—judging from figure 2.19—the extent of external support appears to be in line with international norms.

Projecting the extent of external assistance, especially over the 20-year horizon covered by this analysis, is a speculative exercise, particularly in light of the increased uncertainty regarding the state of the global economy and the deteriorated state of public finance in some of the major donor countries. Nevertheless, this study provides a quantitative exercise to illustrate the implications of external assistance for the HIV/AIDS burden. The fiscal burden of HIV/AIDS is analyzed in two scenarios. The first describes a situation in which external support is demand driven, with donors continuing to support the HIV/AIDS program at a given rate. In the second scenario, HIV/AIDS financing may not grow faster than the level of GDP of main donor countries, so that budget allocations for HIV/AIDS external assistance remain constant relative to donors’ GDP. Specifically, the scenarios assume:

1. External assistance indefinitely accounts for 20 percent of the costs of the HIV/AIDS program, but not of the costs of the impact of HIV/AIDS on public servants, which are assumed to be fully covered from domestic fiscal resources.

2. External assistance starts out at 20 percent of the costs of the HIV/AIDS program in 2010, and grows at a rate of 2.5 percent annually, which is about the rate of growth of major donor countries historically, and projected by IMF (2010b) through 2015.

The outcomes of the two scenarios in terms of domestic financing needs are summarized in figure 2.21. With external support of 20 percent of HIV/AIDS program costs, domestic financing needs hover just below 3 percent of GDP. Thus, the fiscal burden of HIV/AIDS remains very high, and the PDV of the costs of HIV/AIDS amounts to 156 percent of GDP (the PDV of the total costs equals 192 percent of GDP). Beyond the very high fiscal burden in this scenario, it appears that Botswana is not very vulnerable to a slowdown in external financing. This not only reflects the limited role of external financing, but also that the program had been fully developed from the outset, and that the increase in spending projected over the coming years is less steep than in most other countries.
V. Conclusions

The scale of the HIV epidemic in Botswana brings extraordinary challenges in responding to the epidemic. The objectives of this study were to assess fiscal policy challenges arising from the HIV/AIDS response, develop tools to better understand the links between the HIV/AIDS program and the fiscal costs of HIV/AIDS, and thus inform the planning of the national HIV/AIDS response, and fiscal planning in general.

Specifically, the study:

(1) Provided a comprehensive analysis of the fiscal costs of HIV/AIDS, with a wider scope than a costing analysis that typically focuses only on the policy response to HIV/AIDS.

(2) Embedded the analysis of the HIV/AIDS costs in a discussion of the fiscal context, and interpreted these costs as a quasi-liability.

(3) Developed tools to assess the (fiscal dimension of) trade-offs between HIV/AIDS policies and measures that account for the persistence of the spending commitments.

**Figure 2.21:** External Support and Domestic Financing Needs

![Graph showing external support and domestic financing needs over time.](image)

Source: Authors’ estimates and projections.
Regarding the scale of the HIV/AIDS impact, this study’s estimates and projections suggest that the fiscal costs of HIV/AIDS will rise from P 3 billion (2010) to P 5.5 billion by 2030. Relative to GDP, the fiscal costs peak at 3.5 percent of GDP around 2016, and slowly decline to 3.3 percent of GDP by 2030. The biggest component of the fiscal costs of HIV/AIDS is the cost of care and treatment, increasing from P 1.3 billion (43 percent of total) to P 2.5 billion (46 percent of total), reflecting the increasing number of people receiving treatment, as well as the increasing role of second-line treatment over this period. Mitigation expenses (largely in support of the increasing number of orphans) are expected to increase from P 0.8 billion to P 1.5 billion (25 and 28 percent of total HIV/AIDS costs, respectively), whereas the costs of prevention programs increase from P 0.2 billion in 2010 to P 0.4 billion in 2030 (remaining at 7 percent of total HIV/AIDS costs). The impact of HIV/AIDS on public servants (excluding treatment and other costs already counted in the other cost categories) amounts to about P 0.3 billion throughout the projection period and declines from 0.3 percent of GDP in 2010 to 0.2 percent of GDP in 2030. Unlike, for example, in South Africa, social expenditures other than orphan care do not appear to play a large role in the fiscal costs of HIV/AIDS in Botswana.

These costs occur over a period in which government revenues are projected to slow down because of an expected decline in mineral revenues. Consequently, the projected fiscal costs increase from 10.8 percent of government revenues in 2013 and 2014 to over 12 percent of government revenues from 2018. One of the crucial aspects of the fiscal dimension of HIV/AIDS is the persistence of the costs incurred by the impact of and the response to HIV/AIDS. Overall, the PDV of HIV/AIDS fiscal costs is 192 percent of GDP if the costs of projected infections are included, or 94 percent of GDP if only the costs committed as a result of infections that have already occurred are included. Even taking into account that the HIV/AIDS response in Botswana has partly been financed through external support, and that the fiscal context is relatively benign (though with difficult challenges lying ahead), these estimates indicate that the impact of and the response to HIV/AIDS represent an extraordinary fiscal challenge.

This analysis of the fiscal costs of HIV/AIDS over time also provides some tools for assessing fiscal trade-offs inherent in HIV/AIDS program choices. Similar to the analysis on the extent to which HIV/AIDS and the HIV/AIDS response absorb available fiscal space in terms of the PDV of the costs of HIV/AIDS, the implications of policy choices in terms of changes
in the PDV can also be assessed. For example, one additional infection is estimated to absorb fiscal resources equivalent to two times GDP per capita.

Combining the macroeconomic and microeconomic strands of the analysis, current spending and the costs incurred by new infections were compared. While the former remains well over 3 percent of GDP throughout the projection period, the latter declines from 2.3 percent of GDP in 2010 to 1.5 percent of GDP by 2030. This reflects that almost all of current spending is in response to infections that occurred in the past, and that reduced HIV incidence over the last years translates into lower spending commitments. Consequently, the quasi-liability implied by the costs committed under the HIV/AIDS program declines from 94 percent of GDP to 50 percent of GDP.

In summary, this study contributes to the design of the HIV/AIDS response and fiscal planning in several areas:

• It analyzes the fiscal costs of HIV/AIDS in the context of the government’s evolving resource envelope, informing medium-term fiscal planning and providing a framework for managing the domestic financing needs of the HIV/AIDS program.

• Focusing on the costs incurred by an additional new infection, the study uses the PDV of the expected additional costs under the HIV/AIDS program as a tool to assess the fiscal implications of program options. However, this tool can also be applied to the analysis of specific prevention and other measures that form part of an HIV/AIDS program. Rather than assessing different profiles of government spending over several decades, this tool provides immediate indicators of the consequences of policy choices on fiscal space.

• Because of the persistence of HIV/AIDS costs, current spending is not a good indicator of the sustainability of an HIV/AIDS program. Instead, it is more accurate to interpret the costs over time as a quasi-liability (similar to pension obligations), and analyze how this liability is evolving over time. This approach provides an immediate measure of the impact of HIV/AIDS and the HIV/AIDS program on the government’s fiscal capabilities and policy scope.

Finally, this analysis recommends considering the following policy issues to contain the fiscal costs of HIV/AIDS and better utilize existing funding sources: improve allocative and operational efficiency within the national
HIV/AIDS response; explore innovative financing mechanisms; strengthen institutions and health systems to improve service delivery; reform policy to generate private savings for health and social insurance; and conduct more cost-effectiveness, cost-benefit, and microeconomic studies to improve program efficiency and effectiveness.

VI. Annex

Assumptions on Macroeconomic Context

HIV/AIDS impacts have major implications for the size of the (working-age) population in the longer run, which is one of the most important determinants of GDP. For consistency of long-term projections, which frequently describe the fiscal costs of HIV/AIDS as a percentage of GDP, it is therefore necessary to capture the impact of HIV/AIDS on GDP and economic growth.

The macroeconomic module is fairly simple, designed to capture some of the major growth impacts of HIV/AIDS to complement and inform fiscal analysis. The model features one sector and one type of labor, and HIV/AIDS affects economic growth as it affects productivity, investment rates, and the supply of labor. Specifically, the model assumes that

\[ Y_t = (1 + D)K_t^\alpha (AL_t)^{1-\alpha} \quad \text{and} \quad K_{t+1} = sY_t - \delta K_t, \quad \text{with} \quad \alpha = \frac{1}{3}, \quad s = 0.24 \]

(before taking into account the impact of HIV/AIDS), and \( \delta = 0.08 \).

The most unusual aspect is the term \((1 + D)\), which reflects the rents from resource extraction. In line with available estimates of mineral production and revenues, \( D \) is projected to decline from 10 percent in 2015 (the end-point of the current development plan) to 3 percent in 2030.

In this framework, the principal impacts of HIV/AIDS are:

- A slowdown in the growth of the working-age population \( L_t \) (in line with the population projections used),
- A decline in the savings rate \( S_t \),
- A decline in labor productivity \( A_t \).
Notes

1. If not indicated otherwise, estimates of HIV prevalence and other indicators of the evolution and scale of the epidemic are derived from NACA (2008), which also forms the basis of this study’s projections. NACA (2008) provides a richer set of data than used by UNAIDS (2010a). The projected HIV prevalence from NACA for 2009 (26 percent of the population aged 15–49) is somewhat higher than the latest estimate (24.9 percent) from UNAIDS (2010a). However, similar differences also occurred between NACA (2008) and UNAIDS (2008).

2. Authors’ calculation, based on estimates of the state of the epidemic from NACA (2008), and demographic estimates from United Nations Population Division (2009b).

3. HIV/AIDS is characterized by a long period between HIV infection and the emergence of the full symptoms of AIDS, followed by a short period to death (in the absence of treatment). Ghys and others (2008) suggest a median survival time of 11 years.

4. The level of HIV prevalence among pregnant women is higher than prevalence for the adult population overall because HIV prevalence is higher for women, and pregnant women tend to belong to cohorts for which HIV prevalence is higher.

5. NACA (2008) reports the size of the population of ages 0–14. To obtain an estimate of the size of the population of ages 0–17, this has been scaled up based on the age distribution of the population in Central Statistics Office (CSO 2009).

6. This already incorporates a rebound in life expectancy from increased treatment access, resulting in an increase in life expectancy from 48 years in 2000–2005 to 55 years in the 2005–10.

7. The estimates over the period 2005–10 include some years in which treatment coverage was limited. However, the indicators may not improve much further in 2010–15: while treatment coverage is higher than in the previous five-year period, mortality among people receiving treatment increases.

8. The only country for which a similar number of studies exists is South Africa.

9. This is further developed in Greener, Jefferis, and Siphambe (2000) and Greener (2004).

10. The model has been calibrated including the mining sector, but does not explicitly account for some peculiarities of this sector (for example, mineral rents).

11. In addition to an updated version of the BIDPA model, Jefferis, Siphambe, and Kinghorn (2006) offer an analysis based on a more elaborate computer-generated equilibrium (multisector) model. As the predictions generated by the different models are fairly similar, the different modeling strategies are not detailed in this paper.

12. Similar to Masha (2004), but here based on a much richer macroeconomic model.

13. The Human Development Index is a composite measure based on economic factors (GDP per capita), access to education (literacy, enrolment), and life expectancy.
14. Of the 179 countries covered, only Equatorial Guinea, where health and education indicators did not improve in line with oil revenues, has a larger discrepancy than Botswana in GDP per capita and life expectancy rankings.

15. The draft NDP 10 (Botswana 2010) observes: “There is a large amount of evidence from other African countries of the extremely high cost of postponing adjustment to a fall in government revenue. [. . .] The longer adjustment is postponed, the harder adjustment becomes because financial reserves have been exhausted, while borrowing instead of adjustment makes it more expensive and virtually impossible to borrow.”

16. The government of Botswana (2010) emphasizes the need to adjust expenditures because of generally shrinking revenues, and supports the expenditure measures envisaged through 2013 because of the need “to avoid excessive borrowing and its associated costs, and as preparation for the lower rate of growth of revenue expected in NDP 11 and thereafter.”

17. This study does not discuss recent trends in private health expenditures in Botswana from WHO (2010a), because these are not based on recent spending data, but projected forward in proportion to overall consumption spending since 2003. The data would therefore not capture any increase in health spending reflecting the escalating need for HIV/AIDS-related spending or the increased provision of antiretroviral treatment through the private (as well as the public) sector.

18. Especially considering that many of the countries in the WHO (2010c) study featuring higher health spending are much smaller than Botswana, including Niue (population 1,438), Kiribati (100,000), Marshall Islands (63,000), East Timor (about same population size as Botswana, but receiving large amounts of external aid), and Nauru (10,000).

19. A second National AIDS Spending Assessment (NACA and UNAIDS 2009) covering the years 2006–8 is almost complete but has not been published yet.

20. These figures are based on disbursements and actual spending and do not yet include support of the five-year, $50 million loan from the World Bank under the Botswana National HIV/AIDS Prevention Support Project—approved in July 2008—and supported by the European Commission through a grant of about $20 million, which effectively enables a zero-interest project loan.


22. For example, the BIDPA (2000) study did not include the costs of antiretroviral treatment and did not anticipate the increased role of external assistance, reflecting a perception at the time that “it is clear that the costs of double or triple therapy are out of the question for the generalized treatment of HIV/AIDS.”

23. Additionally, productivity on the job may decline. While this is documented for parts of the private sector (see, for example, Rosen and others [2004]), there is not a convincing way of generalizing these findings to the public sector, and therefore they were not used in this study.
24. The large differences in the mortality rates from population estimates and the data on civilian service could occur if coverage of public servants in the data reported by the Ministry of State President and NACA (2008) is lower than the totals reported by IMF (2007) labor market data, or if data on civil service mortality incompletely measure attrition for health-related reasons. Other factors that could conceivably play a role are large differences in HIV prevalence rates across population groups (implausible for Botswana) or differences in access to treatment, which is unlikely to play a large role because of the high overall treatment coverage rates.

25. Kinghorn and others (2002) and Abt Associates South Africa (2000) reported that public servants are entitled to 180 days of sick leave on full pay within a three year cycle, and may take another 180 days of sick leave at half pay (once annual leave balances are exhausted).

26. For South Africa, Rosen and others (2007) assumed that six patient visits are required during the first year on treatment. Harling, Bekker, and Wood (2007) report a total of 10,137 patient visits in a site, with 11,569 patient months of treatment, which would imply about 10.5 visits per patient per year.


28. This arrangement passes the financial risks associated with premature mortality on to the surviving dependents. However, government employees would be able to obtain some insurance through a funeral scheme operated by the Botswana Public Employees Union or one of several private insurance companies.


30. Rosen and others (2004) report a “reduction in productivity due to new employee’s learning curve” of between 25 and 60 percent for skilled workers, and between 20 and 55 percent for unskilled workers. In many cases, a person filling a vacated position will come from a related position within the government (which may incur a lower learning cost), but would need to be replaced in his or her previous position. This assumption implies that the learning costs of a new appointment and the costs of shifts between positions, possibly including a new appointment further down the chain, are equivalent.

31. For example, if a job requires one year of training, such as a teacher, an agency employs 1,000 people, and the time a newly trained employee can be expected to stay on the job declines from 10 years to 8 years, the number of people that needs to be trained annually increases from 100 to 125 in order to fill all positions. Haacker (2004) provides a more extensive discussion of the impacts of HIV/AIDS on training costs and the returns to training.

32. The most recent year for which HIV/AIDS-related spending estimates are available is 2008. These data are based on population averages, calculated using estimates from Stover and others (2008) and United Nations Population Division (2009b). One factor not accounted for is the possibility that access to antiretroviral treatment among government employees is higher than it is for the general population.
33. The medical costs have been calculated as 20 percent of the costs of care and treatment included in the national HIV/AIDS program, reflecting the share of government employees in the labor supply. IMF (2007) reports that the public sector accounts for about 40 percent of total employment. The share of 20 percent used also corresponds to the size of the working-age population, including the informal sector, the unemployed, and people who do not participate in the (formal or informal) labor market.

34. Unlike a full demographic and epidemiological module, our model cannot capture certain inter-generational effects as lower fertility and increased mortality among children eventually affect the size of the adult population. This shortcoming plays a very limited role over the 20-year time frame we consider. For an analysis beyond this period, we would recommend a more sophisticated model.

35. For the long run, our projections on mineral revenues follow Clausen (2008), who projects a gradual decline in mineral revenues to 3 percent by 2030.

36. According to United Nations Population Division (2009b), the total population in 2010 is about 10 percent smaller than it would have been without the impact of HIV/AIDS (1.978 million compared to 2.222 million). By 2030, the United Nations Population Division (2009b) projects that the population size will grow to 2.337 million (23 percent smaller than without the impact of AIDS, at 3.045 million).

37. Note that these prevalence rates refer to the population aged 15+, and come out somewhat lower than the more commonly quoted HIV prevalence rate for ages 15–49.

38. The analysis in this area is subject to considerable uncertainties, depending on the course of prices of second-line drugs over the next two decades and long-term survival rates of people receiving second-line treatment.

39. All citizens of Botswana aged 65 or older are entitled to an old-age pension, amounting to P 166 per month (SSA 2009). In October 2009, there were 90,639 registered old-age pensioners (Matambo 2010), and the costs of old-age pensions amounted to about P 180 million, or 0.2 percent of GDP (authors’ calculation, based on a pension of P 166/month).

40. There were 42,381 recipients of destitution allowances as of October 2009 (Matambo 2010). Destitution allowances included a cash benefit (P 61) and food rations (equivalent to P 172 per person per month) and are available to all destitute residents, who are considered to be people unable to support themselves because of old age, disability, or a chronic health condition; needy children with a terminally ill parent; or orphans or abandoned children not covered by the orphan care program. The total costs of destitution allowances are about P 120 million, equivalent to 0.1 percent of GDP.

41. IMF (2010b) projects that GDP will increase by 37 percent during 2010–14, corresponding to an annual growth rate of 6.6 percent, and following a contraction by 3.7 percent in 2009.

42. To estimate the fiscal costs of HIV/AIDS beyond 2030, projections were extended to 2070 using some crude assumptions regarding the course of HIV/AIDS (continued
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gradual decline in HIV incidence) and the HIV/AIDS response (applying 2030 coverage rates forward), and some summary assumptions were applied regarding overall costs thereafter.

43. As summarized in the foreword to UNAIDS (2008): “Today, for every two people who start taking antiretroviral drugs, another five become newly infected. Unless we take urgent steps to intensify HIV prevention we will fail to sustain the gains of the past few years, and universal access will simply be a noble aspiration.”

44. Although focusing on the impact of HIV incidence on government expenditures in the present section, this does not imply that these are the only—or even the most important—impacts of HIV/AIDS that the government would want to take into account.

45. Because the consequences of an HIV infection differ between men and women (different mortality patterns, risk of mother-to-child transmission for women), the estimates shown are calculated as the arithmetic mean of the costs of an additional infection for men and women, weighted by the shares in the number of new infections.

46. Note that these costs are weighted averages across the categories “receiving first-line treatment,” “receiving second-line treatment,” “not receiving treatment,” and “deceased.” For this reason, the expected costs of care and treatment per year are lower than the costs of first-line or second-line therapy.

47. The term “commitment” usually suggests that a government is legally obliged to fulfill a liability. The situation regarding HIV/AIDS spending is different, because the government is not legally obliged to meet certain targets under the HIV/AIDS program. The usage of the term “commitment” in this study, deriving from political commitments made under the HIV/AIDS program, is therefore weaker than the legal definition.

48. Because debt relief typically comes in large chunks and would therefore distort cross-country comparisons in any given year, data on external assistance overall (figures 2.18a and 2.18c) exclude debt relief (that is, sector 600, “Action Relating to Debt”).


50. These points are further discussed in Haacker (2009).

51. NACA and UNAIDS (2010) suggest somewhat higher levels of external support than those reported in UNAIDS (2008).

52. This assumes that in addition to the fiscal costs of HIV/AIDS, each death incurs a private cost equivalent to $1 \times GDP$ per capita. The rate at which these costs translate into reduced savings and investment is assumed to be equal to the aggregate savings rate. For example, a fiscal cost of 2 percent of GDP and a mortality rate of 1 percent would translate into an overall cost of 3 percent of GDP, and a decline in savings of 0.51 (≈ 0.17 × 3%) percent of GDP.

53. This assumes that $A$ grows at a rate of 1 percent over the projection period. However, to capture the aftermath of and recovery from the economic crisis, $A$ is set to
match the GDP projections from IMF (2010b) through 2015. Regarding the impact of HIV/AIDS, it is assumed here that a mortality rate of 1 percent reduces \( A \) by 0.5 percent, that is, \( A_t = (1.01)^t (1 - 0.5m) A_0 \).

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