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HIV/AIDS: The Impact on the Social Fabric and the Economy

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In many countries, the HIV/AIDS epidemic has attained a scale at which the impact on the economy and, even more broadly, on societies, is both evident and very serious. Through its broad economic impact, HIV/AIDS thus becomes an issue for macroeconomic analysis, and policies to prevent the spread of the virus have direct implications for key economic indicators such as economic growth and income per capita,[1] and for economic development more generally. However, because the impact is very uneven across individuals or households, an analysis that captures only the main aggregate economic variables would miss many of the microeconomic effects of HIV/AIDS on living standards, which also matter for public policy and which, in turn, affect the main aggregate economic variables, for example through the accumulation of physical and human capital.

To start with the most obvious effect, increased mortality means that the economy is left with fewer workers, both in total and across different occupations and skill levels. As private employees and public servants fall ill and eventually die, the efficiency of production or administrative processes is diminished. On the consumer side, households can seldom fully compensate for the loss of a breadwinner; as a result, poverty rises and children's access to education deteriorates. In the longer run

[1]This point is discussed in much more detail by Masha (Chapter 9, this volume).

HIV/AIDS affects the accumulation not only of human capital but of physical capital as well. For example, as expenditure is shifted toward HIV/AIDS-related activities, aggregate saving is likely to decline, leaving fewer resources available for investment; at the same time, increased production costs and deteriorating economic prospects make investment in the affected countries less attractive. Through increased mortality and its economic repercussions, HIV/AIDS also increases economic risk, and this, too, contributes to a deterioration in welfare.

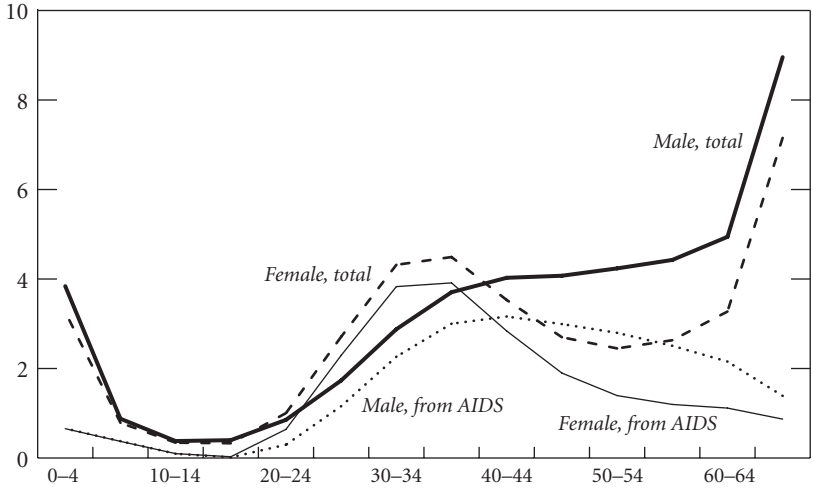
This chapter discusses the available evidence from studies on the macroeconomic impact of HIV/AIDS. The key concept that connects the various strands of analysis is this: *HIV/AIDS affects the economy and economic development through its adverse impact on the social fabric itself.* Here the term "social fabric" extends not only to the social and economic institutions already noted—households, companies, and the government—but also to more abstract concepts such as governance and social coherence. HIV/AIDS does have a serious impact on traditional economic measures such as economic growth, income per capita, and investment, but it does so by affecting very diverse areas of public, social, and economic life. To understand all the macroeconomic repercussions, the economic analyst thus needs to cast the net very widely.

This chapter will pursue three lines of inquiry. The first proceeds from the bottom up, focusing on the impact of HIV/AIDS on different social and economic institutions and highlighting its macroeconomic consequences. The second, in contrast, takes a bird's-eye perspective, addressing how HIV/AIDS, through its microeconomic impacts, affects typical macroeconomic variables, and reviewing how this is captured in various models of economic growth. The third, drawing on the first two, analyzes how HIV/AIDS, both directly and through its impact on social and economic institutions, affects poverty, inequality, individual risk, and welfare.

Impact of HIV/AIDS on Social and Economic Institutions

HIV/AIDS affects an economy primarily through increased mortality and morbidity. To capture the impact of increased mortality at all levels and across all sectors, this chapter uses the term "social and economic institutions." This term covers not only households and extended families, small and large enterprises, and local public services and the central government, but also more abstract concepts such as the strength of the legal system and of property rights.

Figure 2.1. Mortality Rates by Age and Sex in Zambia, 2004
(Percent)



Source: International Programs Center, U.S. Census Bureau.

Increased Mortality

Figure 2.1 illustrates the impact of HIV/AIDS on mortality rates by age and sex for Zambia in 2004, where it is estimated that HIV/AIDS has raised the mortality rate for the population aged 15–49 almost fourfold, from 0.5 percent annually to 1.9 percent. For the entire population, mortality has increased from 1.0 percent to 2.1 percent, making HIV/AIDS the leading cause of death. Just as striking, Figure 2.1 shows that, in Zambia (as in the other countries in the region), AIDS-related mortality affects women to a greater extent and at an earlier age than men, because females on average begin sexual activity at an earlier age and because the risk of transmission of the virus is greater from male to female than from female to male. Among Zambian women, mortality rates from all causes peaked at 4.5 percent for the cohort aged 35–39, and 87 percent of these deaths (3.9 percent in absolute terms) were accounted for by HIV/AIDS. Among working-age men, mortality from HIV/AIDS-related causes peaks for the cohort aged 40–44 (at 3.1 percent, or 78 percent of deaths in this cohort); overall mortality for men then increases by cohort, as increasing deaths from other causes more than offset the decline in HIV/AIDS-related mortality with age.

Table 2.1. Impact of HIV/AIDS on Mortality and Life Expectancy in Selected Countries
(Percent except where stated otherwise)

Country	HIV Prevalence Rate, Ages 15–49, End-2003[1]	Mortality, All Ages, 2004		Mortality, Ages 15–49, 2004		Mortality, Ages 15–49, Projected 2010		Life Expectancy at Birth (years)	
		Total	From AIDS	Total	From AIDS	Total	From AIDS	Actual	Without AIDS
Botswana	37.3	2.9	2.5	3.8	3.7	3.6	3.5	34.2	75.7
Côte d'Ivoire	7.0	1.5	0.4	1.1	0.6	1.1	0.7	48.4	55.7
Ethiopia	4.4	1.5	0.2	1.0	0.4	1.0	0.4	48.7	53.1
Haiti	5.6	1.3	0.3	0.9	0.5	0.9	0.5	52.6	60.2
South Africa	21.5	2.9	2.5	2.3	2.0	2.1	1.9	44.1	66.7
Vietnam	0.4	0.6	0.02	0.2	0.03	0.2	0.04	70.4	70.9
Zambia	16.5	2.1	1.0	1.9	1.4	1.9	1.4	39.4	56.2

Sources: Joint United Nations Programme on HIV/AIDS (2004); U.S. Census Bureau, International Programs Center, International Data Base (2004) and unpublished tables.
[1]Data refer to the population aged 15–49.

Table 2.1 illustrates the catastrophic impact of HIV/AIDS in countries around the world where it is widely prevalent.[2] In Botswana, South Africa, and Zambia, AIDS is the leading cause of death; mortality rates for the 15–49 age group in these countries have increased dramatically. As a consequence, life expectancy at birth has declined dramatically: for some of the worst-affected countries covered in Table 2.1, it declined by 20 years or more from what it would have been in the absence of AIDS. The table also shows the severe impact of HIV/AIDS in countries with more "moderate" HIV epidemics. For example, in Ethiopia, with an estimated adult HIV prevalence rate of 4.4 percent, overall mortality has increased by 18 percent, mortality among the working-age population has risen by over 50 percent, and life expectancy at birth has declined by 4.5 years.

The demographic impact of HIV/AIDS, through increased mortality and reduced birthrates, is discussed in more detail elsewhere (see, for instance, Epstein, Chapter 1 of this volume). Some of its aspects, such as the increased numbers of orphans, changes in dependency rates, and changes in the composition of the working-age population, will be taken up below in the context of the impact of HIV/AIDS on social and economic institutions.

[2]The prevalence rate most frequently quoted is that for the age group 15–49. This rate is often (and somewhat imprecisely) referred to as the adult prevalence rate, or the prevalence rate for the working-age population. It is important to recognize that this rate is an average over age groups with very different prevalence rates. The proportion of the population that eventually dies of AIDS is usually closer to the prevalence rate for the worst-affected age group (which, however, does not include the members of this cohort who died earlier or will get infected later).

Households and Extended Families

HIV/AIDS has profound effects on the economic situation of those households it afflicts.[3] Income declines as breadwinners fall ill and die and as other household members are obliged to take time off from other productive activities to care for sick relatives. At the same time, households have to reallocate their spending to devote a much greater share to health care, including not only drugs and doctors' fees but also supplies for home care. The impact of HIV/AIDS also extends beyond those households directly affected, to the many other households who intervene to provide them with support. When a household affected by HIV/AIDS dissolves, members of the extended family frequently take care of the surviving children. The loss of a household member can have long-term effects on the well-being of other members, through the costs of treatment and, especially, if children have to take time off from school for financial reasons or to care for sick relatives.

Beyond this very general description of the impact of HIV/AIDS, it is important to acknowledge that the ability of a household to cope with the illness or death of a member depends on the afflicted person's status within the household. To the extent that HIV/AIDS raises mortality among very young adults (Figure 2.1), it is less likely to strike a primary income earner or head of household. The impact also depends on the household's socioeconomic characteristics. Households with low income or few assets may be in a worse position to cope with the income and expenditure shocks associated with HIV/AIDS; small farm households, because of their different economic structure and access to social support, may be affected by and respond to HIV/AIDS differently than urban households (especially those drawing their income from the formal sector). More generally, the structure of the household need not be fixed: following the death of a household member, others in the household may leave (or, in the case of orphans, be taken in by other relatives), or the household may dissolve entirely. At the same time, other people may join the household and take on the role left vacant by the deceased household member.

The aggregate demographic indicators reported in Table 2.2 provide some information on how HIV/AIDS affects households. The total dependency ratio increases, mainly because the increase in deaths among the

[3]For a thorough review of the literature up to 2000, see Booysen and Arntz (2001). A more current (but much shorter) discussion is included in Joint United Nations Programme on HIV/AIDS (2004, pp. 41–51).

Table 2.2. Impact of HIV/AIDS on Dependency Ratios and Orphanhood in Selected Countries
(Percent)

Country	Adult HIV Prevalence Rate, End of 2003	Dependency Ratios, 2004						Orphans as Share of Population Aged 17 and Under		
		Total[1]		Child[2]		Old-age[3]		2003		Projected, 2010 (total)
		Actual	Without AIDS	Actual	Without AIDS	Actual	Without AIDS	Total	Due to AIDS	
Botswana	37.3	95.6	88.7	76.6	69.7	19.1	19.7	20.0	15.0	24
Côte d'Ivoire	7.0	105.5	105.4	84.6	84.0	20.9	21.4	13.4	4.4	13
Ethiopia	4.4	115.3	115.0	95.1	94.6	20.3	20.4	11.1	2.1	11
Haiti	5.6	111.7	112.4	90.9	90.7	20.8	21.7	15.3	. . .	13
South Africa	21.5	85.4	82.9	57.3	55.2	28.1	27.7	12.9	4.5	19
Vietnam	0.4	74.3	74.2	50.2	50.1	24.1	24.1	7.0	. . .	7
Zambia	16.5	113.8	116.6	100.8	100.8	13.0	15.8	18.3	10.5	19

Sources: UNAIDS (2004); UNAIDS, UNICEF, and USAID (2004); and author's calculations based on data provided by the International Programs Center, U.S. Census Bureau.

[1]Sum of child and old-age dependency ratios; numbers may not sum to totals because of rounding.

[2]Ages 0–14.

[3]Ages 50 and over.

working-age population raises the relative size of the young population, as reflected in the child dependency ratio.[4] The increase in child dependency is closely related to the fact that the number of orphans increases as their parents succumb to HIV/AIDS. For Botswana and Zambia, a rough estimate is that 20 percent of the population aged 17 or younger are orphans, and the majority of these orphans (77 percent in Botswana, 60 percent in Zambia) were orphaned by HIV/AIDS. The pattern regarding old-age dependency is inconclusive at first blush, likely reflecting several effects working in different directions. In the early stages of the epidemic, old-age dependency may increase, because the disease predominantly kills young people. But as these younger cohorts decimated by HIV/AIDS themselves attain old age, this effect is reversed.

HIV/AIDS affects the income of the affected households not only through the sickness and death of household members, but also as the time previously devoted to income-generating activities by other household members must be reallocated to the care of the sick member. The impact of HIV/AIDS on the income of an affected worker depends on the

[4]The total dependency ratio is defined as the sum of the population aged 14 or less ($P_{0–14}$) and the population aged 50 or more (P_{50+}) divided by the working-age population ($P_{15–49}$), or $(P_{0–14} + P_{50+})/P_{15–49}$.

source of that income. If the worker is self-employed or is paid according to his or her productivity (for example, a tea picker), income declines immediately as the worker's health (and thus productivity) starts to deteriorate. If instead the worker receives a fixed salary (as is typical in the public sector and parts of the private formal sector), the income loss is not directly tied to the decline in productivity, and, as absenteeism increases, the loss is mitigated through sick leave and, possibly, a disability pension.

In assessing the impact of HIV/AIDS on income, it is useful to distinguish between time lost from work (absenteeism) and declining productivity on the job. There is substantial evidence that both time at work and productivity decline well before a worker dies or retires because of ill health. In one South African sugar mill, about 10 percent, on average, of a sick employee's working time was lost in the two years before the worker retired (Morris and Cheevers, 2000). According to Fox and others (2004), tea pickers on an estate in Kenya who retired or died from AIDS-related causes earned 16 percent less in their penultimate year at work, and 17.7 percent less in the final year. Notably, there was also a substantial increase in the number of days these employees spent on light duty.

The household's living standard also deteriorates as other household members have to reallocate time from other productive activities (not necessarily income-generating) in order to care for a sick relative. In this regard, Steinberg and others (2002), using data from a survey of 771 AIDS-affected households in different parts of South Africa, find that over two-thirds of caregivers are women. Twenty-two percent of caregivers had to take time off from work and other income-generating activities, 20 percent had to forgo school or study time, and 60 percent took time from other housework and gardening activities.

The most comprehensive study of the impact of adult mortality on rural households, that by Mather and others (2004), synthesizes studies from five countries: Kenya, Malawi, Mozambique, Rwanda, and Zambia.[5] Their findings include the following. First, HIV infection does not seem to be correlated with relative income or education.[6] Second, among women, those most severely affected by the deaths of other prime-age adults in a household are young dependents, not wives or female heads of house-

[5]The sample size ranges from 420 (Malawi) to 6,922 (Zambia), the data take the form of panel data (Kenya and Malawi) or cross sections with recall surveys, and the time frames of the surveys range from 4 years (1999–2002 in Mozambique and Rwanda) to 13 years (1990–2002 in Malawi).

[6]The study makes inferences on the impact of HIV/AIDS (as opposed to other causes of mortality) based on the incidence of prime-age adult mortality.

holds. Third, households affected by adult deaths do not uniformly have less available prime-age labor than nonaffected households—a finding that may reflect the ability of those households to attract new members. Fourth, the death of a male household head is associated with a larger decline in crop production and nonfarm income than the death of any other type of household member. Yamano and Jayne (2004), whose study is one of those covered by Mather and others (2004), find that the impact of adult mortality on households is related to household wealth. Splitting their sample in half based on initial asset levels, they "find negative impacts on the net value of crop production, assets, and off-farm income only in the case of male head-of-household mortality among relatively poor households." This study also finds that the death of a male household head (aged 16–59) "is associated with a 68 percent reduction in the net value of the household's crop production," and that female adult mortality is associated with an adverse effect on grain crops, whereas male adult mortality has a stronger effect on cash crops such as coffee, tea, and sugar.

HIV/AIDS results in increased demand for health-related goods and services. Because household income tends to shrink at the same time this demand is rising, the household is forced to cut other expenditures or sell some of its assets. Steinberg and others (2002) find that households affected by HIV/AIDS spend about one-third of their income on health care, compared with a national average of 4 percent. Other categories of expenditures are cut correspondingly, most notably clothing and electricity. This finding is consistent with an earlier World Bank study, which found that households affected by HIV/AIDS lowered their overall expenditures, but that the share of medical expenditure in the total rose (World Bank, 1999). One important part of HIV/AIDS-related expenditure is the cost of funerals. Steinberg and others (2002) suggest that funeral expenses are, on average, equivalent to four months' salary. Naidu (2003) reports that the average cost of a funeral for low-income households in Soweto, South Africa, was about 9,000 rand (about $1,400), or 3.5 times the average monthly household income.[7] Over 30 percent of funeral costs were paid from household savings, and 40 percent "from family and friends"; only 10 percent of the sampled households had some form of funeral insurance.

Although households directly affected by HIV/AIDS bear the brunt of the economic costs, these costs can be mitigated by various forms of formal and informal insurance provided through the private sector, the public sector, or the extended family and local community. Workers in the formal sec-

[7]Quoted in the *Sunday Times* (South Africa), August 31, 2003.

tor may have access to private insurance that provides medical and death-related benefits; in most countries separate insurance schemes exist for public servants. However, the coverage of such formal insurance schemes is generally quite low: in most countries in sub-Saharan Africa, for example, fewer than 10 percent of the working-age population are covered.[8] Moreover, these formal insurance schemes come under strain as HIV/AIDS becomes widespread. For the population not covered by formal insurance schemes, the public sector can provide some forms of social security. In the context of HIV/AIDS, the most important form of such implicit insurance is public health services. Other forms of social security provided through the public sector are destitution allowances and (particularly relevant here) orphan allowances (see, for example, Botswana Institute for Development Policy Analysis (BIDPA), 2000) and disability grants. One example of the potential role of grants comes from the study of the impact of HIV/AIDS on urban households in Soweto, mentioned above (Naidu, 2003). That study finds that income in households affected by HIV/AIDS was, on average, 8 percent lower than in households not affected, but that earned income was 27 percent lower; the loss of earned income was to some extent offset by higher receipts of disability grants and pensions.

Where insurance through the private or public sector is insufficient or not available, the extended family or the community can provide some form of informal insurance. As previously noted, when households affected by HIV/AIDS dissolve, other households often take in orphans who have lost one or both parents. Rugalema (1999) reports on the impact of HIV/AIDS in the Bukoba district of Tanzania; there, in addition to the 32 percent of households directly affected by HIV/AIDS, a further 29 percent experienced indirect effects, including "fostering orphans, providing labor or cash to help care for the sick person, and providing for survivors."[9] And, as noted above, friends and family covered about 40 percent of funeral expenses in Soweto, according to Naidu (2003).

The data in Table 2.2 point to a very substantial increase in the number of orphans. In Zimbabwe, for example, orphans (defined as children who have lost at least one parent) are estimated to have accounted for 18.6 percent of the young population at the end of 2003; this share is projected to increase to 21 percent by 2010. It is important to note that these shares are averages and that the share of orphaned children increases with age. For

[8]See Barbone and Sanchez (1999) for a broad survey of pensions and social security systems in sub-Saharan Africa, and Plamondon, Cichon, and Annycke (Chapter 8, this volume) on social security in the context of HIV/AIDS.

[9]Quoted in Whiteside (2002).

those aged 10–14 (by some accounts a group whose access to education is particularly at risk), the share of orphans is likely to be higher than the average.

The loss of one or both parents to HIV/AIDS affects the well-being of their orphaned children directly, but it also has important economic repercussions. As households affected by HIV/AIDS lose income and have to reallocate resources toward care, children are at higher risk of malnutrition. The loss of a loving parent, the increased financial hardship, and the frequent need to take time off from school to care for a sick family member cause their education and thus their economic prospects to suffer. During the parent's illness and after his or her death, members of the extended family frequently care for the children of the family. Case, Paxson, and Ableidinger (2002), using data from 19 Demographic and Health Surveys conducted in 10 countries in sub-Saharan Africa between 1992 and 2000, show that orphans tend to live in poorer households than nonorphans and that school enrollment rates for orphans tend to be lower than for nonorphans, even after controlling for household income. These findings are consistent with estimates by the United Nations Children's Fund (UNICEF, 2003), which suggest that dependency ratios (a crude proxy for income per capita) in households caring for orphans are 20 percent higher than in nonorphan households (1.8 rather than 1.5), and that enrollment rates for orphans are 13 percent (not percentage points) lower than for nonorphans. Again there is an issue regarding the aggregation over age groups: for example, Ainsworth, Beegle, and Koda (2002) provide some evidence for Tanzania that the drop in enrollment rates is larger for the 10–14 age group than for the 5–9 age group.

From a macroeconomic perspective, access to education is intimately linked to the accumulation of human capital, as the discussion below of economic growth will make clear. Also, the study by Bell, Devarajan, and Gersbach (Chapter 3, this volume) is built around the impact of increased mortality on the transfer of human capital between generations, which is disrupted through the death of one or both parents, and the incentives to invest in human capital.

Private Sector[10]

HIV/AIDS, by increasing morbidity and mortality, affects both the productivity of employees living with the disease and productivity in general,

[10]The section on the impact of HIV/AIDS on the private sector benefited from extensive comments by Patrick Connelly.

as the retirement or death of employees disrupts companies' operations. For most companies, however, the most important costs associated with HIV/AIDS are monetary, including medical and death-related benefits, which add to personnel expenses. HIV/AIDS also has implications for the costs of recruitment and training: employees lost to AIDS must be replaced, and their successors must be trained. These costs include not only the direct financial costs but also various indirect costs, such as managerial time devoted to hiring and training new staff, and the productivity losses incurred while the new hires are learning their job. Looking forward, increased mortality means that companies need to train more staff for each of a number of specific tasks, to ensure that a sufficient number of employees with these skills will always be available; at the same time, the financial returns to these investments in training decline, because the new hires are themselves at greater risk of dying. This section will discuss all these issues, as well as how the impact of and the response to HIV/AIDS differ between small and large companies.

Some of the costs of HIV/AIDS to companies have already been discussed in the context of the income effects on households. From studies of the effects of HIV/AIDS on worker performance, it appears that absenteeism rises and productivity declines well before the death or retirement of an employee due to AIDS. The extent to which this represents a cost to the employer depends on the context. In the case of piece workers, the infected workers themselves bear most of the costs of their lower productivity. For workers who receive a fixed salary, the company bears most of the costs.

Table 2.3, adapted from Aventin and Huard (2000), shows the breakdown of HIV/AIDS-related costs for two companies in Côte d'Ivoire: a food-processing company (company 1) and a textile company (company 2). The largest cost component is that for medical care and related costs: the sum of all health-related costs, including preventive measures, HIV screening, payments to medical workers on the payroll, and health insurance, exceeds 35 percent of all HIV/AIDS-related costs for company 1 and 25 percent for company 2. Also important are sick leave, costs related to lost productivity and reorganization, funeral costs, and (for company 1) disability pensions to staff retiring for health reasons. Funeral grants, corresponding to about one monthly salary at company 1 and almost two monthly salaries at company 2, cover a substantial proportion of the funeral costs of deceased staff.

One potential cost to companies not covered in Table 2.3 is death-related benefits (other than funeral grants) paid to surviving spouses and dependent children; these can take the form of an ongoing pension or a

Table 2.3. Costs of HIV/AIDS for Two Companies in Côte d'Ivoire
(Percent of total except where stated otherwise)

Cost Item	Company 1	Company 2
Medical care	25.2	13.0
Prevention	1.0	1.2
HIV screening	0.6	—
Wage bill for medical personnel	5.2	12.5
Increased health insurance costs	5.0	—
Disability pensions	23.7	—
Sick leave	9.3	18.2
Attendance at funerals	3.1	3.3
Dismissals and severance pay	—	1.1
Recruitment and training	—	5.2
Loss of productivity, reorganization	13.3	25.0
Funeral costs	13.5	20.5
Total HIV/AIDS-related costs[1]	100.0	100.0
Total as percent of wage bill	1.3	0.8
Memorandum:		
HIV incidence among company employees (percent of workforce a year)	1.9	1.1

Sources: Author's calculations based on data from Aventin and Huard (2000).
[1]Items may not sum to totals because of rounding.

lump-sum payment. It is common when discussing pensions to distinguish between defined-contribution and defined-benefit schemes. In the former, the employee or the company, or both, make contributions to a pension fund, and the invested proceeds, plus any return, are paid out at retirement or death. In a defined-benefit scheme, payments are made according to a formula, often linked to tenure, and are not directly linked to past contributions. In general, the costs of HIV/AIDS to a company with a defined-contribution pension plan are likely to be small. If instead the company has a defined-benefit scheme that provides a fixed payout in case of death, however, HIV/AIDS-related payouts can be substantial. Most death benefits reported in the literature range from two to four times annual salary; for company 1 in Table 2.3, this could amount to an additional 3.8 to 7.6 percent of the wage bill. Thus HIV/AIDS can have a marked impact on personnel costs: one much-quoted earlier study for South Africa, assuming relatively generous benefits, projected that AIDS could add up to 15 percent to the wage bill by 2010 (Moore, 1999). In the absence of successful prevention measures to contain the numbers of new infections, this could mean that the company's profits, salary levels, or benefit levels are not sustainable.

Rosen and others (2004) provide a comparative analysis of six South African companies and identify four main determinants of differences in

costs per new HIV infection: the level of death and disability benefits provided, the level of medical care for lower-level employees, the status of unskilled workers (whether permanent employees or contractors), and labor productivity or the composition of the workforce. The costs are higher for skilled employees, reflecting the higher costs of absenteeism and training. In particular, for companies providing disability pensions and pensions to surviving dependents, these tend to be the largest components of total costs, followed by productivity losses and sick leave and absenteeism. Rosen and others (2004) estimate that the actual costs for the six South African companies they studied ranged from 0.4 to 6.0 percent of the wage bill, depending on the demographics and the skill level of workers, and on the types of medical or death-related benefits provided.

Companies can take various steps to contain HIV/AIDS-related costs, including measures to prevent their employees from contracting AIDS, changes in the types or amounts of benefits they offer, and screening and medical treatment for their employees. Among these, prevention stands out, since it is generally recognized as the most cost-effective class of interventions from the company's point of view. It can be even more cost-effective from a social perspective, when one takes into account that companies bear only part of the costs of a worker's illness and death. Unfortunately, many companies do not have HIV avoidance policies in place, and often companies come to recognize prevention as a priority only after HIV cost avoidance has become a necessity. For example, South Africa's Bureau for Economic Research (BER, 2004) reports that only one-fourth of about a thousand companies surveyed in that country had implemented a formal HIV/AIDS policy. Conversely, a forward-looking prevention strategy that keeps down the number of infections among the workforce can reduce the financial pressure to cut costs by reducing employee benefits. On the other hand, companies who primarily employ casual workers may have little financial incentive to invest in prevention, because they incur only modest benefit costs, if any; because training costs for such workers tend to be low; and because high turnover means that most of these workers will have left the company long before current prevention efforts result in a smaller number of AIDS cases.

Once a company faces the possibly huge financial costs of an HIV epidemic among its employees, it will presumably seek ways to reduce those costs. Because death-related benefits and pensions to surviving dependents frequently account for a large share of the direct financial costs of HIV/AIDS, they are also a primary target for cost cutting. The available evidence suggests that HIV/AIDS is already affecting retirement funds in a very substantial way. For the most common form of retirement plan in

South Africa, defined-contribution schemes, Sanlam (2004) reports that death benefit premiums have increased from 1.9 percent to 2.5 percent of the wage bill (a relative increase of over 30 percent), and disability benefit premiums have risen from 1.5 percent to 1.8 percent between 2002 and 2004. Together with declines in employer contributions and increased administrative costs, these escalating costs have contributed substantially to a decline in retirement provisions from 12.4 percent to 10.8 percent (a relative decline of 13 percent). Because defined-contribution schemes eventually pay out the accumulated contributions minus the costs of risk benefits and administrative costs, this decline would mean that payouts at retirement or upon death in service (in addition to death benefits) will eventually decline and that the increased costs of risk benefits are passed through to employees. Looking ahead, most fund managers polled (72 percent) expected a substantial further increase in the cost of risk benefits over the next two years.

As the costs of death-related, disability, and medical benefits increase, companies may respond by reducing the costs of medical benefits, for example by cutting benefit levels or shifting a larger share of the cost to employees. Reductions in benefits—medical or death-related—frequently take the form of contracting out certain tasks and replacing permanent employees (especially low-skilled workers) with fixed-term contract workers or casual labor. This is illustrated in Table 2.4, from Rosen and Simon (2003), which compares benefits for regular and casual employees; this study also provides other examples of such burden shifting. In the case of medical benefits, the erosion of private health coverage implies increased economic risk for households facing an HIV/AIDS epidemic. To the extent that households who previously relied on private health services make use of public services instead, part of the burden of the disease is absorbed by the public sector (as the demand for public health services increases) or the public at large (as a larger number of patients relying on the public sector draw on limited health resources).

The above examples have described the various costs of HIV/AIDS to companies and various approaches to reducing those costs, but expenditure on prevention and treatment can also be interpreted as a form of investment. When a company extends or expands health services benefits to its HIV-positive employees, it does incur additional costs, but these expenditures may produce savings for the company in time as the number of employees contracting the virus is reduced, as the onset of morbidity and mortality for those who do become infected is delayed. Denote, for example, the cost of a particular form of treatment as C_T, and the costs of mortality (discussed above) as C_M. The treatment delays the onset of the

Table 2.4. Compensation and Benefits Provided to Low-Skilled Employees and Contract Workers at One South African Company

Item	Permanent Employees	Fixed-Term Contract Workers
Employment term	Permanent	10-month contract, renewable annually
Average salary or wage	85 rand a day	71 rand a day
Retirement benefits[1]	Proceeds of employee's account with defined-contribution provident fund, to which company contributes 7 percent of salary	None
Disability benefits[2]	Lump-sum payment of two times annual salary	None
Death benefits	Lump-sum payment of two times annual salary	None
Funeral benefits	None	1,800 rand for coffin and transport
Health insurance (medical aid)	Company contributes 60 percent of premium[3]	None
Primary medical care	Free to worker and dependents at company clinic; referral to public hospital	Free to worker at company clinic; referral to public hospital
Paid sick leave	12 days a year, plus extensions at management discretion	12 days in each 10-month contract
Memorandum: Share of males in workforce	95 percent	97 percent

Source: Rosen and Simon (2003); the identity of the company is confidential.
[1]Payable upon normal retirement, death, or medical retirement.
[2]Payable upon medical retirement.
[3]For a family of four, the remaining 40 percent amounts to 31 percent of salary for a low-skilled employee; almost no low-skilled workers join.

symptoms of AIDS and the employee's death from time T to time T'. The net financial gain from providing this treatment is

$$\textit{Net financial gain} = \sum_{i=1}^{T'} (1+r)^{-i} C_T(i) + [(1+r)^{-T'} - (1+r)^{-T}] C_M, \quad (1)$$

where r is the discount rate and i indexes time. The first term on the right-hand side of equation (1) gives the present discounted value of the costs of treatment, and the second, the discounted financial gain associated with the employee's increased life expectancy. Rosen and others (2001, 2004), for example, use this approach to illustrate the cost-effectiveness of various prophylactic treatments and of HIV testing and counseling. The approach has also been used to assess the cost-effectiveness of antiretrovi-

ral treatment. Suppose, for example, that the cost of providing such treatment is $1,000 a year and that the treatment increases an employee's remaining life expectancy from two years to six years. The costs associated with the employee's death are $20,000, and the company applies a discount rate *r* of 10 percent. The present discounted value of the cost of treatment for six years is then $4,355, and the postponement of the employee's death lowers the present discounted value of death-related costs by $5,239.

A company following this approach would typically find that it gains financially from providing antiretroviral treatment to its higher-paid staff. An important additional consideration, however, is that employees value medical benefits as part of their compensation package. This means that the company would be able to pass on some of the cost of expanded treatment options to its employees, either through employee contributions to the company's medical plan or through lower salaries. Finally, companies that provide more extensive medical benefits packages have more to gain from effective prevention programs. The evidence available suggests that both considerations are relevant, with some examples of companies providing antiretroviral treatment to their senior staff, and others providing antiretroviral treatment to all employees and in some cases to their families as well.[11]

As companies, whether by choice or by necessity, internalize some of the costs and economic benefits of prevention measures and treatment efforts, they are frequently willing to implement or finance some HIV prevention measures among their workers. Only very large companies will find it cost-effective to develop an HIV prevention program on their own. However, some insurers have developed integrated medical and HIV prevention packages in which companies can participate, and this expands the range of companies with access to prevention programs.

HIV/AIDS also affects the availability of employees with specific qualifications. This follows from the changes in the working-age population brought about by increased mortality, but HIV/AIDS also affects the return to investment in skills. Although an employer may be able to replace a worker who has died for HIV/AIDS-related reasons, the worker's death shrinks the aggregate supply of labor. This means that wages for workers with specific skills are likely to rise, or that workers who die will be replaced with workers with less skill and less experience. At the same time, the age structure of the working-age population changes: increased mortality means that employees are, on average, younger, and that individuals

[11]For this latter group, examples in South Africa include AngloGold, BMW, and Sasol.

with substantial experience in their profession, normally a prerequisite for leading positions in a company, become more scarce.

Companies also invest in training, especially to enhance the skills of their employees that are job-specific. With increased mortality, the returns to such investments decline, and, as a consequence, companies are likely to reduce their investments in training. For example, suppose a company observes that its employees quit with a probability of 10 percent a year, and that the company applies a discount rate of 5 percent. In this case, if the mortality rate among its employees rises from 0.25 percent to 1 percent, returns to training employees will fall by 4.7 percent.[12] If the mortality rate rises to 3 percent, returns to training will fall by 15.3 percent. Alternatively, the company may have to maintain a constant number (say, 100) of employees with certain skills that are key to its operations. As mortality rates rise from 0.25 percent to 1 (or 3) percent, the average number of employees who need to be trained each year then rises from 10.2 to 10.9 (or 12.7), and the annual training budget would have to rise by 6.6 (or 24.2) percent. Another cost of additional training, not captured so far, is learning on the job: workers usually need time to adjust to a new work environment and become fully productive. Connelly and Rosen (2004) estimate that the time needed on the job to become fully productive ranges from 5 days for unskilled workers to 20 days for skilled workers and 60 days for managers.

The above examples of the impact of HIV/AIDS on companies derive from case studies or simulations; another important source of information is business surveys. Based on questionnaires or interviews with managers, these surveys provide qualitative assessments of the impact of HIV/AIDS, for example on employees, production costs, profits, and the economic environment. The most comprehensive survey so far is that by the BER (2004) in South Africa, which reports that 39 percent of responding companies indicated that HIV/AIDS has reduced labor productivity or increased absenteeism.[13] In the same survey 40 percent of respondents indicated that "the epidemic increased their demand for labor (e.g., via

[12]The returns to training are calculated as $(s + m + \delta)\int_{\alpha}^{\omega}(i - \alpha)e^{-(s+m+\delta)^*(i-\alpha)}/di + (\omega - \alpha)e^{-(s+m+\delta)^*(\omega-\alpha)}$, where s is the job separation rate, m is the mortality rate, δ is the discount rate, α is the employee's age, and ω is the age at which the employee retires from the labor force. In this example, α equals 15 and ω equals 60. For simplicity, it is assumed that quit rates and mortality rates do not differ across workers. The assumed quit rate of 10 percent is near the middle of the range of 6.8 to 18.3 percent (excluding workers leaving because of sickness or death) reported by the World Bank (1999).

[13]The study was commissioned by the South African Business Coalition on HIV/AIDS and is therefore frequently referred to as the SABCOHA study or survey.

work shadowing or replacement of AIDS sick workers." Although fewer than 10 percent of companies noticed an adverse impact of HIV/AIDS on sales, 30 percent expected to see an adverse impact after five years.[14] A study from Malawi focusing on micro- and small enterprises finds that the most important channel through which HIV/AIDS affects these companies is the demand for their products or services.[15]

The BER (2004) study also provides important insights into the differing impacts of HIV/AIDS on businesses of different sizes, and their responses. It reports that 25 percent of all South African businesses have an HIV/AIDS policy in place, but only 13 percent of small companies (those with fewer than 100 employees) do; in contrast, 90 percent of companies with more than 500 employees have such a policy.[16] Table 2.5 shows that, for smaller companies, productivity losses and direct costs (loss of experience, higher turnover, and recruitment and training costs) associated with the loss of employees are the principal financial repercussions of the epidemic. The survey also finds that the larger the company, the more important are the costs of higher employee benefits. Although the cost rankings are very similar for small and medium-sized companies (the only difference being the ranking of benefit costs), they are markedly different for large companies. For these companies the costs of benefits and measures to contain the adverse impact of HIV/AIDS dominate. These trends are consistent with the conjecture that there is a positive correlation between prevention efforts and benefit levels. They may also reflect a weaker capacity of small business management to implement HIV policies; from this perspective, the rankings for smaller companies reflect a more passive attitude and an emphasis on direct costs, whereas the larger companies tend to have some active policy in place. Indeed, in a survey of the major business concerns of small and medium-size enterprises (Connelly and Rosen, 2004), HIV/AIDS ranked only ninth (out of 10), although some higher-ranking concerns (including the number-one concern, worker productivity) were in some way related to HIV/AIDS. Small companies may also provide retirement benefits to workers. In

[14]The impact of HIV/AIDS on sales differs from sector to sector and is generally less for export-oriented businesses (such as mining companies). Companies providing health- and death-related services (such as hospitals, pharmacies, and funeral parlors) may experience a substantial increase in demand.

[15]See Ebony Consulting International and Malawi National Statistical Office (2000).

[16]Rosen (2002) and Rosen and others (2003) report a similar finding for Nigeria: firms that were part of a family of firms or an industrial group were twice as likely to take actions against HIV/AIDS (informational materials, speakers, condom distribution, training of employees as peer educators or counselors).

Table 2.5. Ranking of Importance of HIV/AIDS-Related Costs to Businesses

Importance (1 = Most Important)	Number of Employees			
	Fewer than 100	100 to 500	More than 500	All companies
1	Lower productivity and increased absenteeism	Lower productivity and increased absenteeism	Higher employee benefit costs	Lower productivity and increased absenteeism
2	Loss of experience and vital skills	Higher employee benefit costs	Voluntary counseling and testing or HIV/AIDS awareness program	Higher employee benefit costs
3	Higher labor turnover rates	Loss of experience and vital skills	Lower productivity and increased absenteeism	Loss of experience and vital skills
4	Higher employee benefit costs	Higher labor turnover rates	HIV/AIDS treatment[1]	Higher labor turnover rates
5	Higher recruitment and training costs	Higher recruitment and training costs	Research into the impact of HIV/AIDS	Higher recruitment and training costs

Source: Bureau for Economic Research (2004).
[1]Including provision of antiretroviral therapy.

most cases these would be provided through a provident fund that manages benefit programs for many companies. Because the contribution rates to such a retirement fund would not reflect AIDS mortality in the workforce of any individual small company, there is no direct link between HIV/AIDS (at the company level) and the costs of benefits, and managers have less of a financial incentive to take action.[17]

The discussion above has already highlighted some of the differences between small and large businesses in the impact of and the response to HIV/AIDS. The role of small businesses is discussed in more detail below, in an effort to bridge the gap between the chapters on households and the discussion of larger private businesses. Because smaller businesses are more likely to be part of the informal sector, much of what follows can also be interpreted in terms of differences between the formal and the informal economy.[18]

[17]Of course, there is an externality involved here. On risk benefits in small companies, see Connelly and Rosen (2004).

[18]This concept of "small businesses" is similar to the one used in Ebony Consulting International and Malawi National Statistical Office (2000), who "visited a stratified sample of over 22,000 households and small businesses to identify active business activities of all kinds employing fewer than 50 employees. This study also enumerated on-farm agricultural activities, as long as 50 percent of the production was sold. . . ."

Apart from issues related to data availability, much of the focus of the literature has been on larger companies, because these include some of the major contributors to GDP, and because the government's tax base is largely associated with the formal economy. However, in many countries with severe AIDS epidemics, the majority of the population works in the informal sector. Also, incomes are generally lower in the informal economy, and many of the instruments available in the formal sector to mitigate the impact of HIV/AIDS on households (such as medical and death-related benefits) do not exist there. In assessing the welfare effects of HIV/AIDS, it is therefore important to give appropriate weight to small businesses.

Small companies are less likely to adopt prevention and awareness measures, because there is a fixed cost involved in developing an HIV/AIDS policy or contracting HIV/AIDS-related services, and they may find it harder than large enterprises to replace key staff. The impact of HIV/AIDS on a small business is also less predictable.

Phororo (2003) discusses in some detail the response of small Namibian businesses to HIV/AIDS among their workers. In light of the resource and time constraints hindering an active response of small businesses to HIV/AIDS, most of the policy measures she discusses rely on collaboration to hold down the costs of HIV policies to small companies (for example, by building a national business coalition on HIV/AIDS) or on including small businesses in programs implemented by other companies. Connelly and Rosen (2004) emphasize that the costs per employee of HIV/AIDS-related services are much higher for small companies, largely because of fixed costs incurred by providers and the additional costs of marketing and delivering services. One of the costs of developing a response to HIV/AIDS is that of obtaining information. Public awareness measures can therefore facilitate the adoption of HIV prevention strategies by small companies. Rosen (2002), drawing on earlier work (published as Rosen and others, 2003), observes that "receiving information from an outside source" is a "good predictor of company action."

When key employees fall ill or die from HIV/AIDS, small companies can find themselves at a disadvantage with respect to large companies in covering for and eventually replacing those individuals. Large enterprises can cope temporarily with the loss of an employee by reallocating work to co-workers with similar experience and skills. This is especially relevant if the position requires specialized training or some experience within the company, as in the case of the branch manager of a bank, a software specialist, or an accountant. The ability to reallocate work within the company also makes it easier to find a permanent replacement for workers retiring

or dying from HIV/AIDS. Small businesses are much less likely to be able to replace key employees from within the company, raising the cost of replacement; in extreme cases, the loss of a key member can result in the dissolution of the business.[19] However, small companies, especially those in the informal sector, rely more on casual employees for their unskilled labor.[20] The company does not have to cover any medical or death-related benefits for these employees and can easily replace them if they are no longer able to fulfill their tasks.

Size—and the law of large numbers—also makes the impact of HIV/AIDS more predictable for large companies. Large employers can expect the HIV prevalence rate among their employees to be close to the relevant population average; small companies, in contrast, will see greater dispersion, with some lucky ones barely affected, while others experience prevalence rates well above the average. This greater predictability also allows large companies to mitigate the impact of HIV/AIDS through forward-looking resource management. For example, a large company that employs 100 accountants might simply decide to hire two more in order to self-insure against a likely increase in absenteeism and HIV/AIDS-related attrition. In contrast, a small company would likely not find it cost-effective to employ even one more accountant to insure against the loss of the one already on the payroll. At the extreme, a very small single proprietorship may well cease to exist if the owner dies or retires.

Finally, HIV/AIDS complicates small businesses' access to credit. Large businesses tend to be incorporated, and therefore HIV/AIDS does not change their default risk other than through its impact on company profits. The owner of a small business, in contrast, is likely to have to borrow in his or her own name. In this case a substantial increase in mortality owing to HIV/AIDS increases default risk, reducing the business's access to or cost of credit.

Public Sector

The implications of HIV/AIDS for the government are fundamentally different from those discussed above for other social and economic institutions, because of the government's public mandate and its key role in

[19]One implication of this for researchers is that surveys of the impact of HIV/AIDS on small businesses tend to underestimate the effects, because many of the worst-affected firms no longer exist and are therefore missed by the survey. This measurement problem also arises in the context of the dissolution of HIV/AIDS-affected households.

[20]See Coetzee (2003) for an illustration.

formulating and implementing the country's response to HIV/AIDS. The impact of HIV/AIDS on the public service and government finance is discussed in some detail in Haacker (Chapter 7, this volume); therefore the discussion that follows highlights only a few issues that are particularly relevant for the impact of HIV/AIDS on the economy in general and on welfare. These issues include the impact on the delivery of public services, the government's personnel costs, the demand for certain government services, and the role of international assistance in supporting and, in particular, financing the response to HIV/AIDS in low-income countries.

HIV/AIDS causes disruptions to government services in ways similar to those discussed above for the private sector. As public servants fall ill and die, the efficiency of government agencies declines because of falling productivity and disruptions related to increasing attrition rates. These disruptions can be particularly severe if employees are allowed extended sick leave, or if long lags intervene between the advertising of a position and the hiring of a replacement. Disruptions can be particularly severe for decentralized government services, such as local education and health services.[21] Because a given small community receives these services from only one or a few public servants, illness or death among them can cause a prolonged local disruption in these services.

HIV/AIDS also erodes the government's financial resources, from both the revenue and the expenditure side. Countries afflicted by the epidemic see their tax base and thus their domestic revenue grow more slowly or even shrink, even as demand for government expenditure, including for personnel, increases. Although countries can often obtain external finance for specific HIV/AIDS-related interventions (according to Table 2.6, almost 80 percent of public spending on HIV/AIDS in low-income countries was financed by external grants), such funding is typically not available to cover the *indirect* costs of HIV/AIDS, such as the impact on the government payroll or certain categories of social expenditure.

The impact of HIV/AIDS on the government's personnel costs, through increased medical and death-related benefits and increased training and recruitment costs, can be severe. These effects are similar to those discussed above in the context of the private sector and need not be further discussed here. However, the financial costs of benefits are likely to be higher for the public sector, because benefits are typically more compre-

[21]See Topouzis (2003) for a discussion of the impact of HIV/AIDS on agricultural extension services.

Table 2.6. Estimated Funding for HIV/AIDS Spending in Low-Income Countries, 2003
(Millions of dollars)

Source of Funding	Amount Spent
Bilateral, United States	852
Bilateral, other governments	1,163
Global Fund	547
UN agencies	350
World Bank[1]	120
Foundations and other NGOs	200
Governments of affected countries	1,000
Total	4,232

Source: Summers and Kates (2003).
[1]Grant component of concessional loans.

hensive than in the private sector. Public servants are more likely to be permanently employed (a condition associated with higher benefit levels), and governments may refrain, for political economy reasons, from cutting benefit levels as a way of containing costs. Thus personnel costs are likely to increase in all areas of the public service.[22]

The sector most directly affected by HIV/AIDS is the health sector.[23] The demands on the public health service rise sharply with the spread of the epidemic; at same time, health personnel, too, are affected by HIV/AIDS. Initially, with antiretroviral treatment in low-income countries out of reach for all but a few (who could afford it or who benefited from a pilot program), public health services could provide little more than palliative care and treatment of opportunistic infections. Even so, reported occupancy rates of hospital beds by HIV patients—ranging between 30 and 70 percent—indicate that HIV/AIDS absorbed much of the existing capacities of health services at that stage. With the dramatic fall in the price of antiretroviral treatments in recent years, however, more and more countries have started to make these treatments available through the public health service. At the same time, the international community is working diligently to provide financing and other support to expand access to treatment in low-income countries. Even with such support, however, expanding health services sufficiently to meet the

[22]Some of the costs may not appear directly in the government's budget, for example if the public sector pension fund is not part of the general budget, or if some forms of benefits are covered from discretionary funds at the ministerial level.

[23]For a thorough discussion of the impact of HIV/AIDS on the health sector, see Over (Chapter 10, this volume).

potential demand for treatment remains a serious challenge in many countries.

International donors play a critical role in the financing of HIV/AIDS-related expenditure in sub-Saharan Africa and (to a somewhat lesser extent) of health expenditure generally. Table 2.6 reports estimates of the sources of funding of HIV/AIDS-related expenditures in low-income countries for 2003. More than three-fourths of public health expenditure was financed through external grants. The data do not distinguish clearly which agencies would provide the services: some grants would finance government activities included in the budget, whereas others would go to international nongovernmental organizations (NGOs) providing services directly in the affected countries. But the data do show that governments that offer a convincing and comprehensive HIV/AIDS program can raise a substantial proportion of the necessary funds from external grants. On the other hand, managing the aid flows, catering to the specific needs of different donors, and coordinating the activities of numerous agencies and NGOs, some of which are directly financed from abroad, can be a challenge for a government whose human resources are already stretched thin by the epidemic.

In the longer run, the impact of HIV/AIDS in a given country does depend on the government's policies and its actions to fight the epidemic and mitigate its impact. A policy that brings down the incidence of new infections and improves the health status of people living with HIV, through prevention campaigns and improved access to treatment, will reduce the adverse macroeconomic effects. As the domestic revenue base improves (or at least deteriorates less rapidly) and outlays related to HIV/AIDS fall, some of the costs of a comprehensive HIV/AIDS framework will be offset by these indirect fiscal gains arising from reduced HIV prevalence and improved health.

Impact of HIV/AIDS on the Economy and Society

HIV/AIDS, through its impact on mortality and morbidity and the resulting demographic changes, affects all levels of an economy and society, from individuals and households to small and large businesses to the different levels and activities of government. Most of these changes can be described in terms of frictions that affect the efficiency of some entity or process, demographic changes (especially losses in human capital), and changes in the composition of domestic demand. These frictions relate to entities that are in some way tangible. But HIV/AIDS can also affect the less tangible social and economic institutions of a country, such

as its civil society, its democratic processes, the acceptance of government by the public, the quality of governance, and social cohesion, which in turn have very direct consequences for economic development.

This chapter has already described (drawing on Chapter 7 of this volume, by Haacker) how HIV/AIDS erodes government's capacities and disrupts public services. Although the emphasis there was on the delivery of services, HIV/AIDS also affects legislative bodies and policymakers. Political processes are adversely affected, especially because this is an area in which experience is particularly important. For all these various reasons, the efficiency of government at all levels is likely to suffer. One possible consequence is increased political instability, spurred by dissatisfaction with the government in place or with the political process in general. More broadly, an essential complement to democratic institutions is a strong civil society, and this, too, is eroded by increased mortality and by many of the social and economic impacts of HIV/AIDS discussed elsewhere in this chapter.[24]

HIV/AIDS, through the economic repercussions of increased mortality and weakened social institutions and government capacities, also contributes to deteriorating security at the individual, community, and national level, and does so both in economic terms and in a more fundamental way.[25] Some of the economic dimensions of increased risk are discussed elsewhere in this chapter, for example in the context of the impact on households (above) and in the discussion on risk and welfare (below). In particular, domestic security deteriorates when the government's capacities are eroded,[26] and weakened governments and deteriorating economic prospects are associated with increased crime and instability.[27]

In an already fragile society, HIV/AIDS can contribute to the outbreak of civil war or prolong its duration. According to a recent World Bank Policy Research Report (Collier and others, 2003), "if a country is in economic decline, is dependent on primary commodity exports, and has a low per

[24]For a more thorough discussion of the impact of HIV/AIDS on democracy, governance, and security and vice versa, see Nelufule (2004).

[25]A report by the International Crisis Group (ICG, 2001) on "HIV/AIDS as a Security Issue" provides a thorough analysis of the multidimensional impact of HIV/AIDS on security.

[26]ICG (2001) lists some examples of how HIV/AIDS has affected policing in Kenya, Namibia, and South Africa.

[27]Various authors have also addressed the economic and security implications of the dramatically increasing number of orphans, currently estimated at about 20 percent of the young population in some of the countries worst affected by HIV/AIDS. See Nelufule (2004) for a recent discussion.

capita income and that income is unequally distributed, it is at high risk of civil war." This description applies to many countries affected by HIV/AIDS (sometimes even before the escalation of the epidemic), and, through its economic impact, the epidemic thus exacerbates a country's vulnerability to civil war. The discussion of democracy and political processes is also relevant: according to Collier and others (2003), "in such conditions the state is likely to be weak, nondemocratic, and incompetent, offering little impediment to the escalation of rebel violence, and maybe even inadvertently provoking it." This observation echoes the discussion above of the effects of HIV/AIDS on government capacities.

What this discussion shows is that the impact of HIV/AIDS on an economy and society goes far beyond disruptions of more or less tangible economic or administrative processes within households, businesses, or government agencies. To the extent that a stable and efficient government, a strong civil society, and economic and social stability contribute to economic development, these broader effects tend to reinforce the other adverse effects of HIV/AIDS on the economy. The discussion later in this chapter of the impacts of HIV/AIDS on economic growth focuses on a narrower set of economic effects. Thus it is important to stress here that the increases in mortality, the declines in birthrates, and the resulting demographic changes may so transform an economy and society as to give rise to economic effects that these models do not capture—or the models may not be structurally stable in such a dramatically altered setting.

Economic Growth and Income per Capita

Drawing on the evidence discussed above on the impact of HIV/AIDS on social and economic institutions, many studies have attempted to assess the epidemic's impact on economic growth and income per capita. Projections of the induced changes in economic growth are useful in several regards. For example, such changes are closely associated with changes in the domestic tax base and thus can be used in forecasting the resources that will be available for general government operations, including the policy response to HIV/AIDS. Changes in income per capita have implications for living standards, although here it is important to take into account the composition of spending (see Arndt and Lewis, 2001) and the distribution of income (as discussed below and in Greener, Chapter 5 of this volume).

Most studies of the impact of HIV/AIDS on economic growth and income per capita utilize some form of the neoclassical growth model,

incorporating assumptions regarding the impact of HIV/AIDS on productivity and labor efficiency, on saving and investment behavior, and on demographics. HIV/AIDS has an immediate macroeconomic impact owing to the productivity losses it imposes on the private sector, as discussed above; macroeconomic studies generally include some assumptions about aggregate productivity changes inspired by this microeconomic evidence. The assumption of changes in the saving rate is in most cases motivated by the increase in medical expenditure observed to accompany increased HIV/AIDS prevalence and its impact on households' ability to save. Finally, demographic changes have three kinds of effects in these models: a smaller labor supply translates into lower output; a lower growth rate of the labor supply is associated with a higher capital-output ratio (mitigating the otherwise adverse effects of HIV/AIDS on output per capita); and higher mortality, by eroding human capital (as measured by tenure or experience), lowers the average efficiency of labor. The principal differences between studies following this approach concern the level of disaggregation of the labor force by skill (studies typically distinguish in some way between skilled and unskilled labor) and by sector (distinguishing, for example, between a formal and an informal sector). This chapter will also explore the potential impact of HIV/AIDS on investment, in an open-economy model in which investment responds to changes in the rate of return to capital.

However, HIV/AIDS has a much more direct and severe effect on the accumulation of human capital: it destroys it in those it kills. Taking a longer view, investment in human capital is also likely to be affected. First, by increasing mortality, HIV/AIDS has a strongly adverse effect on the returns to investment in human capital (schooling and training), which may discourage individuals or companies from undertaking such investment.[28] Second, because so many of its victims are adults of parenting age, HIV/AIDS is associated with an increase in orphans—as noted above, orphans now make up around 20 percent of the under-18 population in some of the worst-affected countries—and there is empirical evidence that orphans have poorer access to education than nonorphans. More generally, HIV/AIDS, through increased uncertainty and the deteriorating economic outlook, will further discourage any form of investment, whether in human, physical, or social capital, and some authors, mirroring the above

[28]For this to be true, individuals and companies must do an adequate job of projecting mortality rates; in a setting where these rates are rapidly rising, this may not be a realistic assumption.

discussion of the impact of HIV/AIDS on the social fabric, suggest that this will magnify the impact on economic growth.

Turning to the empirical studies, one can distinguish between two types of models. Some studies try to estimate the impact of HIV/AIDS on economic growth by means of some form of growth regression. Others use larger macroeconometric models originally developed for macroeconomic and fiscal analysis and policy advice. The relationships between the major macroeconomic variables in these models are based on an econometric analysis (rather than calibration), and they also capture short-term demand side effects. However, on the production side, and thus in the long run, these models have similar features to the simpler and more aggregated growth models. The prime example of a model of this type is that presented in BER (2001).

Productivity Effects

When the death or illness of a worker disrupts a company's production, or when that of a family member disrupts household production, aggregate productivity declines. This is illustrated in the following equation:

$$c = \alpha d_W + \beta s_W + \gamma d_p + \varepsilon s_p, \tag{2}$$

where c stands for the direct costs of HIV/AIDS (in percent of GDP), d_W and s_W stand for mortality and morbidity among the working-age population (in percent), and d_P and s_P are the corresponding variables for the total population.

The productivity losses associated with HIV/AIDS are represented by the first two terms on the right-hand side of equation (2), where α stands for the disruptions to production associated with AIDS mortality (replacement of workers, funeral attendance), as a percentage of GDP per capita, and β stands for the productivity losses associated with morbidity.[29] Other costs associated with HIV/AIDS are funeral and other death-related expenses (γ) and the costs of care and treatment (ε); these costs are expressed in terms of the *use* of output rather than as direct output costs, and for an analysis of the impact of HIV/AIDS on living standards it makes sense to add them.[30] Although this type of analysis of the direct costs of HIV/AIDS provides some useful insights, in the longer run HIV/AIDS also affects output through changes in the accumulation of

[29]In practice this relationship is often simplified, linking estimates of total costs during the course of the illness to estimates of HIV/AIDS-related mortality.

[30]This point is made by Arndt and Lewis (2001).

capital (including through an increase in HIV/AIDS-related expenditure, as represented by parameters γ and ε), or in the composition of the supply of labor. Looking beyond the very short run, it is therefore necessary to adopt a more general framework.

Studies Using the Neoclassical Growth Model

The earliest studies of the macroeconomic impact of HIV/AIDS used the neoclassical growth model, to explore different channels through which the epidemic affects the economy. These studies included those by Over (1992) and Cuddington (1993a, 1993b). This model still is frequently used, both as a framework for synthesizing estimates of the impact of HIV/AIDS on various macroeconomic aggregates, and to draw inferences about how the impact will evolve over time.[31]

Many of the insights from these studies can be summarized using a one-sector growth model, in which output (Y) is a function of the levels of capital (K) and labor (L), with the latter disaggregated into highly skilled and unskilled labor:

$$Y = AK^{\alpha}(e_H p_H L)^{\beta}(e_U p_U L)^{\gamma}, \tag{3}$$

where $\alpha + \beta + \gamma = 1$; p_H stands for the proportion of highly skilled individuals in the working population; and $p_U = 1 - p_H$ for the proportion of unskilled individuals. A denotes total factor productivity, and e_H and e_U represent the efficiency of highly skilled individuals and unskilled individuals, respectively.

The capital stock evolves according to

$$\dot{K} = sY - \delta K, \tag{4}$$

where $\dot{K}$ denotes the rate of growth of the capital stock over time. Studies following this approach usually assume that gross investment equals domestic saving (sY) and that net investment therefore is equal to saving minus the depreciation of capital. The supply of labor (and of its skilled and unskilled components) grows at rate n. Transforming the model into per capita terms (with $k = K/L$ and $y = Y/L$), the capital-labor ratio evolves according to

$$\dot{k} = sy - (\delta + n)k, \tag{5}$$

[31]Haacker (2002b) provides a more detailed and technical discussion of the issues covered in this section.

and the economy moves toward an equilibrium in which $sy - (\delta + n)k$ and the capital-labor ratio, and therefore output per capita, are constant. Solving for the steady-state capital-labor ratio (k^*) and output level (y^*) yields

$$k^* = \left(\frac{sA}{\delta + n}\right)^{1/(\beta+\gamma)} (e_H p_H)^{\beta/(\beta+\gamma)} (e_U p_U)^{\gamma/(\beta+\gamma)} \tag{6}$$

and

$$y^* = A(k^*)^{\alpha} (e_H p_H)^{\beta} (e_U p_U)^{\gamma}; \tag{7}$$

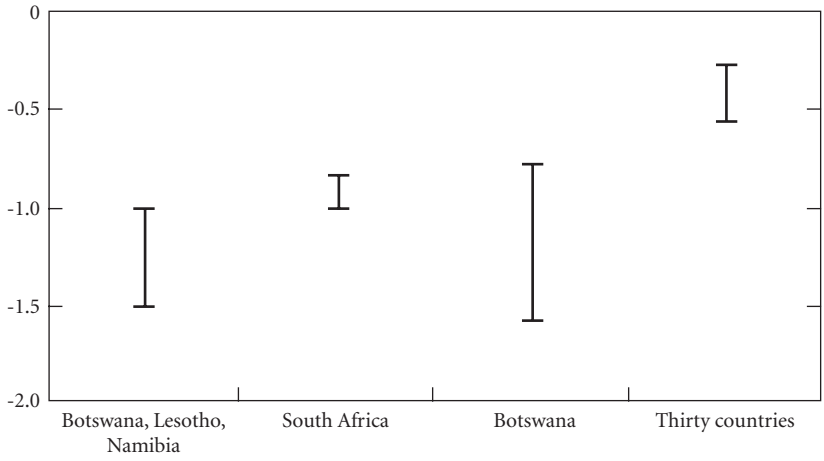
that is,

$$y^* = A^{1/(\beta+\gamma)} \left(\frac{s}{\delta + n}\right)^{\alpha/(\beta+\gamma)} (e_H p_H)^{\beta/(\beta+\gamma)} (e_U p_U)^{\gamma/(\beta+\gamma)} \tag{8}$$

Equations (6), (7), and (8) provide a framework for the assessment of the economic impact of HIV/AIDS, at least in the longer run, described by the steady state. In particular, the various channels through which HIV/AIDS can affect GDP per capita are as follows.

- *Changes in total factor productivity* (A) *or in the efficiency of skilled or unskilled labor (*e_H and e_U). Usually, changes in A are taken to reflect the disruptions caused by increased mortality, whereas changes in e_H and e_U capture losses in human capital associated with the loss of experienced workers. Estimates of the change in A are based on studies of the impacts of HIV/AIDS on productivity or on production costs (although, from a macroeconomic perspective, the latter partly reflect transfers). In line with the microeconomic studies cited above, most studies would assume that an increase in AIDS incidence of 1 percent is associated a decline in total factor productivity of 0.5 to 1 percent.
- *Changes in the composition of the workforce (*p_H *and* p_U). If HIV prevalence is higher among the unskilled, the workforce share of the skilled (p_H) will rise, and output per capita will rise. There is no clear pattern across countries regarding the skill bias of HIV/AIDS. Studies from South Africa (such as BER, 2001) and Botswana (BIDPA, 2000) typically suggest that HIV prevalence is higher among workers with low skills, but these results are not robust across countries and may change during the course of an epidemic.
- *Changes in the saving rate*. The assumptions adopted in the literature regarding changes in aggregate saving are inspired by studies of the impact of HIV/AIDS on individual households. If, for example, households affected by HIV do not save because they must meet the costs of treatment and care, this translates into a decline in aggregate saving, which can be related to observed HIV prevalence rates. As dis-

Figure 2.2. Estimated Impact of HIV/AIDS on Economic Growth Rates in Selected Countries
(Percentage points of GDP)



Source: UNAIDS (2004).

cussed below, however, studies addressing the optimal saving behavior of households who face a substantially increased risk of mortality predict a much larger decline in saving rates.

- *Changes in the rate of population growth*. HIV/AIDS is associated with a decline in population growth, initially owing to increased mortality but later also reflecting lower birthrates. A decline in the growth rate of the working-age population is associated with an increase in the capital-labor ratio (and thus of income per capita), as the existing capital stock is spread across fewer incoming workers.

Studies projecting the impact of HIV/AIDS on economic growth using an approach similar to that outlined above typically predict declines of 1.0 to 1.5 percentage points for the worst-affected economies, defined as those with HIV prevalence rates for the working-age population over 20 percent (in Botswana and Swaziland, the rate exceeds 35 percent).[32] This is illustrated in Figure 2.2, adapted from Joint United Nations Programme on HIV/AIDS (UNAIDS, 2004). As the rate of population growth also slows, the estimated impact on GDP per capita becomes even smaller. Box 2.1,

[32]The studies represented in Figure 2.2 may have a more elaborate sectoral structure; this issue is discussed further below.

Box 2.1. Impact of HIV/AIDS on Output and Income per Capita

The table below summarizes the impact of HIV/AIDS in a growth model as described in equations (3) through (9), both for a closed and for an open economy. For the open economy, the table differentiates between the impacts on output and on income, as capital outflows result in investment income accruing to domestic residents (or, vice versa, lower inward investment is associated with lower interest payments to foreign residents).

Consider an economy with an HIV prevalence rate of 10 percent. The growth rate of the working population falls by 1 percentage point, from 3 percent to 2 percent a year. Skilled workers account for 20 percent of the working population. Factor shares are 37 percent for capital, 28 percent for

Impact of HIV/AIDS on Output and Income per Capita
(Percent)

Type of economy and output or income	Total	Contribution of:				
		TFP[1]	Saving	Population growth	Labor efficiency	
					Skilled	Unskilled
Closed economy						
Output per capita	−0.5	−2.4	−1.2	4.5	−0.9	−0.6
Income per capita	−0.5	−2.4	−1.2	4.5	−0.9	−0.6
Open economy with perfect capital mobility						
Output per capita	−3.8	−2.4	0.0	0.0	−0.9	−0.6
Income per capita	−1.7	−2.4	−0.7	2.8	−0.9	−0.6

Source: Haacker (2002b).
[1]Total factor productivity.

which draws on Haacker (2002b), provides an example of the impact of HIV/AIDS on steady-state GDP per capita.

In one important regard there is a disconnect between the framework described above and the concerns in the business and political communities regarding the impact of HIV/AIDS on domestic and foreign direct investment. Whereas the latter fear that an uncertain and deteriorating economic outlook could deter investment, and thus worsen the economic impact of HIV/AIDS, the above closed-economy framework assumes that investment changes only in line with domestic saving, and that an increase in the capital-labor ratio offsets much of the adverse impact of HIV/AIDS. At the same time, the rate of return to capital declines (as the capital-labor ratio increases); the assumption that investment responds passively to changes in saving is therefore implausible.

skilled labor, and 35 percent for unskilled labor. The rate of depreciation is 10 percent a year. In the open-economy model, the economy starts out with a net investment position of zero. As a result of increasing mortality rates, average labor productivity falls by 2 percent for skilled workers and by 1 percent for unskilled workers. The aggregate saving rate (for both the formal and the informal sector) falls from 15 percent to 14.7 percent—that is, by 2 percent (0.3 percentage point)—and total factor productivity declines by 1.5 percent.

As a result of these changes, output per capita declines by 0.5 percent in the closed-economy model, owing to declines in total factor productivity and the efficiency of labor, which together account for a decline in output per capita of 3.8 percent. Although the saving rate decreases (accounting for a further decline of output per capita of 1.2 percent), most of the adverse effect on output per capita from all these sources is offset by slower population growth (which, other things equal, would raise output per capita by 4.5 percent), so that the overall effect on output per capita is relatively small.

If investment is sensitive to changes in the rate of return to capital, as in the open economy described by equation (9), the impact of HIV/AIDS on output per capita is much stronger, because changes in the population growth rate (and in the saving rate) no longer have an impact on output per capita. Since in this case the country's net investment position changes (as residents accumulate foreign assets or the level of foreign-owned assets in the domestic economy declines), it is important to take into account the associated interest income streams. In this example, output per capita declines by 3.8 percent, whereas income per capita falls by only 1.7 percent.

A simple model that does take these considerations into account is the open-economy version of the neoclassical growth model.[33] In this model the rate of return to capital is tied to the world interest rate, possibly adjusted for country risk.[34] In the present context this means that

$$\frac{\partial Y}{\partial Y} = r^{\star} + \textit{risk premium}. \tag{9}$$

[33]For a general discussion of this model, see Barro, Mankiw, and Sala-i-Martin (1995) or Haacker (2002b).

[34]One possibility not explored here is that an HIV/AIDS epidemic may itself increase a country's risk premium, reflecting the country's deteriorating and more uncertain economic outlook. Instead the risk premium is assumed to be constant.

As the rate of return to capital falls—for example, because of the costs and productivity losses associated with an HIV/AIDS epidemic—domestic and multinational investors in this model reduce their investment in the affected economy and instead invest abroad. This means that the capital-labor ratio declines, and the adverse impact of HIV/AIDS is exacerbated rather than mitigated as above. Box 2.1 provides a numerical example for this type of model, drawing on Haacker (2002b).[35]

One of the issues frequently raised regarding the impact of HIV/AIDS on GDP is whether and to what extent the impact can be mitigated or income per capita can rise through shifts of workers from the informal to the formal sector. When an employee of a high-productivity company in the formal sector retires or dies and is replaced by a hitherto less gainfully employed worker from the informal sector, income per capita rises. This argument, however, is at best misleading and, in many situations, wrong, because it rests on the assumption that the demand for labor in the formal sector is a given. First, it is important to understand that the formal sector relies to a larger extent on employees with particular qualifications, whereas people moving from the informal to the formal sector (and those in the formal sector they replace) typically have fewer professional skills. Second, HIV/AIDS also affects professionals with formal skills, and in the aggregate this is likely to have an adverse effect on the demand for unskilled labor.

Indeed, for the most common forms of the neoclassical growth model, it can be shown that an equiproportionate change in the number of skilled and unskilled workers will eventually leave the shares of skilled and unskilled workers working in the two sectors (and thus GDP per capita) unchanged. In this case changes in GDP per capita would need to come from changes in the composition of the labor supply or in the accumulation of capital, along lines similar to those discussed above.[36]

Several studies have addressed the impact of HIV/AIDS using more complex, computable general equilibrium models.[37] Although these models typically feature a much larger number of sectors, the dynamic structure is similar to that of the neoclassical growth model. One of the distinct advantages of this approach is that it allows a more realistic sectoral disag-

[35]Although they do not make it explicit, Drouhin, Touzé, and Ventelou (2003) also use this framework regarding the accumulation of physical capital.

[36]For a thorough discussion for the impact of HIV/AIDS in a dual economy, see Haacker (2002b).

[37]Examples include Kambou, Devarajan, and Over (1992) for Cameroon, Arndt and Lewis (2001) for South Africa, and Arndt (2003) for Mozambique.

gregation of GDP. However, the insights from these models resemble those of the dual-economy model discussed above: those sectors that use factors that are more affected by a shock will contract. An analysis of this family of models is beyond the scope of the present study, but the studies referenced also discuss some of the more general issues regarding computable general equilibrium models.

Saving and the Accumulation of Human Capital

The studies discussed above make rather simple assumptions about the link between HIV/AIDS and saving, typically relating changes in saving to the cost of treatment. There are good reasons to believe, however, that HIV/AIDS has a much more extensive and complex impact on saving. The increased risk of mortality means that individuals have less of an incentive to save, both for themselves and for their offspring. This approach also extends to the accumulation of human capital. The models discussed above interpret HIV/AIDS as a disruption to production processes, which reduces productivity, but the impact on productivity can be much larger in the longer run as individuals invest less in their own or their children's education, or as companies reduce their investment in employee training.

Freire (2002) addresses the impact of HIV/AIDS on saving using a model with intertemporally optimizing consumers; her paper also includes an application to South Africa. Linking the optimal consumption paths to a representative individual's mortality, she estimates that saving as a proportion of GDP will be about 14 percent (not percentage points) lower by 2010, a much larger number than would be obtained using the more common approach, whereby some of the direct costs of HIV/AIDS are financed from savings. Several other studies focus on the impact of HIV/AIDS on the accumulation of human capital. Ferreira and Pessoa (2003) adopt a model in which individuals allocate their lifetime between education and work in order to maximize the present discounted value of lifetime income. Equilibrium is characterized by some optimal level of schooling, a steady-state capital-labor ratio, and an allocation of agents to the goods and education sectors. Although the calibrations of the model yield projections of the impact of HIV/AIDS that are on the high side (for Zambia, for example, the estimate is of a decline in education time by half, and a drop in income per capita by one-third), the authors very thoroughly discuss their findings in the context of the earlier literature.

The most ambitious attempt so far to assess the impact of HIV/AIDS on economic growth is that by Bell, Devarajan, and Gersbach (2003 and

Chapter 3, this volume). The unit of analysis is the individual household. HIV/AIDS may result in the death of one or both parents in a household, which affects the accumulation of human capital in several ways. It affects their children's ability to accumulate human capital, and it reduces the family's income. Looking ahead, the increased risk of mortality reduces the returns to investment in the children's education. This is an effect similar to those described above, and it applies to all households. In light of the large numbers of orphans in countries with severe epidemics, these authors' emphasis on the asymmetric effects on orphans is highly relevant: not only do orphans attain lower levels of human capital in this analysis, but, because a child's level of human capital depends on that of the child's parents, their own offspring will be affected as well.

Birdsall and Hamoudi (Chapter 4, this volume) assess the impact of HIV/AIDS on the accumulation and utilization of human capital. The key to their argument is that lower life expectancy reduces the returns to accumulating human capital, thus reducing the demand for education, and they present evidence that increased life expectancy has indeed been associated with increased duration of schooling and higher primary school enrollment rates. The impact of HIV/AIDS on GDP will be exacerbated if, because of HIV/AIDS, the economy falls back below a critical mass of human capital. Finally, the authors point out that, as HIV reduces the accumulation of physical capital, this would in turn reduce the returns to human capital.

Incorporating the Impact of HIV/AIDS into a Large-Scale Macroeconomic Model

Several studies have analyzed the impact of HIV/AIDS in South Africa using more complex macroeconomic models. A study commissioned by ING Barings South African Research (2000) emphasizes the impact of HIV/AIDS on the labor force (distinguishing among four skill levels), on productivity (through absenteeism and illness), on production costs, and on the demand for health services. They predict that the labor supply (weighted by skill level) will decline by 12.8 percent by 2010 and that real GDP will decline by 3.1 percent compared with a scenario without AIDS, implying a substantial increase in per capita income.[38] Arndt and Lewis (2001), using a 15-sector computable general equilibrium model, draw on

[38]This substantial increase in income per capita appears to stem from a decline in unemployment and an increase in aggregate demand (in per capita terms).

the same demographic projections used in the ING Barings study. They project that GDP per capita will decline by 8 percent by 2010, relative to a no-AIDS scenario, and that domestic absorption, excluding food, medical services, and HIV/AIDS-related government expenditure, will fall by 13 percent. BER (2001) focuses on the epidemic's effects on the overall population and the labor force, the direct and indirect costs to private businesses, and government and household expenditure. The study projects that GDP growth will decline by between 1.4 and 1.8 percentage points between 2002 and 2015, and that GDP growth per capita will increase by 0.7 to 1.0 percentage points over the same period.

Empirical Studies

Several studies have attempted to evaluate the impact of HIV/AIDS on economic growth empirically, with mixed results. An early study by Bloom and Mahal (1997), using data through 1992, finds an insignificant link between growth of GDP per capita and cumulative AIDS cases for a cross section of 51 countries. Bonnel (2000) finds that HIV/AIDS may affect growth of GDP per capita both directly and through its impact on policy institutions. He reports that, in the 1990–97 period, increased HIV prevalence was associated with a decline in growth of GDP per capita. For a country with an HIV prevalence rate of 15 percent, for example, he postulates a decline in growth of GDP per capita of 1 percent. Using panel data from 41 African countries between 1960 and 1998, Dixon, McDonald, and Roberts (2001) find a significant effect of HIV/AIDS on "health capital" (as measured by life expectancy), but no significant impact of health capital on growth.

In interpreting these empirical studies, it is important to bear in mind two principal shortcomings. First, it is generally not possible at this stage of the epidemic to distinguish whether the observed changes in the growth rate of GDP per capita (if any) reflect long-term changes or changes in the level of steady-state GDP per capita associated with a temporary change in GDP growth as the economy adjusts to the new equilibrium. For example, it is not possible to extrapolate the findings of Bonnel (2000) beyond the 1990–97 period he considers. Second, the empirical analysis of the impact of HIV/AIDS on economic growth is beset with serious problems arising from errors in variables, affecting both the dependent variable (economic growth) and the HIV-related variables (mortality, prevalence, and so forth). Regarding GDP growth, the national accounts framework in many countries with high HIV prevalence rates is weak, and the data on GDP growth are unreliable. Data on HIV prevalence and mortality, in turn, are

usually derived from relatively few observations, usually seroprevalence data from blood tests at antenatal clinics, which are incorporated into an epidemiological and demographic model to obtain aggregate estimates at the national level, with a large margin of error.

Balance of Payments

The two components of the balance of payments are the capital account (also called the financial account, which captures investment flows) and the current account (which comprises payments for goods and services, and transfers, including external grants). One of the concerns regarding the macroeconomic impact of HIV/AIDS, alluded to above, is that the deteriorating and uncertain economic outlook and higher production costs in afflicted countries are likely to deter investment. Domestic investors would shift funds abroad, and international investors would refrain from investing in the affected economy; as a consequence, the balance on the capital account would decline. At the same time, the grant flows associated with an expanded response to HIV/AIDS can be substantial, amounting to several percent of GDP in some countries. One of the possible adverse macroeconomic effects of such increased aid flows is Dutch disease: an inflow of external grants can cause the domestic currency to appreciate, reducing the competitiveness of domestic industry.

To understand the potential implications of capital outflows, consider the discussion above of the impact of HIV/AIDS on the growth of output and income per capita in an open economy. In the most commonly used closed-economy models, increased mortality and lower birthrates result in an increase in the capital-labor ratio, which mitigates the impact on output per capita. A higher capital-labor ratio, however, is associated with a decline in the rate of return to capital. In the open-economy model, investment responds to a decline in the rate of return to capital, by rising until this rate is back in line with the rate of return of some comparator asset. What are the quantitative implications for the capital account? In the numerical example in Box 2.1, based on Haacker (2002b), capital outflows cause output per capita in the open economy to decline by an additional 3.3 percent. Given an elasticity of output with respect to capital of 37 percent (see Box 2.1) and a capital-output ratio of 2 (a not-uncommon ratio for many developing countries), the accumulated change in the capital account (through larger capital outflows or a decline in foreign direct investment) could eventually amount to 19 percent of

GDP.[39] Even under the assumed conditions of perfect capital mobility, this accumulated change would materialize only as the demographic and economic impacts of the epidemic unfold over time. On an annual basis, the changes in the balance of payments are therefore much smaller than the eventual accumulated change. A second issue for the balance of payments is the increased grant inflows associated with an expanded response to HIV/AIDS. Most of these funds would initially finance prevention-related activities such as voluntary counseling and testing (which are projected to account for 9.5 percent of the total costs of scaling up HIV/AIDS activities in low- and middle-income countries in 2005; see UNAIDS, 2004), programs for populations at risk (19.3 percent), condom marketing and provision (8.7 percent), and management of sexually transmitted diseases (5.7 percent), or social expenditures such as community and orphan support (9.3 percent). Treatment and care—presumably with a somewhat higher import content—are projected to account for only about one-third of the costs of scaling up HIV/AIDS-related programs in 2005 and 2007. Thus most of the grant financing would finance locally provided services with a rather low import content, or transfers and social expenditure.

This raises the question of whether these grant inflows would create some imbalance in the balance of payments, causing currencies to appreciate in the recipient countries—a phenomenon commonly referred to as "Dutch disease." The empirical literature on the link between aid and Dutch disease is inconclusive.[40] In the case where grant inflows finance HIV/AIDS-related spending, it is also important to distinguish between changes in the nominal exchange rate and changes in productivity and competitiveness. From a macroeconomic perspective, HIV/AIDS-related expenditures are productive expenditures, enhancing the productive capacity of the economy both immediately (through treatment) and in the longer run (through enhanced prevention and orphan support). This would enhance productivity and competitiveness and facilitate the sterilization of foreign currency inflows.

Finally, although this discussion has treated the current and capital accounts as separate issues, one should not simply add up the effects of HIV/AIDS on the two, because the effects are interdependent. A comprehensive response to HIV/AIDS, financed through external grants, would mitigate many of the effects on demographics, productivity, and produc-

[39]This is calculated as (capital/GDP) × (percentage change in output)/(elasticity of output with respect to capital).

[40]For a more thorough discussion of the macroeconomic effects of external aid, see Nkusu (2004).

tion costs that give rise to capital outflows, and it would give rise to new investment opportunities, especially in the health sector. Thus a reduction in capital outflows (or an increase in foreign direct investment) would be part of a successful scenario financed by external grants.

Poverty and Inequality

HIV/AIDS affects most of the common indicators of living standards, such as income, health standards, and access to education. Success in combating HIV/AIDS, malaria, and other diseases is therefore itself one of the Millennium Development Goals (MDGs) defined by the United Nations, and it will have a direct effect on at least five other MDGs: eradicating extreme (income) poverty and hunger, achieving universal primary education, promoting gender equality and empowering women, reducing child mortality, and improving maternal health.[41] At the same time, poverty affects people's vulnerability to HIV/AIDS, both by increasing the risk of contracting the virus oneself (for example, through lack of education or sexual choice) and by reducing one's ability to deal with the economic and social consequences of AIDS: poor households are in a worse position than others to cope with the illness and death of a household member.

The primary objective of this and the following section is to show how HIV/AIDS, through its demographic and economic impacts, affects living standards at the individual and the household levels. Although it echoes the discussion of the microeconomic effects of HIV/AIDS, especially at the household level, the discussion also draws on the analysis of the impact of HIV/AIDS on economic growth. The key hypothesis guiding the discussion is that, in light of the uneven impact of HIV/AIDS across individuals and households, the distributional aspects of the impact of HIV/AIDS are as much a part of the picture for the economic or fiscal analysis of HIV/AIDS as the impacts on economic growth or income per capita. Without prejudice to the other dimensions of the impact of AIDS on poverty, the analysis here focuses on that impact in terms of household and individual income, since this most directly relates to the contents of this chapter. The discussion in this section is also complemented by the more extensive analysis by Greener (Chapter 5 of this volume).[42]

[41]The MDGs less directly affected are ensuring environmental sustainability and developing a global partnership for development.

[42]For broader discussions of the impact of HIV/AIDS on poverty, see also Loewenson and Whiteside (2001), van Donk (2002), and Whiteside (2002).

HIV/AIDS can affect poverty and the distribution of income in several ways. As wages and salaries (and other factor income) change, reflecting changes in factor markets, the income distribution changes. The most visible effects are on those households with an HIV-positive member. Through the loss of an income earner, or as other household members need to divert time from work to the care of one who is sick, the household's income declines. At the same time, the household's needs increase because of higher medical expenses.

Before discussing the link between HIV/AIDS and poverty, it is worth taking one step back to discuss the meaning of poverty in this context.[43] In most cases poverty is defined in terms of income, either in absolute terms such as dollars per capita or per household, or in relative terms, for example as a percentage of average household income in the economy. Households or individuals whose income is below some critical value, or poverty line, are classified as poor. A more comprehensive definition of poverty is needs based; here the poverty line is defined as the price of a consumption bundle, whose content is based on an assessment of critical needs, which may differ according to household characteristics. Because HIV/AIDS is associated with an increased need for health-related spending in those households affected, the critical income level will be higher for those households.

Not only can HIV/AIDS cause poverty, but poor households, in turn, are also more vulnerable to HIV/AIDS, in that they are less able than other households to maintain a given level of consumption when faced with some new adversity. Although health expenditure as a share of household income is frequently similar across households with different incomes, higher expenditure, of course, buys better health care. Moreover, higher-income households have better access to credit and insurance markets (for example, through employment-based health and social insurance), mitigating the impact of illness on living standards. Especially in the absence of well-functioning credit and insurance markets, a household's wealth is also relevant. A household that derives a larger share of its income from assets that it owns is in a better position to smooth consumption in response to changes in its income.

The discussion above of the macroeconomic effects of HIV/AIDS already has some implications for the distribution of income (and, to a much lesser extent, the incidence of poverty), primarily through changes

[43]The applicable definitions of poverty are discussed in more detail in Greener (Chapter 5, this volume).

Table 2.7. Income and Expenditure of Households Affected by Illness in South Africa
(Percent of income or expenditure in unaffected households)

Item	Any Illness	HIV/AIDS
Household income		
Total	84	71
Per person	74	61
Per adult equivalent	78	65
Household expenditure		
Total	81	78
Per person	70	68
Per adult equivalent	74	72

Source: Bachmann and Booysen (2003).

in wage rates. Typically, studies of the effects of HIV/AIDS on GDP per capita, inspired by the neoclassical growth model, distinguish between different types of labor (skilled and unskilled, for example) and between sectors (formal and informal; agriculture, manufacturing, and services; and so forth). Wage rates reflect the scarcity of each type of labor. If the macroeconomic model predicts that the incomes of skilled workers will increase, this points toward an increase in inequality, because skilled workers already typically draw higher salaries than unskilled workers. The principal limitation of this type of model in analyzing poverty and inequality, however, is that it focuses on the aggregate supply of labor rather than the well-being of households. Thus, in such an analysis, a worker dying of AIDS simply disappears from the labor force, whereas in fact the death of an income earner has obvious implications for the income and welfare of the affected household.

The most direct information on the impact of HIV/AIDS on households comes from case studies comparing households affected with those not affected by the disease (or by illness in general). For example, Bachmann and Booysen (2003), using a sample of 404 households from South Africa, find that income and expenditure for households affected by HIV/AIDS or other illness is substantially lower than for households not affected (Table 2.7). The impact of HIV/AIDS on income seems to be more severe than for other illnesses, and this is consistent with a higher incidence of hospital visits for people living with HIV.

The principal shortcoming of detailed case studies of the impact of HIV/AIDS is the limited sample size. An alternative approach, taken by Greener (Chapter 5, this volume) and the earlier study from Botswana that this chapter draws on, by Greener, Jefferis, and Siphambe (2000), combines a macroeconomic framework with detailed data on household income and

household composition from a Household Income and Expenditure Survey and a definition of poverty based on the costs of a basket of basic goods. Unlike Bachmann and Booysen (2003), this study focuses on the impact of HIV/AIDS owing to increased mortality only, modeled as a one-time shock, and thus does not capture the adverse impact on the households of people living with HIV.

The primary effect of HIV/AIDS on poverty and inequality in Greener (Chapter 5, this volume) derives from its impact on household incomes. The study finds that, for a given wage rate, HIV/AIDS results in an increase in the poverty rate, and that poor households are disproportionately affected. The household poverty count increases from 37.7 percent to 43.7 percent. At the same time, however, inequality as measured by the Gini coefficient barely changes. Adding the changes in the macroeconomic environment to the analysis mitigates the impact on the household poverty count by 1 percentage point, as household income in this case rises. Thus the study confirms that income per capita is not a meaningful indicator of the impact of HIV/AIDS on poverty: although income per capita rises on average, poverty rates increase.

The studies just discussed cover a relatively short time horizon. In fact, the impact of HIV/AIDS on poverty is likely to evolve over a longer period, as more households become affected; on the other hand, the fortunes of a household affected by HIV/AIDS today may improve in the future. In the absence of empirical studies thus far, a hypothetical example will illustrate this point. Consider an economy in which all households are either "rich" or "poor." The evolution of the income distribution over time can be characterized by a transition matrix, which shows the probability that a household will remain rich or poor in the next year or move up or down this simplistic income distribution. Formally,

$$\begin{bmatrix} s_{r,t}+1 \\ s_{r,t}+1 \end{bmatrix} = \begin{bmatrix} \alpha_{rr} & \alpha_{rp} \\ \alpha_{rr} & \alpha_{rp} \end{bmatrix} \begin{bmatrix} s_{r,t} \\ s_{r,t} \end{bmatrix}, \tag{10}$$

where $s_{r,t}$ and $s_{p,t}$ represent the shares of the rich and the poor in the population at time t, respectively, and α_{rp} denotes the probability that a poor household will belong to the rich group in the next period. Assume that, in a given year, 2 percent of rich households experience an adverse shock and become poor ($\alpha_{pr} = 0.02$, and therefore $\alpha_{rr} = 0.98$), and 4 percent of poor households become rich ($\alpha_{rp} = 0.04$). Over time the economy will then converge to a steady state in which 67 percent of households are rich and 33 percent are poor. Now assume that, because of HIV/AIDS, 2 percent of households each year will lose an income earner. As a consequence, half of the rich households affected will become poor (and α_{pr} rises by

about 1 percentage point, to 0.0298), and none of the poor households affected will become rich (α_{rp} falls to 0.0392). This would mean that, over time, with more rich households becoming poor and fewer poor households becoming rich, the poverty rate rises from 33 percent to 43 percent in the new steady state. Although this example is only illustrative, it suggests that even a relatively low incidence of HIV/AIDS can have a substantial impact on poverty rates as this impact accumulates over time.[44]

Booysen (2003) uses this type of approach over a relatively short time horizon and shows that HIV/AIDS is associated with a decline in the income ranking of the affected households. He uses a relatively small sample (325 households, with three semiannual observations for each), which he sorts into five income quintiles.[45] His findings suggest that households affected by HIV/AIDS are more likely to move down the income distribution and less likely to move up. The principal difference between this analysis and the example above is that Booysen focuses on the income distribution (and movements of households affected by HIV/AIDS within the distribution) rather than movements relative to some poverty line.

One study concerned with the impact of HIV/AIDS on poverty in the long run is that by Bell, Devarajan, and Gersbach (Chapter 3, this volume), already discussed above in the context of economic growth. In that chapter HIV/AIDS has an immediate impact on household income; in terms of the above transition matrix, α_{pr}, the probability of a rich household turning poor, increases. Additionally, there are some factors at play that affect the future prospects of household members, including a disruption of the transfer of human capital between parents and children and a disadvantage in access to formal education. Thus for those households α_{rp}, the probability of becoming rich, may decline.

Two primary conclusions can be drawn from this analysis of the impact of HIV/AIDS on poverty (as measured here in terms of household or individual income). First, because the economic impact of HIV/AIDS is very uneven across households (depending, in the first place, on whether a household member has become infected or dies), aggregate measures of the economic impact of HIV/AIDS provide very little information regarding the impact on poverty. Second, the impact of HIV/AIDS may accumulate over time, because an increased risk of becoming poor at some point during a given period of time—measured in terms of the coefficients in a

[44]In this numerical example, it takes 10 years to complete half of the adjustment toward the new steady state.

[45]The sample appears to be the same as in Bachmann and Booysen (2003), apart from attrition between the second and third wave of the exercise.

transition matrix as in equation (10)—translates into larger changes in the steady-state income distribution. Similarly, but looking at a longer time frame, the impact of HIV/AIDS may be cumulative because its adverse effects are passed on to the next generation, for example in terms of children's education as in the study by Bell, Devarajan, and Gersbach.

Risk and Welfare

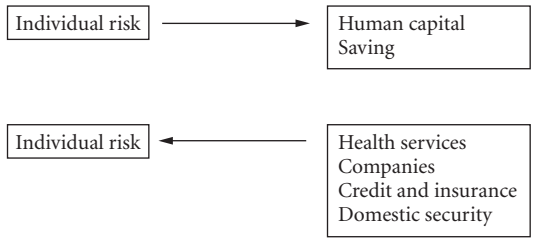
The presence of HIV/AIDS increases individual risk—to health and life, but also in terms of material living standards—and most measures of welfare are in some way affected by such changes. This section discusses first some of the direct economic effects of the increased risk to individuals due to HIV/AIDS. However, the fact that economic and social institutions must adjust to cope with the impact of increased mortality often has implications of its own for individual risk. Against this background, this section will discuss several measures of welfare and provide examples of the impact of HIV/AIDS on welfare in several countries.

Economic Repercussions of Increased Risk

Through its impact on morbidity and mortality and its many economic repercussions, an increased prevalence of HIV/AIDS is associated with an increase in economic risk. This increased risk derives most directly from the decrease in life expectancy, but also from increased uncertainty about future living standards, business prospects, and the general economic outlook. Increased risk, in turn, affects the behavior of those subject to it and, consequently, the whole economy. The broad economic repercussions, in turn, generally result in a further increase in individual risk. Figure 2.3 illustrates the macroeconomic effects of increased economic risk and how the impact of HIV/AIDS on the economy indirectly increases individual risk.

Through its impact on mortality and life expectancy, HIV/AIDS reduces the expected returns to investments in human capital, both directly for the individuals concerned and—in the context of an overlapping-generations model—for their children. This insight is at the core of the theoretical analysis in Bell, Devarajan, and Gersbach (2003, and Chapter 3, this volume); Birdsall and Hamoudi (Chapter 4, this volume) provide some empirical evidence for this relationship. Increased mortality risk also affects the expected returns from other forms of savings. When individuals perceive that their mortality risk has increased, they will discount

Figure 2.3. HIV/AIDS, Individual Risk, and the Economy



future earnings at a higher rate. Thus the incentive to save income or invest in assets declines.[46] Moreover, domestic private savings decline if additional health expenditures are partly financed from savings. On the other hand, the economic risk associated with HIV infection could encourage precautionary saving.

Through its macroeconomic impacts, HIV/AIDS also has more indirect effects on the economic risk faced by households and individuals. The most important of these are the impact on public health services, on companies (especially their willingness and ability to provide employment-based risk benefits), and on credit and insurance markets. In most countries facing severe epidemics, health insurance coverage is very limited, but public health expenditure implicitly provides some degree of insurance. The available evidence suggests that, so far, existing health services can barely cope with the increased demand, and they respond by rationing services. Thus, in the absence of greatly increased resources, public health services can no longer fulfill their role of providing some degree of health insurance to those not covered by formal health insurance schemes.

As discussed in more detail above, employees in the formal sector are frequently covered by a corporate health insurance policy and receive certain death-related benefits. In response to the rising cost of these benefits, many companies have reduced the coverage of their health insurance plans and have shifted their pension plans from defined-benefit schemes to defined-contribution schemes. Such a change in pension arrangements typically means that employees dying from AIDS will receive less, because they are likely to die at a relatively young age.

Additionally, HIV/AIDS affects the functioning of credit and insurance markets, as increased mortality raises individual default risk for personal

[46]Freire (2002) analyzes this aspect in the context of South Africa.

loans and increases the cost of life insurance.[47] Regarding loans, it is useful to distinguish between personal loans and mortgages. For personal loans the primary effect of increased mortality-related default risk is an increase in the cost of lending. To the extent that prevalence rates differ across population groups, borrowers in high-prevalence groups are likely to see their access to credit deteriorate. For people known to be HIV-positive, Jurisich, Liber, and Elkounovitch (2002) report that "some 30 percent of non-mortgage lenders would decline a loan, [and the other lenders indicated that] a solution might be found using a combination of a shorter loan term, other security methods . . . [or] ensuring that there is existing insurance in place." For mortgages, which tend to involve larger sums and longer repayment periods, banks tend to be more concerned about mortality-related default and may ask that the borrower take out life insurance as a condition for lending. In that case, if HIV-positive borrowers cannot obtain life insurance, they are excluded from obtaining or refinancing a mortgage.

Finally, and echoing the earlier discussion of social and economic institutions, HIV/AIDS increases individual risk to the extent that it adversely affects domestic security. Most directly, widespread prevalence of HIV/AIDS impairs the capacities of government institutions to fulfill their tasks, including the enforcement of domestic security. At the same time, poverty rates may increase and access to education may decline, both of which could eventually increase the incidence of crime. More generally, the World Bank's recent report on civil war and development policy (Collier and others, 2003, discussed above) makes the case that the incidence of civil war is much higher in low-income countries whose economies are stagnant or declining. Thus, in politically unstable countries, an HIV/AIDS epidemic, by hindering or reversing economic development, contributes to a political and economic setting that makes domestic conflict more likely.

Welfare

Changes in income per capita fail to capture the full impact of HIV/AIDS on living standards, primarily because increased mortality means that lives become more uncertain and, on average, shorter, but also

[47]Jurisich, Liber, and Elkounovitch (2002), in a study from South Africa, report that death-related defaults accounted for 28 percent of defaults on loans and 20 percent of defaults on mortgages. Because mortality is expected to rise over the next several years, these shares (and overall default risk) are likely to increase.

Table 2.8. Human Development Indices for Selected Countries, 1950–2001

			2001	
Country	1950	1975	Actual	In absence of AIDS
Botswana	0.25	0.50	0.57	0.77
Malawi	0.27	n.a.	0.48	0.52
Mozambique	0.16	0.32	0.39	0.48
Haiti	0.18	n.a.	0.32	0.36
South Africa	0.48	0.65	0.68	0.77
Swaziland	0.24	0.51	0.58	0.74
Thailand	0.39	0.60	0.78	0.79

Sources: Crafts (2001); and author's calculations based on data from United Nations Development Programme (2003) and the U.S. Census Bureau.

because of the manifold economic repercussions of HIV/AIDS discussed above. Having already addressed the impact of HIV/AIDS on many of the specific aspects of economic development (such as access to education, health standards, and poverty rates), this chapter will instead focus in this section on two summary measures of the impact of HIV/AIDS on welfare. The first of these is the Human Development Index (HDI) developed by the United Nations Development Programme (2003), and the second (used, for example, in Crafts and Haacker, Chapter 6 of this volume) is a measure based on individuals' valuations of increased mortality risk.

The HDI attaches equal weights to educational attainment, income per capita, and life expectancy at birth, all three of which are likely to be affected by HIV/AIDS. The largest impact, however, comes from declining life expectancy; changes in the other two factors are more uncertain and dependent on the policy response and as such are not included in the present analysis. Table 2.8 illustrates the changes in the HDI brought about by the lowering of life expectancy due to HIV/AIDS and establishes a historical perspective. It demonstrates how the reduced life expectancy at birth due to HIV/AIDS slows an economy's development as measured by the HDI and offsets any gains in educational attainment and GDP per capita. For example, whereas countries like Botswana, South Africa, and Swaziland—had they not been affected by severe HIV/AIDS epidemics—might have attained living standards (as measured by the HDI) comparable to those in Brazil or Russia, their HDIs are now more comparable to those in countries like Bolivia (for South Africa), or India and Cambodia (for Botswana and Swaziland).

The second approach involves imputing the costs of increasing mortality from individuals' valuations of increased mortality risk. This approach has an explicit foundation in the microeconomic theory of the consumer:

Table 2.9. Aggregate Welfare Effect of Increased Mortality, 2004

Country	Change: In mortality (percentage points)	In life expectancy (percent)	In welfare (percent)
Botswana	3.1	−59.1	−88.9
Côte d'Ivoire	0.4	−13.3	−37.3
Ethiopia	0.2	−8.5	−25.3
Haiti	0.3	−12.7	−33.9
South Africa	1.1	−32.3	−69.6
Thailand	0.02	−0.8	−2.3
Zambia	1.1	−32.3	−68.8

expected lifetime utility declines if mortality rises (and, consequently, life expectancy falls). One can measure the welfare loss associated with increased mortality by determining the loss in income that, for a given individual, would yield the same loss in lifetime utility as the observed loss in life expectancy. In general, risk aversion implies that the welfare loss thus defined will exceed the loss in expected income owing to reduced life expectancy. This means that an increase in risk, as measured by increased mortality owing to HIV/AIDS or through its economic repercussions, can have strong implications for welfare.

Estimating the welfare loss associated with increased mortality requires estimating the trade-off between income and mortality or life expectancy. In the literature, such estimates of the "value of statistical life" are typically obtained from wage differentials between jobs with different mortality risks; data on these differentials are often available from past assessments of environmental or health interventions. Table 2.9 summarizes estimates of the welfare loss due to HIV/AIDS from Crafts and Haacker (Chapter 6, this volume), which also describes this approach in more detail.

The estimates reported in Table 2.9 suggest that the welfare effects of increased mortality are huge, dwarfing even the most pessimistic estimates of the economic impact in terms of GDP per capita. Among the countries covered here, welfare losses range from 2.3 percent of GDP in Thailand, where life expectancy declines by 0.8 percent, to 89 percent of GDP for Botswana, with life expectancy declining by 59 percent.[48] Whatever the significance of these point estimates, they clearly show that the impact of

[48]The fact that the estimated welfare loss is larger than the decline in life expectancy can be linked to individuals' preferences; the estimates imply that these preferences exhibit some degree of risk aversion, which is a standard assumption in the microeconomic literature. See Crafts and Haacker (Chapter 6, this volume) for a more detailed discussion.

HIV/AIDS on economic growth and income per capita, although a useful measure in many respects, is not a meaningful indicator of the full economic costs of the epidemic.

Conclusions and Outlook

The primary effect of HIV/AIDS is an increase in mortality and a deterioration in health. The epidemic affects primarily young adults, who are integrated into all areas of economic and social life, and this chapter has highlighted its effects at the household level, for businesses, and for government services. With mortality rates for the working-age population increasing manyfold in countries with severe epidemics, the economic impact is grave: indeed, HIV/AIDS is clearly the most serious impediment to economic growth and development in these countries. Therefore an understanding of the economic consequences of HIV/AIDS is essential for economic analysts and policymakers working in countries with severe epidemics.

However, the channels through which HIV/AIDS affects economic growth are not well understood. Most of the earlier studies focused on disruptions to the production process associated with increased mortality and morbidity and on the impact of increased health expenditure on domestic saving. This chapter's analysis of the microeconomic effects of HIV/AIDS, for example on households and the private sector, and of the impact on social and economic institutions in general, suggests that these effects are very serious and that many are not captured in macroeconomic assessments. Studies that have attempted to capture some of these effects (such as Bell, Devarajan, and Gersbach, Chapter 3, this volume, for households, and Haacker, 2002b, for investment) find substantial downside risks to economic growth, related, for example, to the accumulation of human capital and its transfer between generations at the household level, and to capital outflows or declines in foreign direct investment.

Although the impact of HIV/AIDS on economic growth is important for a variety of reasons, it is necessary to keep in mind that this impact is spread very unevenly across the population. It is obviously most profound for people living with HIV/AIDS, and their households, especially when the afflicted member is an income earner. On the other hand, many households are affected only through the macroeconomic repercussions of HIV/AIDS, and some may even benefit, for example when a worker is promoted to replace someone who has died, or when a business competitor closes down. Thus, even if the estimated impact of HIV/AIDS on average income per

capita is small, poverty rates can increase.[49] More generally, it is questionable whether GDP and GDP per capita are meaningful measures of the economic impact of HIV/AIDS. If, for example, the probability for a 20-year-old to survive until age 60 declines from over 70 percent to less than 30 percent, this has a serious impact on living standards beyond any changes in consumption.[50] Several studies have attempted to assess the impact of increased mortality on welfare directly,[51] and they find that it dwarfs any estimated effects on economic growth. Even for countries with only moderate HIV epidemics, such as Vietnam (Table 2.9), the welfare losses can be significant; for some of the worst-affected countries, such as South Africa and Botswana, they can exceed three-fourths of GDP.

HIV/AIDS, through its numerous impacts on households and individuals, on the productive capacity of the economy, and on government finances, is a serious constraint on economic development. In many countries with severe epidemics, it is the single most serious challenge today to maintaining and, where possible, improving living standards. However, getting the response right, in terms of preventing new infections and mitigating the impact of those that do occur, represents a huge challenge to governments and their development partners, especially where the human capacities of the public services are themselves eroded by the epidemic. The international community has responded by developing programs, such as the WHO's "3 by 5" initiative, designed to increase access to treatment quickly and substantially. The analysis in this chapter shows that these international efforts are warranted, indeed imperative, when measured against the economic development objectives of the international community.

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[49]See Greener (Chapter 5, this volume)

[50]The numerical example of survival rates by age is based on Table 7.1 in Haacker (Chapter 7, this volume) and applies to Zambia in 2004.

[51]See, for example, Crafts and Haacker (Chapter 6, this volume) and Jamison, Sachs, and Wang (2001).

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