PART II

The Economic and Development Impacts of HIV and AIDS

CHAPTER 3

Development Impact of HIV and AIDS in South Asia

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Introduction

The epidemiology of HIV and AIDS in the countries of South Asia and the economic context in which the epidemic takes place are very different from those in high-prevalence countries, which have motivated most of the studies on the economic development implications of HIV and AIDS. The extent to which South Asia can learn from the literature is therefore unclear. Against this background, the present chapter takes stock of the development impacts of HIV and AIDS. Specifically, the chapter addresses two objectives. First, in addition to providing some summary indicators of the impacts of HIV and AIDS (such as key health indicators, or economic growth), the chapter analyzes the impacts of HIV and AIDS on a microeconomic level and across population groups. Second, the chapter discusses the interactions of the ongoing response to HIV and AIDS with development impacts across population groups.

Among the consequences of HIV and AIDS that can be most directly measured or estimated are the **health and related demographic impacts** (section 2). In light of the overall low HIV prevalence rates in the region, the section discusses the contribution of HIV and AIDS to the burden of disease (including comparisons with other diseases). Next, it provides estimates of the impacts of HIV and AIDS on key demographic variables,

such as the mortality rate, the population growth rate, and life expectancy. Finally, it discusses some of the consequences of the socioeconomic profile of the epidemic.

Section 3 addresses **aggregate measures of the economic impact of HIV and AIDS.** First, we discuss the magnitude of the impact of HIV and AIDS on economic growth. Second, we present estimates of the welfare effects of HIV and AIDS that more explicitly account for the increased risks to health and life. The section concludes with a discussion of the shortcomings of such aggregate approaches; in particular, they do not capture development implications of HIV and AIDS that arise when the impact of HIV and AIDS is asymmetric across population groups.

Section 4 summarizes the available information on the **impact of HIV and AIDS across population groups.** The main part of this section deals with the economic impact and coping, discussing issues such as the income and employment losses associated with HIV and AIDS, other adverse impacts like stigma, the role of caregiving, and the burden of medical expenditures. Where available, we present data on differences in the impact of HIV and AIDS across population groups, for example, differentiating by wealth. One item on which we place particular emphasis throughout this section is the gender dimension of HIV and AIDS (HIV awareness, economic impact); a separate section deals with the impact on orphans.

Section 5 focuses on challenges associated with and development aspects of the response to HIV and AIDS. One key aspect of the response is **access to prevention**. Effective prevention is crucial not only in terms of containing the scale of the epidemic and its economic impact, but also for a successful and sustainable scaling up of treatment, with the aim of containing pressures on health services in the future. Meanwhile, **access to treatment** has the potential of mitigating the health and economic impacts of HIV and AIDS. At the same time, inequities in access to treatment can be an important source of inequities in the development impact of HIV and AIDS, and exacerbate its impact on key development indicators, e.g., those related to poverty. We focus on two main issues. First, we analyze access to treatment on the country level (which—in an international context—is low in South Asia), and discuss potential impediments to the scaling up of treatment in South Asia. Second, we discuss the limited evidence regarding inequities in access to treatment, using both data on access to health services in general and summarizing the (very limited) direct evidence on access to antiretroviral treatment across population groups.

The picture that emerges regarding the economic development impacts of HIV and AIDS is complex. We find the impact of HIV and AIDS on

economic growth in South Asia to be very small, especially when compared with the high growth rates realized in most of the region. However, the welfare implications, taking into account the impact of increased mortality, are by no means negligible. Meanwhile, we find that the most relevant implications of HIV and AIDS in an economic development context arise on a subnational level, in terms of inequities according to socioeconomic status (wealth, access to education) regarding the susceptibility to HIV and AIDS and the ability to cope with the economic impact. Also, we present evidence regarding an asymmetric impact of HIV and AIDS on women, arising particularly from the socioeconomic consequences of widowhood. Finally, we note that access to treatment in the region is low in an international context, and present evidence that points to weaknesses in health systems as a factor not only impeding progress in extending access to treatment, but also as a factor in exacerbating inequities in terms of the socioeconomic impact of HIV and AIDS.

Health and Demographic Impacts of HIV and AIDS

HIV prevalence in Asia is relatively low in an international context, especially when compared against regions that have inspired much of the literature on economic or development impacts of HIV and AIDS. The role of HIV and AIDS as an economic development issue in the region—particularly in the context of the broader development agenda objectives, such as the MDGs—therefore is not as prominent or obvious as for countries where HIV and AIDS have assumed catastrophic proportions.

One of the recognizable aspects of the health impact of HIV and AIDS is increasing mortality. Estimates of mortality attributable to AIDS and other diseases and conditions provide an indicator for the relative contribution of AIDS to the burden of disease in a country or region. WHO (2006c) also allows assessments of the burden of disease in terms of losses of disability-adjusted life years (DALYs). The findings are similar to the one presented here for mortality, with AIDS accounting for 1.3 percent of DALYs lost in South Asia overall, and 1.8 percent of DALYs lost in India. This partly reflects that HIV and AIDS primarily affect working-age adults, while diseases primarily affecting children have a larger weight in terms of losses of DALYs, and diseases associated with old age correspondingly carry a lower weight. The average loss in DALYs associated with an AIDS-related death thus happens to be close to the average loss in DALYs across all deaths. Estimates of the causes of deaths by country

are available from WHO (2006c) for 2002 (see also Lopez and others 2006). To assess the mortality associated with HIV and AIDS in South Asia, however, it is important to recognize that estimates of AIDS-related mortality have since been revised, especially for India. To obtain a more accurate estimate of mortality associated with AIDS, we therefore substitute adjusted estimates of AIDS-related deaths in India (about 190,000 in 2005; see table 3.1) for the earlier WHO estimates (about 360,000; see WHO 2006c).

Figure 3.1 illustrates the mortality associated with AIDS in the region (the eight countries covered by the World Bank's South Asia Region, see table 3.1), as well as for India. Overall, AIDS accounts for 1.5 percent of all deaths in South Asia, about the same level as measles or diabetes. For India, the share of deaths attributed to AIDS is higher, at about 2 percent, slightly more than half the level of deaths from tuberculosis.

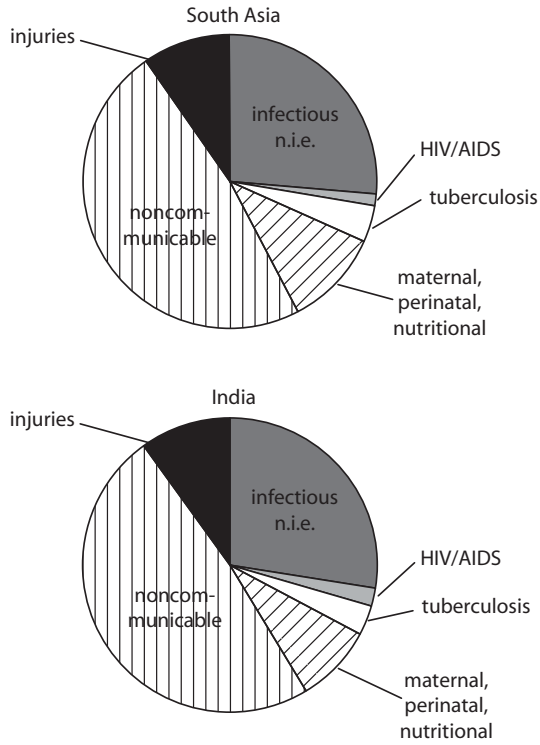
The mortality estimates also allow for comparisons between countries in terms of the state of health systems. We illustrate this point with a comparison between India and the United States. Controlling for the age structure of the population, mortality associated with HIV and AIDS in India was about five times higher than in the United States, even though

Table 3.1 South Asia: Key HIV and AIDS Statistics

	HIV prevalence, ages 15–49 (percent)		*People living with HIV and AIDS*		*Share of women among PLWA*	*AIDS deaths*	
	2007	*2001*	*2007*	*2001*	*2007*	*2007*	*2001*
Afghanistan	<0.01	<0.01	<1,000	<500	n.a.	<100	<100
Bangladesh	0.01	<0.01	12,000	7,500	16.7	<500	<100
Bhutan	0.09	<0.01	<200	<100	n.a.	<100	n.a.
India	0.34	0.46	2,400,000	2,700,000	36.7	= 190,000	n.a.
Maldives	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Nepal	0.5	0.5	70,000	56,000	17.1	4,900	2,600
Pakistan	0.10	0.07	96,000	51,000	28.1	5,000	1,900
Sri Lanka	0.03	0.03	3,800	3,000	36.8	<500	<200
Memorandum Items							
Cambodia	0.8	1.5	75,000	120,000	26.7	6,900	14,000
China	0.08	0.06	700,000	470,000	28.6	39,000	15,000
Thailand	1.4	1.7	610,000	660,000	41.0	31,000	66,000
Myanmar	0.7	0.9	240,000	300,000	41.7	24,000	24,000

Sources: UNAIDS/WHO (2008) and author's calculations.
Note: AIDS deaths for India approximated based on the midpoint of estimates included in UNAIDS (2006a), adjusted for revisions in the estimated for HIV prevalence in India that have occurred meanwhile. The number of deaths for India relates to 2005, not to 2007.

Figure 3.1 South Asia and India: Contribution of AIDS to Mortality



Source: Author's calculations, based on WHO (2006c) and UNAIDS, NACO, and WHO (2007).
Note: n.i.e. = not included elsewhere.

HIV prevalence was lower in India (about 0.4 percent, as compared to 0.6 percent).[1] Thus, relative to the number of people living with HIV and AIDS, the estimated number of AIDS-related deaths in India is eight times higher than in the United States.

Table 3.1 presents key indicators for the state of HIV and AIDS in South Asia, based on the *2008 Report on the Global AIDS Epidemic* (UNAIDS and WHO 2008). Overall, the number of people living with HIV and AIDS in the region is about 2.6 million, of whom the lion's share are located in India (in line with its population weight, but also reflecting that HIV prevalence is higher there than in the other countries in the region, except for Nepal). The number of AIDS deaths amounted to about 200,000 (based on a crude approximation for India, see above). The countries covered differ significantly in terms of the share of women among the people living with HIV and AIDS, which ranges from about

17 percent (Bangladesh, Nepal) to about 37 percent (India, Sri Lanka). Overall, the number of people living with HIV and AIDS in the region is estimated to have declined between 2001 and 2007, owing to an estimated decline in the number of people living with HIV and AIDS in India, while the estimated numbers increased for every other country in South Asia where estimates were available.

One point worth noting about table 3.1 regards the availability of estimates of the scale of the epidemic in some countries under consideration. First, no estimates are available for Maldives; for this reason, the country will not be included in the tables summarizing the demographic or economic impacts of HIV and AIDS. Point estimates for most variables are also not available for Afghanistan and Bhutan, so these countries will also not be included in our analysis below.

In order to address the impact of HIV and AIDS for the economies in question, it is necessary to understand the impacts of HIV and AIDS on key demographic indicators. To this end, we face several challenges. The most comprehensive estimates of the demographic impacts of HIV and AIDS are those by the UN Population Division. However, among the 62 countries for which the UN Population Division (2007) provides counterfactual estimates of a "no-AIDS" demographic scenario, there is only one South Asian country (India). For this country, the demographic projections are based on estimates of HIV prevalence that have been superseded by the more recent ones discussed above. Our estimates of the demographic impact of HIV and AIDS in India are therefore based on those from the UN Population Division (2007), but scaled to account for an updated lower estimate of HIV prevalence. For the other countries, we assume that the impacts of HIV and AIDS on key demographic indicators, adjusted for the scale of the epidemic, are similar to those in India, and therefore apply coefficients derived from the estimates for India.[2] To provide a wider regional context, we also report demographic indicators for some other Asian countries, especially those with large numbers of people living with HIV and AIDS.

We find that HIV and AIDS do have a perceptible impact on key demographic indicators (table 3.2). Life expectancy at birth in India and Nepal declines by about half a year, the rate of population growth declines by about one-tenth of a percentage point, and mortality rates increase by 0.2–0.3 per 1,000 (meaning that in India and Nepal, one in 36 or one in 25 deaths, respectively, are estimated to be AIDS-related). Taking a broader Asian perspective, we see that, in the countries where estimated HIV prevalence exceeded 1 percent (Cambodia, Thailand), life

Table 3.2 The Demographic Impact of HIV and AIDS in Selected South and East Asian Countries

	HIV prevalence, ages 15–49 (Percent)	*Crude death rate (Per 1,000)*	*Crude death rate: Impact of HIV and AIDS*	*Population growth (Percent)*	*Population growth: Impact of HIV and AIDS*	*Life expectancy at birth (Years)*	*Life expectancy: Impact of HIV and AIDS (Years)*
	2005	*2005*	*2005*	*2005*	*2005*	*2005*	*2005*
South Asian countries							
Bangladesh	0.01	7.5	0.01	1.67	0.00	64.1	–0.02
India	0.38	7.9	0.22	1.49	–0.02	65.5	–0.5
Nepal	0.5	7.7	0.30	1.97	–0.03	63.8	–0.7
Pakistan	0.1	7.1	0.07	1.84	–0.01	65.5	–0.2
Sri Lanka	0.03	7.2	0.02	0.47	–0.01	72.4	–0.1
East Asian countries							
Cambodia	1.06	8.4	0.59	1.74	–0.13	59.7	–0.8
China	0.08	7.1	0.03	0.58	0.00	73.0	–0.1
Thailand	1.46	8.5	0.63	0.66	–0.05	70.6	–1.1
Myanmar	0.76	9.7	0.53	0.85	–0.05	62.1	–0.6

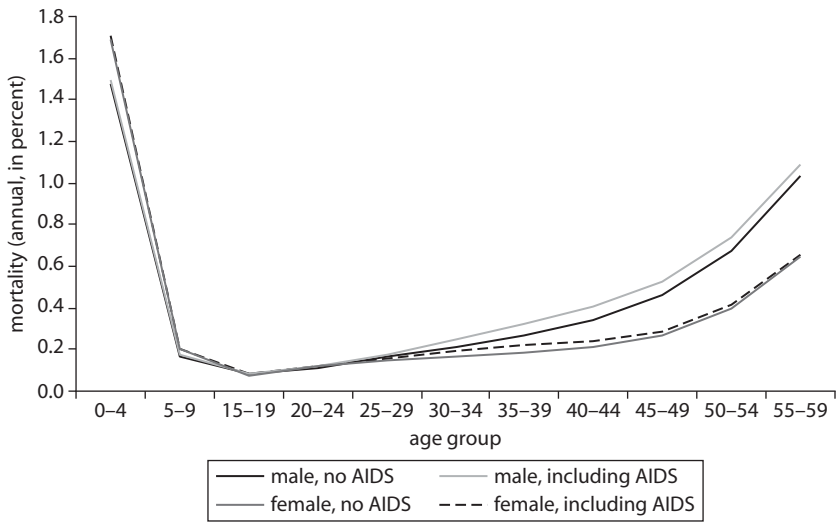
Sources: UNAIDS/WHO (2008) for HIV prevalence, UN Population Division (2007) for population indicators, author's estimates, based on data from UN Population Division (2007) and other sources, for HIV and AIDS-related indicators.

expectancy declined by around one year, and up to 1 in 11 deaths was accounted for by HIV and AIDS.

One of the characteristic features of the HIV and AIDS epidemic is that the majority of those infected are young adults; therefore mortality is also concentrated at relatively young ages. Figure 3.2, based on estimates by the UN Population Division (modified to account for lower estimates of HIV prevalence) shows that HIV and AIDS do have a notable impact on mortality, especially at ages 30–44. As the majority (about 70 percent) of people living with HIV and AIDS in India are male, the impact on mortality is much more pronounced for this group. Between the ages 25 and 40, mortality increases by 20 percent for males, and 14 percent for females. Consequently, the probability of reaching age 50 declines by 1.5 percentage points for men, and by 0.6 percentage points for women. Another consequence of the age structure of people living with HIV and AIDS is that people dying for AIDS-related reasons frequently leave behind dependents, including orphans.

Obviously, the demographic projections, especially the impact of HIV and AIDS on the age profile of mortality, depend on the coverage rate of antiretroviral treatment in the respective country (a point that we will return to below). The UN Population Division incorporates estimates

Figure 3.2 India: HIV/AIDS and Mortality by Age and Sex

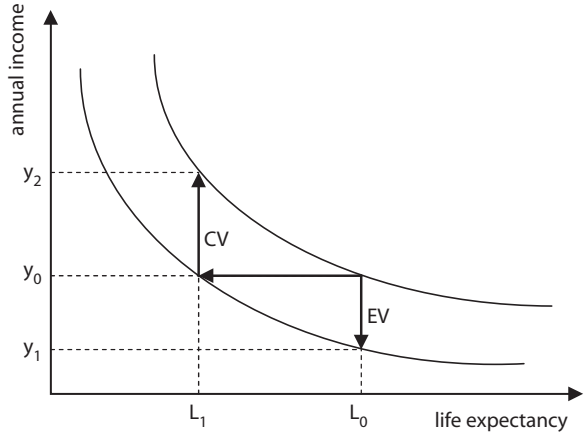


Source: Author's calculations.

of the coverage rate of antiretroviral treatment in their demographic projections, in line with WHO (2006). According to those estimates, access to antiretroviral treatment in India was limited in 2005 (about 7 percent), and therefore had limited impact on the estimated mortality rates shown in figure 3.3 below. However, the more recent estimates of the scale of the epidemic suggest that the coverage rates achieved in India were higher, around 15 percent to 20 percent.[3] Nevertheless, even with complete coverage of antiretroviral treatment, figure 3.3 would still show a significant increase in mortality among young adults, as the UN Population Division assumed that the median and average survival times of adults after initiation of treatment are 6.6 years and 9.5 years, respectively.[4]

While the most readily available estimates of the demographic impacts of HIV and AIDS presented here provide some indicators for the average impact of HIV and AIDS on the population, they fall short from an economic perspective as they do not capture the socioeconomic profile of the epidemic. Most important, the available evidence suggests that the most important drivers of the HIV epidemic in South Asia are injecting drug use and sex work (see the discussion by Claeson and Wilson, this volume). These findings, however, do not easily translate into socioeconomic categories commonly used in analyzing distributional aspects of health developments.

Figure 3.3 Evaluating the Loss from Reduced Life Expectancy



Source: Author's calculation.

The Economic Impact of HIV and AIDS: Aggregate Approaches

The scale of the demographic impact of HIV and AIDS in some regions has motivated studies of the actual or potential economic impact of HIV and AIDS, most of which discuss the effects on economic growth, GDP, or GDP per capita. While the earlier studies employed a neoclassical growth framework to derive estimates of the growth impact of HIV and AIDS from its direct impacts on (physical and, sometimes, human) capital accumulation and the demographic implications, some more recent studies also consider longer-run effects, for example, through access to and decisions on education. A somewhat different approach is based on the premise that the most direct and severe impact of HIV and AIDS on welfare arises from the increased risk to health and life associated with it. Accordingly, some studies attempt to quantify the welfare losses caused by increased mortality and deteriorated health. Finally, in a context of increasing access to treatment, it is also important to consider the repercussions of access to treatment for the economic impact.

Economic Growth

Many studies of the impact of HIV and AIDS on economic growth employ a neoclassical growth model in which HIV and AIDS affect parameters or factors of production that enter an aggregate production function.[5] To capture the essence of these earlier studies, and as a reference point for a discussion of some more recent efforts to calibrate the macroeconomic impact of HIV and AIDS, we briefly present a simple version as a "workhorse." We distinguish two production factors, capital K and labor L, and two productivity parameters, A (total factor productivity) and h, which is a measure of the average level of human capital and affects the productivity of labor. Thus, $Y = AK^{\alpha}(hL)^{(1-\alpha)}$. To obtain GDP per capita, it is necessary to divide Y by the size of the total population P, which yields

$$y = A(hl)^{(1-\alpha)}k^{\alpha}, \tag{1}$$

where $y = Y/P$ stands for GDP per capita, $k = K/P$, and $l = L/P$. In equilibrium,

$$y = A^{1/(1-\alpha)}hl\left(s/(\delta + n)\right)^{\alpha/(1-\alpha)}. \tag{2}$$

In this framework, HIV and AIDS has a level effect on steady-state GDP per capita, which can be attributed to changes in total factor productivity A, labor productivity or human capital h, the labor force participation

rate l, the savings rate s, and the population growth rate n (assuming that the parameters α and the depreciation rate δ remain constant).

What are the implications of HIV and AIDS for GDP per capita in this framework? As an example, we illustrate the predicted effects for India, assuming an HIV prevalence rate of 0.36 percent, and setting the parameters α and δ equal to 0.35 and 0.08, respectively. Haacker (2004b) summarizes some of the most commonly quoted productivity effects, suggesting that an HIV prevalence of 20 percent would be consistent with a productivity loss of 2 percent to 3 percent; for India, the implied loss in GDP per capita through this channel would be about 0.08 percent.[6] Changes in labor force participation would reflect both people living with HIV and AIDS withdrawing from the labor market, and demographic shifts (specifically, a change in the share of the working-age population in the total population). Regarding the former, assuming that 5 percent of people living with HIV and AIDS withdraw from the labor market appears to be on the high side, this would translate into a decline in l by 0.02 percent. Regarding the role of induced demographic shifts, we use data from the UN Population Division (2007), suggesting that the impact at present is minimal (0.02 percent), but that it will rise to around 0.1 percent by 2020. Overall, the impact of HIV and AIDS on l would amount to 0.05 percent in 2005, but may rise to about 0.1 percent by 2020.

The potential impact of HIV and AIDS on savings and investment is more difficult to establish, and we consider the following as a plausible guess for the purpose of our numerical exercise. From microeconomic studies, we note that households affected by HIV and AIDS tend to dissave to finance treatment and care. This, however, applies less to wealthy households, which carry a disproportionate weight in national savings. Somewhat arbitrarily, we assume that national savings decline by 0.1 percent (corresponding to 0.03 percentage points, given a savings rate of about 30 percent). Finally, based on estimates by the UN Population Division (2007), we assume that population growth slows from 1.51 percent to 1.49 percent (for 2005–10), which would raise GDP per capita by about 0.1 percent.

Overall, the impact of HIV and AIDS on steady-state GDP per capita in India, through the direct effects described, appears to be very small. Adding up the various channels, we arrive at an overall negative impact of 0.16 percent, owing to the productivity effect (–0.12 percent), the decline in the share of the working-age population (–0.10 percent), and a decline in savings (–0.05 percent), partly offset by the slowdown in population growth (+0.12 percent). To understand the magnitude of this

effect, it is instructive to relate it to the annual rate of growth of GDP per capita (about 6 percent annually in 2001–06). A decline in the level of steady-state GDP per capita of 0.16 percent thus corresponds to a one-off loss of about 1.5 weeks of GDP growth. This would be barely perceptible, especially as the adjustment to the new steady-state level of GDP per capita would take several years, so that the slowdown in growth would be spread accordingly.

While focusing on the impacts of HIV and AIDS on the level and growth of GDP per capita above, it is also important to understand the impact on long-term GDP growth. For this, it is convenient to think of GDP as the product of GDP per capita and the size of the population. Regarding GDP per capita, the most concrete effects of HIV and AIDS on GDP we describe relate to the level, but not the rate of growth, of GDP per capita. The key channel through which HIV and AIDS affects GDP growth in our preliminary analysis is the rate of population growth, which in India slows down by about 0.02 percentage points in 2005–15, after which the negative impact gradually tapers off through 2050 (according to the UN Population Division 2007). Overall, the level of the population is projected to be 0.5 percent lower than in the absence of HIV and AIDS by 2050 (a small change relative to the projected increase of 44 percent between 2006 and 2050). Assuming an average GDP growth rate of 5 percent over this period, the slowdown in GDP growth owing to an HIV and AIDS-related slowdown in population growth would thus be relatively modest, corresponding to the loss of about one-200th of the average growth rate attained through 2050.[7]

Two aspects of the impact of HIV and AIDS on growth could result in a somewhat more adverse outcome than the one described above. First, if reduced expectations of economic growth or higher production costs result in a decline in investment, this could exacerbate the impact on growth. We have not modeled this channel, as HIV and AIDS are not normally rated among key factors affecting growth prospects or production costs in South Asia,[8] and apparently do not factor into investment decisions in the region. Second, HIV and AIDS may affect the rate of accumulation of human capital, including through impaired access to education (both formal and within the family) for an increasing number of orphans. While we do provide some evidence that access to education may be an issue, we cannot adequately quantify the implications for economic growth without better knowledge about the impact of HIV and AIDS on orphans, the socioeconomic profile of the epidemic, and the consequences of orphanhood in the region.

On the other hand, aggregate economic models of the type used here may overestimate the impact of an epidemic on economic growth if the distributional aspects of the epidemic matter. There are two factors that may suggest that the growth impacts of HIV and AIDS are lower than the model above suggests. To the extent that the contribution of high-risk population groups—notably injecting drug users and sex workers—to GDP is below average GDP per capita, and if the epidemic is concentrated among these groups, an aggregate model such as the one employed here may overstate the impact on GDP.[9] A second factor not captured here regards access to treatment. If the economically most active segments of the populations have privileged access to treatment, the impacts of HIV and AIDS on GDP growth could be milder than suggested by aggregate demographic indicators (while poverty outcomes could be worse). The limited access to treatment in South Asia so far (table 3.8), and the important role of private out-of-pocket spending in the health systems of most South Asian countries (see Over, this volume), suggests that this is a relevant consideration.

Welfare

While the scale of the impact of HIV and AIDS on GDP or GDP per capita is important for many reasons, observers agree that the adverse impact of HIV and AIDS is not adequately described by these measures. There are two main approaches to developing more substantial (in the sense of providing policy guidance) measures of the economic impacts of HIV and AIDS. One line of reasoning emphasizes the distributional aspects of HIV and AIDS, which arise if the risk of infection, the ability to cope with the economic impact, and the access to care and treatment are correlated with income or other poverty-related indicators. These issues are at the heart of many of the policy issues regarding the response to HIV and AIDS, and are discussed in more detail further below. A second approach, which we now turn to, focuses on the direct implications of HIV and AIDS on health and mortality, and attempts to estimate the economic costs of risks to health and life. The logic behind this approach (and its relation to the estimates of the impact on GDP per capita, above) can be summarized by an equation describing an individual's welfare over his or her lifetime, depending on consumption, the state of health, and expected survival rates, for example:

$$W_t = h_t u(c_t) + E\left[\sum_{i=t+1}^{T} S_{ti} D_{ti} h_i u(c_i)\right]. \qquad (3)$$

This individual's well-being in period t, $h_t u(c_t)$ depends on consumption in that period (c_t) and an indicator of the individual's state of health (h_t). The individual's lifetime welfare also includes expectations ($E[\ldots]$) about well-being in future periods, taking into account a possible discount factor (D_{ti}, – frequently, it is assumed that $D_{ti} = e^{-\gamma(i-t)}$) and the probability to survive from period t to period i, S_{ti}.[10]

An individual whose welfare is described by Eq. (3) values a high income (which translates into high consumption) and longevity. When analyzing the welfare impact of an epidemic, which brings about a decline in survival rates, Eq. (3) can therefore be used to calculate the income loss that, at survival rates prior to the adverse health event, would have yielded the same welfare loss as the observed increase in mortality, given income. As this hypothetical change in income describes an income loss *equivalent* to the observed increase in mortality, it is referred to in the microeconomic literature as *equivalent variation*.

This reasoning is illustrated in figure 3.3. The indifference curves describe combinations of life expectancy and annual income that yield the same welfare level. An adverse health event results in a decline in life expectancy from L_0 to L_1. For a given life expectancy of L_0, a drop in income from y_0 to y_1 would yield the same decline in welfare; this is the equivalent variation referred to above (labeled EV in figure 3.3), and will be used as a measure of the welfare costs of HIV and AIDS in our analysis. A different measure of the costs of HIV and AIDS that is sometimes presented is the amount that would, at the lower level of life expectancy L_1, restore welfare to the initial level. This is also referred to as compensating variation (labeled CV in figure 3.3).[11]

The shape of the curves in figure 3.3, and thus the size of the equivalent income loss, depends on the curvature of the function u(c) in Eq. (3). The faster the marginal utility of c declines, the steeper is the indifference, and the higher is the income loss that is equivalent to a given decline in life expectancy.

The approach sketched here had originally been used to estimate the contribution of improving life expectancy to living standards. It had first been applied to illustrate the welfare effects of HIV and AIDS by Jamison, Sachs, and Wang (2001); Crafts and Haacker (2002, 2004) present a more fully developed framework; more recently, Philipson and Soares (2005) confirm the earlier findings; and Das and others (2006) apply a similar framework to India, but focus on morbidity rather than the risk of premature death. To estimate the welfare costs of increasing mortality in South Asia, we follow Crafts and Haacker, who postulate that a 1 percent

decline in life expectancy, in terms of its welfare effects, is equivalent to a loss in income of 3.68 percent.[12]

Drawing on the estimates of the impacts of HIV and AIDS on life expectancy discussed earlier, it is then possible to estimate the welfare impacts of HIV and AIDS owing to higher mortality. Table 3.3 presents these estimates for the five South Asian countries for which point estimates of HIV prevalence are available. For India and Nepal, the countries with the highest HIV prevalence rates in the region, the impact of HIV and AIDS on living standards is substantial (minus 4 percent and minus 3 percent, respectively), owing to the declines in life expectancy. We thus find that the welfare costs associated with higher mortality (or lower life expectancy) are much higher than the impact of HIV and AIDS on economic growth discussed above. Our framework also allows comparisons of the costs of HIV and AIDS with the rate of growth of GDP per capita. In India, an economy growing very fast in international comparisons (with annual growth of GDP per capita of about 6 percent), the costs of HIV and AIDS correspond to about half a year of economic growth. While the impact of HIV and AIDS in Nepal is lower, so is GDP growth, and the costs of HIV and AIDS exceed the annual gains in GDP per capita (3 percent annually in 1996–2006).[13]

These estimates are also useful as illustrations of the macroeconomic risks associated with HIV and AIDS, implying that a rise in HIV prevalence to 1 percent could wipe out the equivalent of one to two years of economic development. Thus, failure to contain the epidemic at low levels does have serious economic consequences, even if one considers prevalence rates of 1 percent to 2 percent (as observed in some other Asian countries) as a worst-case scenario.

Table 3.3 South Asia: Welfare Effects of Reduced Life Expectancy, 2005

	HIV prevalence, age 15–49 (percent)	*Life expectancy (years)*	*Impact of HIV /AIDS (years)*	*Welfare effects of HIV/AIDS (percent)*
Bangladesh	0.01	64.1	–0.02	–0.1
India	0.38	64.7	–0.5	–2.8
Nepal	0.5	63.8	–0.7	–4.0
Pakistan	0.1	65.5	–0.2	–0.9
Sri Lanka	0.03	72.4	–0.1	–0.3

Sources: UNAIDS and WHO (2008), UN Population Division (2007), and author's estimates and calculations.

Summary of Findings

There are two main findings we draw from our discussion of the aggregate effects of HIV. First, the welfare effects, in the specific sense of the cost of increased mortality, are by no means small, corresponding to the equivalent of one-half to one year of economic growth in India and Nepal. In an adverse scenario, which has HIV prevalence rising to 1 percent, the welfare costs could rise to the equivalent of one to two years of economic growth. Second, most of the welfare costs are associated with the direct health impact of HIV (we focus on mortality), whereas the impact on economic growth or income per capita appears minor in South Asia. This finding is important as it means that the response to HIV and AIDS will not be complicated by any macroeconomic repercussions.

However, in terms of understanding the impact of the epidemic on society, designing policies to address the impact, and implementing the response to HIV and AIDS, the broad measures of the size of the impact carry little information. To this end, it is important to gain a better understanding of who is affected by the epidemic. Further, we need to understand how the epidemic affects key development goals (for example, in the areas of poverty reduction, education, and gender, in addition to the direct health impact); we will turn to this issue next.

Beyond Aggregate Measures of the Impact of HIV and AIDS

As noted above, much of the economic development impact of HIV and AIDS cannot be captured by the aggregate measures presented above. First, the impact is uneven. The impacts are concentrated in and can be very severe for the households directly affected by HIV and AIDS. This is a situation, in terms of welfare effects or policy implications, very different from a setting in which the adverse impacts are distributed evenly. Second, the ability of households to cope with the economic impact of illness (for example, regarding the costs of care and treatment or the need to compensate for the loss of a breadwinner) differs according to socioeconomic status. Third, HIV and AIDS particularly affect certain population groups (for example, orphans); also, a low economic status of women can translate into increased vulnerabilities regarding the risk of infection or the economic consequences of infection or widowhood. Finally, access to prevention and treatment may differ across population groups. While this is an issue that is clearly relevant here, we take it up later in the context of our discussion of the response to HIV and AIDS.

Impact and Coping

Our analysis proceeds in two steps. First, we discuss some of the direct impacts, focusing on household income, health, and stigma. Second, we address how households cope with the demands associated with an HIV infection, looking at caregiving, increased medical expenditures, and the financing of any additional household needs (or of income shortfalls associated with HIV and AIDS). Owing to data limitations, most of our discussion in this section draws on two studies of the household-level impacts of HIV and AIDS in India (Das and others 2006, and Pradhan and others 2006), with some additional pieces of information added, where available. Two key aspects of the impact of HIV and AIDS—the implications of orphanhood and access to treatment, are treated in dedicated sections below.

HIV and AIDS can be associated with *employment loss or reduced income* as people living with HIV and AIDS (or caregiving household members) have to take time off from paid employment. Both Pradhan and others (2006) and Das and others (2006) find that unemployment rates among people living with HIV and AIDS are higher than for the respective control groups. The former report an unemployment rate for HIV-positive men of 14.2 percent (non-HIV positive: 4.3 percent) and for women of 4.5 percent (non-HIV positive: 2.9 percent); the latter finds an unemployment rate among males living with HIV and AIDS of 13 percent (non-HIV positive: 5 percent). For women, Das and others (2006) find that some HIV-positive women enter employment; many of these are widows whose household has lost an income earner.

The most detailed data on employment loss associated with HIV and AIDS are those of Pradhan and others (2006), who find that 36.5 percent of people living with HIV and AIDS who were able to retain their employment nevertheless reported an income loss, which averaged about 9 percent. Among those who lost their employment (about 9 percent of the sample of people living with HIV and AIDS), the income loss was severe, at about 66 percent. In rural areas, the reported income losses were somewhat higher (75 percent, compared with 60 percent in urban areas). Additionally, households may lose the income of caregivers; however, the average loss in income of caregivers is relatively modest (3.5 percent), and caregivers had to give up employment in only 0.5 percent of the surveyed households affected by HIV and AIDS).

Another important aspect of the adverse income effects is the losses associated with the death of a person living with HIV and AIDS. One area where such losses are particularly pervasive is the situation of

HIV-positive widows. As noted in Pradhan and others (2006), widows account for a substantial share of women living with HIV and AIDS; this study also reports that about half of the households headed by widows have an annual income of less than Rs. 20,000, compared to about one-sixth of other households affected by HIV and AIDS, and 10 percent of the households not affected by HIV and AIDS. However, as this study does not provide more information on the composition of households headed by widows, it is difficult to interpret these findings. Das and others (2006) report much lower income for households headed by widows compared to households with widowers.

The *medical aspects* of HIV and AIDS are largely beyond the scope of the present study. In an economic development context, Das and others (2006) provide some indicators of the negative impact of HIV on health indicators such as the body mass index or an index intended to measure the extent of morbidity, and also discuss indicators based on subjective well-being, and provide estimates of the welfare costs of such declines in the heath of affected individuals, based on a compensating variation (see figure 3.4 on a similar example of the concept, in the context of our discussion of the welfare implications of increased mortality). Pradhan and others (2006) report data on the incidence of episodes of illness and the types of illnesses affecting people living with HIV and AIDS in their sample.

An additional component of the adverse effects of HIV and AIDS is the *stigma* associated with it, and both Das and others (2006) and Pradhan and others (2006) provide some evidence for its relevance for assessing the impacts of HIV and AIDS on affected individuals and households. According to Pradhan and others (2006), about 10 percent of respondents living with HIV and AIDS reported being "treated differently or badly." Among these, the most common forms of stigma are neglect and isolation (about two-thirds), verbal abuse, children's isolation, or being socially excluded (about one-third each, multiple responses possible). About 2 percent of respondents were asked to vacate their house because of their HIV status. Regarding discrimination at the workplace, only about one-quarter of respondents disclosed their HIV status there, and about 40 percent of these reported some form of stigmatization (most commonly denial of promotion, refusal of loan, isolation, or name calling). Among those who did not disclose their HIV status at the workplace (three-quarters of respondents), concern about losing their job played an important role. Similarly, Das and others report for their sample that about three-quarters of people living with HIV and AIDS did not disclose their HIV status to family and friends, and 85 percent did

Figure 3.4 Access to Treatment and Key Development Indicators

Figure 3.4.1
(Countries with HIV prevalence < 1 percent)

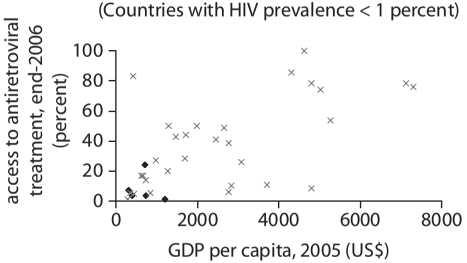


Figure 3.4.2
(Countries with HIV prevalence < 3 percent)

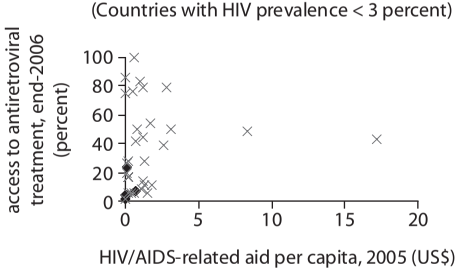


Figure 3.4.3
(Countries with HIV prevalence < 1 percent)

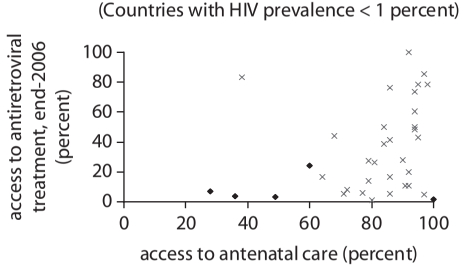


Figure 3.4.4
(All countries)

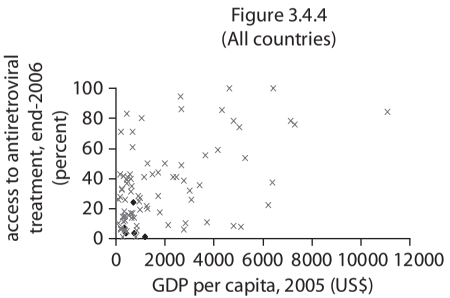


Figure 3.4.5
(All countries)

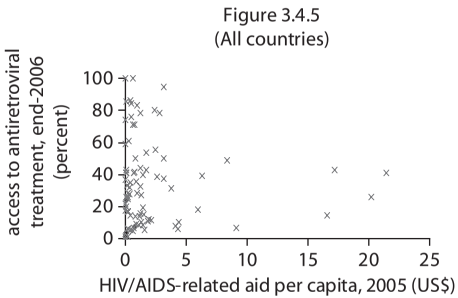
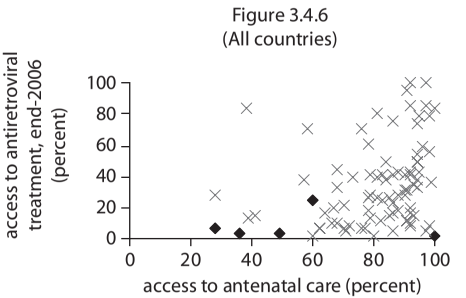


Figure 3.4.6
(All countries)



Sources: IMF (2007), OECD (2007), and WHO, UNAIDS, and UNICEF (2007).
Note: Data points relating to South Asian countries are shown in bold.

not disclose it at the workplace, out of concerns about negative consequences for themselves or their family.

While it is clear from our discussion of the income effects of HIV and AIDS that many households experience shortfalls in income, which in some cases can be very significant, HIV and AIDS is also associated with an increased demand for health services, and increased household expenditures on care and treatment. According to Pradhan and others (2006), medical expenditures account for 11 percent of total expenditure of HIV and AIDS-affected households, as compared with 3 percent for households not affected by HIV and AIDS. This comparison, however, understates the impact of HIV and AIDS as households affected by HIV and AIDS increase their total expenditure as well. When measured against expenditure of the non-HIV and AIDS control group, the increase therefore comes out somewhat more pronounced (9.4 percent rather than 8 percent). The findings by Das and others (2006) are broadly in line with these findings.

Regarding medical expenditures, one key aspect is the financing of antiretroviral treatment, and Pradhan and others (2006) provide some data on different channels of access to ART and the associated costs. More than half of the respondents with access to antiretroviral treatment (about 15 percent of the respondents living with HIV and AIDS) receive it at government hospitals, and an additional 5 percent through NGOs. With monthly costs of antiretroviral treatment through private providers between Rs. 1,141 (through chemist shops) and Rs. 1,669 (through private nursing homes or doctors), and the latter exceeding total monthly household expenditure for many households affected by HIV and AIDS, government facilities (Rs. 246) and NGOs (Rs. 547) clearly are the only modes of provision of antiretroviral treatment accessible to a large share of people living with HIV and AIDS. Also, it is important to bear in mind that—reflecting that only 15 percent of people living with HIV and AIDS among the respondents receive treatment—the reported increases in medical expenditures largely reflect the pre-ART stage of HIV and AIDS, and likely understate the eventual impact of HIV and AIDS on medical expenditures.

As incomes shrink while the need for expenditures on care and treatment increases, households affected by HIV and AIDS frequently borrow or dissave by selling off or drawing down household assets. Pradhan and others (2006) observe that 46 percent of households affected by HIV and AIDS borrow, but only 27 percent in the control group, with a modestly higher average borrowing. Among households that borrowed, the amount

borrowed was higher for households affected by HIV and AIDS (Rs. 10,992, as compared with Rs. 9,167 for households not affected by HIV and AIDS). Regarding savings, their data illustrate the asymmetric economic impact of HIV and AIDS according to income category, specifically the adverse impact of HIV and AIDS for the two lowest income categories for which they report data. For income between Rs. 20,001 and Rs. 30,000, the savings rate declines by about 10 percentage points; for lower-income households, the decline in the savings rate is about 24 percent (table 3.4).[14]

Orphans

Beyond those infected, one population group that is seriously affected by HIV and AIDS is children of people living in HIV and AIDS-affected households and orphans. While there is little information regarding the specific situation of children orphaned by AIDS, especially in countries with low HIV prevalence rates (all countries in South Asia), we can also draw some relevant information from studies analyzing the situation of children orphaned by AIDS in general. However, one issue that is particularly relevant for AIDS orphans is the high rate of children who have lost both parents in this group, reflecting high rates of coinfection among couples, which tends to exacerbate the adverse impacts of orphanhood.

The situation of children orphaned by AIDS has been recognized as a core challenge in the context of the international response to HIV and AIDS (see for example, UNAIDS/WHO 2006a). However, estimates of the impact of HIV and AIDS on orphan rates are not available for South Asian countries. To obtain a best available estimate of the impact of HIV and AIDS on orphan rates, we therefore have to draw on evidence from other countries, or draw some inferences from other demographic indicators such as mortality rates.

Table 3.4 Household Savings by Income Category

	Non-HIV Households		*Households Affected by HIV*	
Household income category	*Household savings (Rs)*	*Savings rate (%)*	*Household savings (Rs)*	*Savings rate (%)*
Up to 20,000	–51	–0.3	–3,197	–23.4
20,001–30,000	361	1.4	–2,087	–8.3
30,001–41,000	1693	4.8	–358	–1.0
41,001–84,000	5906	10.2	2637	4.6
84,001 and above	26,801	21.3	35,123	24.7

Source: Pradhan and others 2006.

Regarding cross-country evidence, a number of countries in southern Africa,[15] before the arrival of HIV and AIDS, had similar mortality profiles as the countries in South Asia we focus on, and estimates of the impact of HIV and AIDS on orphan rates are available for these countries. For these countries, an HIV prevalence rate of 20 percent could translate into a share of orphans among the young population (ages 0–17) of more than 10 percent. For countries like India or Nepal (HIV prevalence 0.4 to 0.5 percent), this would translate into an increase in orphan rates of 0.2–0.3 percentage points, which compares to an underlying orphan rate of about 9 percent.

However, there are two principal shortcomings to this comparison. First, the increase in orphan rates in southern Africa does not show the full impact yet, as mortality among working-age adults has been increasing over the last decade. More substantially, even if one accepts that the demographics of the respective countries (in South Asia vs. southern Africa) allow this kind of comparison, the nature of the epidemic differs very significantly between the regions, with important implications for the link between increasing adult mortality and orphan rates. Most important, and reflecting differences in risk behavior, HIV prevalence among women is much lower than for men (as evident from the low share of women among people living with HIV and AIDS; see table 3.1). Additionally, adverse health conditions may affect fertility, and—especially for men—certain types of risk behavior (men having unprotected sex with men, injecting drug use) may be negatively correlated with the propensity to procreate. In order to estimate the number of orphans, it is also necessary to account for the number of children who have lost both parents.

Specifically, we make the following assumptions: (1) We calculate the (increased) likelihood of becoming a maternal orphan by age, based on the average increase in mortality among females at age 20–49. (2) We calculate the likelihood of becoming a paternal orphan, but cap the increase in parental mortality at twice the increase in maternal mortality.[16] (3) To estimate the total number of orphans by age, we add up maternal and paternal orphans, adjusting for an assumed share of children who have lost both parents among AIDS orphans of one-quarter.[17] (4) To calculate the increase in the share of orphans among the young population (ages 0–17), we apply weights to each year, in line with the rate of population growth. (5) Finally, we subtract 10 percent from the total to account for higher mortality among children who have contracted HIV from their mother.

In this scenario, we find that HIV and AIDS could result in an increase in the number of orphans of about 0.4 percent of the young population in India. By age 17, about 0.9 percent of the young population will have experienced orphanhood owing to HIV and AIDS. The estimates for Nepal are similar; while estimated HIV prevalence is higher, the share of women among people living with HIV and AIDS is lower, and higher population growth also mitigates the increase in the orphan rate.

Besides income effects, another dimension of increased risk on the individual level is the increased risk of orphanhood and its implications for individual welfare at a young age and beyond. In addition to the direct effects of losing a parent, orphanhood can have numerous economic repercussions. One immediate concern is that orphanhood may be associated with a deterioration in material living standards during childhood if orphans live in poorer households. For paternal orphans, Ainsworth and Filmer (2006), in one of the few studies covering Asia and not only Sub-Saharan Africa, find that in about two-thirds of the surveys covered by their study, orphans are concentrated in poorer households. Maternal orphans also tend to live in poorer countries, while there is considerable variation across countries. The greatest variation occurs for two-parent orphans, who frequently live in richer households. However, they note that the countries with the highest concentration of two-parent orphans among the poor are Asian (Laos, Indonesia, and the Philippines).

The second main channel that has been studied relatively widely through which orphanhood can affect living standards is access to education. Table 3.5 reports the findings from Ainsworth and Filmer (2006) on enrollment rates for orphans and nonorphans. At least for the first four studies shown, orphanhood is associated with substantially lower enrollment rates, with a difference between enrollment rates for nonorphans and two-parent orphans between 9 percent and 27 percent, and paternal or maternal orphans somewhere in between.[18] The literature points at various reasons for the apparent link between orphanhood and educational status or attainment. While enrollment rates are usually correlated with household income, the link between orphanhood and household income is not clear in many countries (see above). Other factors that could have a bearing on orphan rates include the degree to which the household head and an orphan living in the household are related,[19] or the nonmonetary aspects of the relationship between parents and children.[20]

Table 3.5 Access of Orphans to Education, Six Countries

	Sample size (Number of 7- to 14-year-olds)	*Households with at least one orphan (Percent)*	*Enrollment rate of 7- to14-year-olds by orphan status (Percent)*			
			Parents alive	*Paternal orphan*	*Maternal orphan*	*Two-parent orphan*
Cambodia (2000)	16,437	8.1	77.4	71.9	64.2	58.5
Indonesia (1997)	29,513	n.a.	90.5	87.1	80.3	80.9
Indonesia (2002)	24,991	2.5	92.4	85.4	87.9	82.3
Lao PDR (2000)	8,953	4.5	74.6	64.7	65.6	48.0
Mongolia (2000)	5,327	4.8	71.2	73.6	70.6	87.5
Philippines (1999)	6,856	4.1	83.6	79.1	79.2	81.8
Vietnam (2000)	7,434	2.6	90.9	86.0	75.8	71.4

Source: Ainsworth and Filmer 2006.
Note: For orphans' enrollment rates, italics indicate that enrollment rates are not statistically significantly different from the nonorphan rate at the 5 percent level.

Table 3.5 also illustrates some of the difficulties involved in analyzing the effects of orphanhood. Especially for two-parent orphans, the number of observations is relatively low. In Cambodia, about 1 percent of 7- to 14-year-olds covered were two-parent orphans. In other Asian countries, the proportion is (sometimes much) lower. As a consequence, the differences between orphans and nonorphans sometimes come out insignificant.[21]

Both of the key studies we draw on in this section also provide some information on the status of orphans in households affected by HIV and AIDS in India. Das and others (2006) report on school attendance among households affected by HIV and AIDS. They find that school attendance rates for children of widows or widowers living with HIV and AIDS are about 15 percentage points lower than for households not affected by HIV and AIDS. Additionally, schooling expenditures per child in widow-led households are about one-third lower than for widower-led households or households with both parents alive. Pradhan and others (2006) differentiate children by gender and household income category (table 3.6). Whereas enrollment rates are virtually the same for high-income households affected or not affected by HIV and AIDS, enrollment rates are 7–8 percentage points lower for the lowest income category. The table also provides some evidence regarding a differential impact by gender— for the income groups between Rs. 20,000 and Rs. 41,000, the decline in enrollment rates is more pronounced for girls.

Table 3.6 Enrollment Rates by Income Category, Ages 6–14
(Percent)

Household income category (Rs)	*Non-HIV households (%)*		*Households affected by HIV (%)*	
	Boys	*Girls*	*Boys*	*Girls*
Up to 20,000	87.0	85.4	94.0	93.2
20,001–30,000	92.5	86.3	93.7	93.0
30,001–41,000	93.2	85.9	96.7	94.7
41,001–84,000	92.8	92.3	97.0	95.6
84,001 and above	98.7	96.1	98.2	97.4

Source: Pradhan and others 2006.

Economic Development Aspects of the Response to HIV and AIDS

By reducing the scale of the epidemic and mitigating the impacts of HIV and AIDS, the international and national responses to HIV have implications for the economic development impact of HIV and AIDS. At the same time, information about the impacts of HIV and AIDS across population groups, as well as of measures to increase awareness, enhance prevention, improve access to treatment, and mitigate the economic and social consequences, can be used to refine the tools adopted to address the epidemic.

Whereas chapter 1 discusses the epidemiology of HIV and AIDS and the implications for effective prevention, we focus on awareness as one of the factors influencing access to prevention. Specifically, we look at differences in HIV awareness across population groups. Our discussion of the challenges of expanding access to treatment proceeds in three main steps. First, we take stock of progress made in expanding access to treatment. As coverage rates of antiretroviral treatment are relatively low in South Asia, we discuss some potential reasons for this. Second, looking forward, the projected fiscal costs of expanding access to treatment are substantial. A scenario assuming an escalation of the epidemic to an HIV prevalence rate of 1 percent of the population between the ages of 15 and 49 suggests that the demand for treatment would rise to an equivalent of between 10 percent and 35 percent of total health expenditures.[22] These findings accentuate the key role of effective prevention (mitigating the demand for HIV and AIDS-related health services) in scaling up treatment in a sustainable fashion. Third, while data on access to treatment across socioeconomic groups are scarce, we discuss some indirect evidence

on access to treatment across population groups, looking at—among other factors—access to antenatal care.

Distributional Aspects on Access to Information about HIV

In addition to the ability to cope with the economic consequences of HIV and AIDS (discussed above) and access to treatment, knowledge and access to prevention services are key factors that affect an individual's or household's vulnerability to HIV and AIDS. As spending on prevention measures or other inputs to prevention programs cannot easily be attributed to individuals, an analysis of the socioeconomic dimension of access to prevention primarily relies on outputs to prevention programs, for example, changes in sexual and injecting risk behavior such as condom use and use of clean needles.

While not an ideal indicator in terms of measuring the success of prevention efforts (as it does not necessarily translate into behavior change), data on knowledge about the sexual transmission of HIV are interesting in the context of our discussion of the socioeconomic aspects of HIV and AIDS, as data on knowledge are available across certain socioeconomic categories and across countries. Lacking data on access to and use of prevention services or of behavior change by income, our discussion will therefore focus on knowledge about HIV across economic quintiles. Table 3.7 summarizes available data on knowledge about sexual transmission of HIV and AIDS for Bangladesh, India, and Nepal, and also reports data on knowledge about HIV prevention from the recently completed *2005–2006 National Family Health Survey* for India. We find a fairly regular pattern of HIV awareness by socioeconomic status across countries, with HIV awareness in the lowest wealth quintile only a fraction of the level of awareness in the highest quintile. Second, there are large differences between men and women, with average HIV awareness among women only about 50 percent to 60 percent of the level of awareness among men. Moreover, the "wealth gap" and the "gender gap" tend to reinforce each other—by far the lowest levels of awareness are recorded for women in the lowest wealth quintile; and the gap between the highest and lowest quintile is much higher for women. One possible explanation for these gaps is access to education. In the countries covered, the patterns of HIV awareness resemble data on school completion rates, and studies differentiating by years of schooling (such as International Institute for Population Science (IIPS) 2007; see lower panel of table 3.7) find a similar pattern by level of education.

To understand how differences in HIV awareness, risk behavior, and other factors translate into a socioeconomic profile of HIV and AIDS

Table 3.7 HIV Awareness across Population Groups
(Percent)

	Knowledge about sexual transmission of HIV							
		Wealth Quintile					*Urban*	*Rural*
	Average	*Lowest*	*2nd*	*3rd*	*4th*	*Highest*	*(Average)*	*(Average)*
Bangladesh (2004)								
Men	51.5	27.5	36.6	47.6	59.8	78.4	69.7	45.7
Women	31.6	9.7	17.0	26.4	40.2	64.2	51.7	25.7
India (1998/99)								
Women	25.3	4.6	8.7	19.3	33.6	59.6	62.8	48.5
Nepal (2001)								
Men	63.4	49.8	55.8	60.5	64.1	84.2	n.a.	n.a.
Women	28.9	10.9	19.1	23.8	33.6	59.6	64.3	49.5

	Knowledge that consistent condom use can reduce chance of acquiring HIV						
	Average	*No education*	*<8 years*	*8–9 years*	*>=10 years*	*Urban (Average)*	*Rural (Average)*
India (2006)							
Men	68.1	33.9	62.8	82.0	93.2	85.6	59.5
Women	34.7	12.5	34.9	57.6	81.0	56.3	25.1

Sources: Gwatkin and others 2007a, 2007b, and 2007c, and IIPS 2007.
Note: For Nepal (2001), the numbers included in Gwatkin and others (2007c) for rural vs. urban HIV awareness are inconsistent with the aggregates, as the average for both urban and rural HIV awareness is higher than the average for the aggregate.

across the population, we would ideally be able to draw on the results of population studies identifying households and individuals affected by HIV and AIDS and those not affected, and compare the respective groups. Hopefully, this will be possible for India when the full dataset of the *2005–2006 National Family Health Survey* is released. Until then, the main data sources are surveys that compare households affected by HIV and AIDS with unaffected households in the same area. While this approach is geared toward identifying household *impacts* of HIV and AIDS, it contains little information on the composition of the population living with HIV and AIDS, because the sample is confined to households that have been identified because they receive some HIV-related medical services, and thus are not representative of the entire population living with HIV and AIDS.

A few conclusions regarding susceptibility can nevertheless be drawn from these studies. For example, they illustrate the differences in risk behavior between men and women. While married men most commonly

acquire HIV from other sexual partners, women frequently become infected by their husbands. In surveys of households affected by HIV and AIDS, this results in high rates of coinfection (both partners infected) and in high rates of HIV-positive widows, whereas the numbers of HIV-positive widowers is generally low. This is most likely explained by an infection pattern whereby the husband acquires HIV earlier and—in many cases—passes it on to the spouse. For example, Das and others (2006) report that "in 54 percent of the 'currently married' families affected by HIV and AIDS, both adults are infected with HIV, while in 42 percent of them only the male adult is infected, and in only 6 percent of cases only the female adult is infected," and that 76 percent of household heads who were "ever married" (largely widows and widowers) are female. Similarly, Pradhan (2006) finds that 36 percent of women living with HIV and AIDS are widowed, but only 4 percent of the men are widowers.

Another key dimension of differences in susceptibility to HIV and AIDS are groups engaging in high-risk behaviors, such as sex workers and their clients, men who have sex with men, and injecting drug users and their partners. While much of the literature regarding prevention strategies focuses on such vulnerable groups (see Wilson 2007), we have little information on the socioeconomic profile of these population groups, as they are not easily accessible using standard survey techniques. While they are some obvious linkages among HIV and AIDS, the propensity to engage in high-risk behavior, and development outcomes (most obviously for the link between prostitution and poverty), we unfortunately cannot provide an adequate discussion owing to data limitations.

The Challenge of Expanding Access to Treatment

Access to care and treatment has the potential to mitigate the health and economic impacts of HIV and AIDS. However, access to treatment is uneven across and within countries. To the extent that access to treatment is positively correlated with key development indicators, it may exacerbate inequalities in living standards. At the same time, expanding access to treatment represents a substantial logistical and financial challenge. With these basic considerations in mind, we will proceed along the following lines. First we discuss the current situation in terms of access to treatment, and the scale of the challenge of expanding treatment. While the data situation is very weak, we then provide some conjectures regarding the determinants of access to treatment within countries.

Table 3.8 summarizes the available data on access to treatment in South Asia. Generally, access to treatment is low in an international context.

Table 3.8 Access to Antiretroviral Treatment in South Asia

	HIV prevalence, end of 2007 (ages 15–49) (Percent)	*Estimated number of people requiring treatment, end of 2007*	*Estimated number of people receiving treatment, end of 2007*	*Antiretroviral treatment coverage, end of 2007 (Percent)*	*Antiretroviral treatment coverage, end of 2005 (Percent)*
Afghanistan	<0.01	n.a.	0	n.a.	n.a.
Bangladesh	0.01	2,400	170	7	1
Bhutan	0.09	<100	18	n.a.	n.a.
India	0.34	n.a.	158,000	n.a.	16
Maldives	n.a.	n.a.	1	n.a.	0
Nepal	0.5	20,000	1,400	7	1
Pakistan	0.10	20,000	600	3	2
Sri Lanka	0.03	780	107	14	6
Memorandum Items					
China	0.08	190,000	35,000	19	25
Thailand	1.4	250,000	153,000	61	60
Myanmar	0.7	76,000	11,000	15	7

Source: WHO (2006a); UNAIDS and WHO (2008); WHO, UNAIDS, and UNICEF (2006); and WHO, UNAIDS, and UNICEF (2008).

Note: The percent of people in India receiving ART comes from author's calculations, based on WHO, UNAIDS, and UNICEF (2006), making adjustments for subsequent revisions to estimated HIV prevalence.

WHO, UNAIDS, and UNICEF (2007) estimate that the coverage rate for low- and middle-income countries had risen to 28 percent as of the end of 2006; for Asia, they report an average coverage rate of 19 percent. If an adjustment is made for the revised estimates for India, the estimated coverage rate would rise to 31 percent globally and 33 percent for Asia. For most countries in South Asia, the coverage rates attained so far are much lower; only for India is the upper range of the estimates for treatment access in the vicinity of the global average. There are two sets of factors that may help explain the low rates of access to treatment in South Asia—limited economic or health sector capacities, and the composition of people in need of treatment.

In this regard, we explore several indicators for the capacities of South Asian economies, or their health sectors, to address the demand for increased health services associated with HIV and AIDS (figure 3.4). First, high levels of *GDP per capita* indicate both the availability of public financial resources to address increasing demand for health services associated with HIV and AIDS, but also a higher capacity among residents to privately pay for some of the costs of treatment, at least for part

of the population. Second, a country's response to HIV may benefit from *external aid*, including for scaling up access to treatment. We therefore illustrate the correlation between HIV and AIDS-related aid and access to treatment. Third, we look at the link between access to treatment and *access to antenatal care* as an indicator for the coverage rate of basic health services. Finally, as the situation regarding constraints to scaling up may differ very significantly across high- and low-prevalence countries, we show the data for all countries where the data are available, and also for the subset of countries with an HIV prevalence rate lower than 1 percent.

Figure 3.4 illustrates the correlation of access to antiretroviral treatment with these development indicators. The data on access to treatment are based on the Progress Report by WHO, UNAIDS, and UNICEF (2007), and include all countries where point estimates on access to treatment were available (for South Asia: Bangladesh, Nepal, Pakistan, and Sri Lanka), plus India, where a point estimate for access to treatment was constructed from the midpoint estimates for people requiring and receiving treatment reported in table 3.8.

Our findings include the following:

- South Asian economies are among the economies with the lowest levels of GDP per capita among countries with low HIV prevalence, and also feature comparatively low rates of access to treatment within this group. However, GDP per capita is not a convincing determinant of a low level of access to treatment in South Asia, as many low-income countries with higher levels of HIV prevalence (in the full sample) feature rates of access that are much higher than those attained in South Asia.[23]

- There is no indication that differences in access to external aid may explain the relatively low levels of access to treatment in South Asia. For both the low-prevalence countries and the full sample, access to treatment in South Asia is comparatively low relative to countries receiving similar levels of external aid.

- Our data indicate that low access to treatment in South Asia is related to the low capacity of health systems in the region. Four of the South Asian countries are among the bottom five countries in terms of access to antenatal care for the low-prevalence sample, and they are among the bottom 10 countries for the full sample. Especially among the low-prevalence sample, access to treatment is positively correlated with the rate of access to antenatal care.

- However, the case of Sri Lanka, with a very high level of antenatal care, but an extremely low rate of access to treatment, amply illustrates that limited capacities of health services only partly explain the low levels of treatment in South Asia. At the same time, the example of Cambodia (with access to antenatal care of 38 percent, but access to treatment at 83 percent) shows that low capacities in basic health services need not be an insurmountable obstacle to attaining high coverage rates of antiretroviral treatment.

The findings from our discussion of the correlation between access to treatment and key development indicators are confirmed by an econometric analysis, based on the full sample.[24] Eq. (4) suggests that an increase in HIV prevalence of 1 percentage point translates into a treatment coverage rate that is lower by 1.1 percentage points, that a difference in GDP per capita of US$1,000 is associated with a difference in treatment access of 7 percentage points, that an additional US$1 in external aid per capita corresponds to a treatment access rate that is 2.9 percentage points higher; and a rate of access to antenatal care that is 1 percentage point higher translates into a treatment coverage rate that is 0.3 percentage points higher. As in our more informal discussion, the latter factor emerges as the most important one in terms of explaining differences in access to treatment in South Asia and other regions.

$$\begin{aligned} TREAT = & \underset{(-0.5)}{-6.0} \underset{(-2.4)}{-1.11^{**}} \cdot HIV + \underset{(6.9)}{0.007^{***}} \cdot GDPPC \\ & + \underset{(6.9)}{2.90^{***}} \cdot AIDPC + \underset{(2.2)}{0.3^{**}} \cdot ANCCARE, \\ & \text{with } R^2 = 0.49.^{25} \end{aligned} \tag{4}$$

The Costs of Treatment

In light of the findings of the previous section, estimates of the costs of scaling up of antiretroviral treatment should be treated with caution, as scaling up takes place in the context of national health systems, and as the capacities of these systems in terms of financial resources, human resources, or the effectiveness of the health sector, may complicate the tasks of scaling up, or may pose constraints that cannot easily be overcome by additional financial resources only.

Nevertheless, estimates of the costs of scaling up provide important information relevant for planning national responses to HIV. Most directly, it is important for budgeting to know the financial implications of any given target for the coverage rate of antiretroviral treatment. Second,

relating the required funding to overall health expenditure provides an additional indicator for the scale of the national response to HIV in the specific national context. Third, a comprehensive scaling up is normally associated with a sustained increase in the number of people requiring treatment (as survival rates for patients receiving treatment rise, while additional people living with HIV and AIDS reach the stage at which they also require treatment). To ensure the viability of the national treatment program in the future, it is therefore important to project the number of people who will participate in a treatment program or require treatment, and to ensure that the required resources (human, financial, drugs, and so on) are provided.

In line with international developments, the costs of treatment—most decisively, the prices of antiretroviral drugs—have fallen in Asia over the last years. Table 3.9 summarizes some of the latest available data. Allowing for some data collection and publication lag (the table quotes only recent studies published in 2006), these estimates suggest that the costs of antiretroviral treatment in low- and middle-income countries in Asia were around US$400–600 per year in 2004. To illustrate the progress made in improving the affordability of these drugs over the last years, in China, the costs were as high as US$10,000 in 2001 and US$4,000–5,000 in 2002.

To understand the full financial implications of expanded access to treatment, it is necessary also to account for the costs of administering the drugs and monitoring the treatment. More comprehensive cost estimates are available only for a subset of countries, suggesting an annual cost of around US$400. In the absence of estimates of the total costs of treatment

Table 3.9 The Costs of Antiretroviral Treatment
(Annual Costs, per Patient, in U.S. dollars)

	Costs of drugs	*Costs of monitoring, etc.*	*Total*
Cambodia	350	—	—
China	400	—	—
India	340	—	—
India	397	420	817
Indonesia	600	—	—
The Philippines	456–576	407	863–983

Sources: Morineau and others 2006 for Cambodia; Ma and others 2006 for China; Priya and others 2006 and Gupta, Trivedi, and Kandamuthan 2006 for India; Gunawan, Kosen, and Simms 2006 for Indonesia; and Monzon and Poblete 2006 for the Philippines.

for a wider set of countries, we will use this estimate throughout, using an indicative estimate of US$800 for the annual costs of treatment per patient across countries.[26] There are two principal uncertainties regarding this estimate. First, the prices of drugs or other supplies (for example, CD4 test kits) may fall, reducing the costs of treatment.[27] Second, drug resistance or other treatment failure may result in an increasing demand for more expensive ("second-line") drug combinations, especially as the number of patients who have been on antiretroviral treatment for some time increases. The average unit costs of treatment may therefore increase.

Based on these estimates, we provide three scenarios for the actual or potential costs of treatment (see table 3.10). *Scenario 1* represents an estimate of the current cost of treatment, based on the latest estimates of the numbers of people receiving treatment as of the end of 2006 (from WHO, UNAIDS, and UNICEF (2007)). *Scenario 2* presents the hypothetical costs of providing treatment to all people living with HIV and AIDS requiring treatment as of the end of 2006; that is, it corresponds to a coverage rate of treatment of 100 percent. Looking forward, one point that needs to be taken into account in estimating the potential costs of a comprehensive treatment program is that the number of people living with HIV and AIDS is endogenous (see Over 2004). Owing to reduced mortality and increased life expectancy, an expansion of treatment, controlling for other factors, is associated with an increase in the number of people living with HIV and AIDS and, even more pronounced, an increase in the number of people requiring treatment. For this reason, we report both estimates of the short-run costs (of providing treatment to all patients requiring it as of the end of 2006) and estimates of the longer-term costs.

Specifically, Scenario 2 makes the following assumptions: (1) It takes the number of people living with HIV and AIDS as given (as reported in table 3.1). (2) Regarding the immediate costs of a scenario with full access to treatment, it assumes that 20 percent of people living with HIV and AIDS require treatment.[28] (3) Regarding the longer term, it assumes that—as a consequence of a comprehensive treatment program—the number of people living with HIV and AIDS would rise by 80 percent, and that 60 percent of the people living with HIV and AIDS in this scenario receive treatment. The scenario is based on the assumption that life expectancy in the absence of treatment is 10 years after infection, that patients would require treatment after 7 years, and that treatment extends the lifespan by 8 years (that is, 11 years after initiation of treatment).[29]

Table 3.10 Expanding Access to Antiretroviral Treatment

	HIV prevalence, end of 2006 (ages 15–49, percent)	*GDP per capita, 2006 (US$)*	*Total health expenditure, 2004 (Percent of GDP)*	*Costs of Treatment (Percent of GDP)*				
				Scenario 1	*Scenario 2*		*Scenario 3*	
				(impact)	*(impact)*	*(longer term)*	*(impact)*	*(longer term)*
Bangladesh	0.014	451	3.1	0.0001	0.003	0.015	0.208	1.126
India	0.36	797	5.0	0.01	0.050	0.271	0.126	0.683
Nepal	0.5	339	5.6	0.004	0.135	0.728	0.280	1.512
Pakistan	0.11	830	2.2	0.0001	0.012	0.063	0.119	0.644
Sri Lanka	0.04	1,355	4.3	0.0002	0.003	0.017	0.082	0.445

Source: IMF (2007), UNAIDS (2006), WHO (2007), and author's estimates and projections.
Note: Estimates for Afghanistan, Bhutan, or Maldives are not shown, as point estimates of HIV prevalence are not available for these countries.

Scenario 3 is built in the same way as Scenario 2, but assumes that underlying HIV prevalence among the population between the ages of 15 and 49 rises to 1 percent in all countries (plus the increase in HIV prevalence owing to longer survival times because of improved access to treatment). Estimating what would represent a credible adverse scenario regarding the evolution of the HIV epidemic(s) in the region is beyond the scope of this paper; our "1 percent" scenario is motivated simply by providing a common indicator for the vulnerability of the respective countries' health sectors to an escalation of the epidemic, "normalizing" the estimates with respect to the level of HIV prevalence.

We find that the current costs of providing treatment to people living with HIV and AIDS are modest both from a fiscal perspective and relative to total health expenditures. Based on the numbers of patients receiving treatment as of the end of 2006, the costs were highest in India, at 0.01 percent of GDP, corresponding to 0.2 percent of total health expenditures. If treatment coverage were to rise to 100 percent, the costs of treatment in India would rise to 0.05 percent of GDP, and to 0.27 percent of GDP in the longer run (about 5 percent of total health expenditure). In Nepal, the country with the highest HIV prevalence rate and the lowest level of GDP per capita, the costs would be more substantial, eventually rising to 0.7 percent of GDP, and about 10 percent of total health expenditure. This analysis of the longer-term costs also accentuates the issue of sustainability of treatment programs, as the long-term costs come out about five times higher than at initiation of the program. Finally, Scenario 3 provides some indication of the implications of a hypothetical escalation of the epidemic(s) to a prevalence rate of 1 percent. In four countries (Bangladesh, Nepal, Pakistan, and Sri Lanka), the demand for treatment would exceed the equivalent of 5 percent of total health expenditure early on, and—in a comprehensive treatment scenario—would eventually rise to between 10 percent and 35 percent of total health expenditure.

Distributional Aspects of Access to Treatment

As we have argued above (in our discussion of socioeconomic impacts of HIV and AIDS), it is important to understand the impact of HIV and AIDS across population groups in order to fully grasp the development impact. This basic conjecture also applies to access to treatment, and our discussion here continues the earlier analysis of characteristics of households affected by HIV and AIDS and differences in the impact of HIV and AIDS across population groups. One principal obstacle to an analysis

of the distributional aspects of access to antiretroviral treatment is lack of socioeconomic data on people receiving antiretroviral treatment. As a starting point, we therefore discuss socioeconomic differences in access to health services for which some cross-country data are available for South Asia (antenatal care visits to a medically trained person). Our discussion then closes with a review of some evidence regarding differences in access to treatment across population groups, focusing on differences by gender and access to treatment for injecting drug users (an important group among people living with HIV and AIDS in many South Asian countries).

Our choice of antenatal care visits to a medically trained person as an indicator for access to health services across population groups has been motivated by several considerations. One important aspect is data availability, as this is an indicator that has consistently been included in major health surveys across countries. Also, HIV and AIDS-related health services are typically delivered in larger health facilities rather than clinics catering only to people affected by HIV and AIDS. The data on antenatal care—as they carry some information on access to health facilities in general—may therefore provide a proxy for access to HIV and AIDS-related services. Antenatal care is also associated with antiretroviral treatment for prevention of mother-to-child transmission of HIV, and—though less directly—with access to antiretroviral treatment for adults, as tests at antenatal clinics may result in the detection of an infection. One primary shortcoming of this indicator, in the context of South Asia, is that antenatal care is utilized by women, whereas the majority of people living with HIV and AIDS are men. Table 3.11 summarizes data on antenatal care visits for Bangladesh, India, and Nepal.

We find a fairly regular pattern of antenatal care visits across countries. First, there are substantial differences in access across wealth quintiles. In this regard, India is the most equitable country, with access for the highest quintile about double the access for the lowest quintile, while the corresponding factor is higher than three for Bangladesh. Second, differences in the quality of services reinforce inequalities in overall access. While the wealthiest quintile predominantly draws on the services of a doctor, the poorer quintiles frequently (in the case of Nepal predominantly) only have access to a nurse or trained midwife. Third, controlling for wealth, there are gaps in access to services between the urban and rural populations, especially for the lower wealth quintiles.[30]

Another potential dimension of inequities in access to treatment regards differences by gender. While this is an important aspect of the socioeconomic impacts of HIV and AIDS, access to treatment seems to

Table 3.11 Antenatal Care Visits to a Medically Trained Person
(Percent)

		Wealth Quintile				
	Average	*Lowest*	*2nd*	*3rd*	*4th*	*Highest*
Bangladesh (2004)	48.8	24.9	38.6	48.8	60.6	81.1
to doctor	31.3	12.3	18.9	26.8	42.0	65.6
to nurse or trained midwife	17.5	12.6	19.7	22.0	18.6	15.5
Rural	43.0	24.1	37.0	46.7	59.3	74.2
Urban	71.0	33.9	52.9	62.0	66.7	85.7
India (1998/99)	65.7	44.1	55.3	68.6	80.3	92.8
to doctor	49.3	26.9	37.0	48.6	65.1	83.3
to nurse or trained midwife	16.5	17.2	18.3	20.0	15.2	9.5
Rural	59.8	43.5	54.2	67.3	78.5	90.1
Urban	86.4	64.6	74.1	76.2	83.4	94.1
Nepal (2001)	48.6	30.4	37.9	50.8	57.5	79.5
to doctor	16.6	6.2	8.5	12.7	18.5	48.2
to nurse or trained midwife	31.9	24.2	29.4	38.0	39.0	31.3
Rural	46.1	30.4	37.7	50.8	56.7	75.9
Urban	80.9	n.a.	(51.8)	(49.7)	77.4	85.8

Source: Gwatkin and others 2007a, 2007b, and 2007c.
Note: Numbers in brackets "indicate the absence of adequate observations to produce acceptably reliable values" (Gwatkin 2007c).

be fairly even across sexes, with a slight advantage for women in most countries. For Asia overall, WHO, UNAIDS, and UNICEF (2007) find that women account for 39 percent of people receiving antiretroviral treatment, which is higher than their share in the population of people living with HIV and AIDS (32 percent). The only South Asian country for which these data are available is India, with a share of women among people living with HIV and AIDS of 39 percent, while they account for 33 percent of people receiving treatment.

Finally, one factor that may be relevant regarding inequities in access to treatment in South Asia is the role of injecting drug users. Aceijas (2006) reports that they accounted for 1.4 percent of people receiving treatment in India at the end of 2004. Given that injecting drug use is considered the main factor in the spread of HIV in northeast India, and an important factor in other areas, this rate is certainly much lower than the share of injecting drug users among people living with HIV and AIDS. Thus, this factor points at the possibility that difficulties involved

in providing treatment to high-risk populations contribute to low rates of access to treatment.

Summary and Conclusions

The picture that emerges regarding the economic development impacts of HIV and AIDS is complex; key findings include the following:

- The impacts of HIV and AIDS on GDP per capita are small. For India, the level effect on GDP per capita (–0.16 percent) corresponds to the equivalent of a one-off loss of about 1.5 weeks of GDP growth, and the slowdown in population growth implies a slowdown GDP growth of 0.02 percentage points through 2015, and a smaller decline later on. (Some factors, for example, regarding human capital accumulation, may exacerbate the negative impacts in the longer run, but we have no data suitable for quantifying these effects at present.)
- Using a simple model that evaluates the direct welfare costs of increasing mortality, we find that these welfare costs are substantial, accounting for 3 percent to 4 percent of GDP in India and Nepal, the countries with the highest prevalence rates in the region.
- HIV awareness is substantially lower for the lower wealth quintiles. Within quintiles, awareness is lower for women and for rural households.
- In a household study on India, 36.5 percent of people living with HIV and AIDS who were able to retain their employment nevertheless reported an income loss, which averaged about 9 percent. Among those who lost their employment (about 9 percent of the sample of people living with HIV and AIDS), the income loss was severe, at about 66 percent.
- The ability to cope with the financial effects of HIV and AIDS differs strongly across wealth quintiles. For the lowest wealth quintile, Pradhan and others (2006) report savings rates of –23 percent for households affected by HIV and AIDS, as opposed to 0 percent for the non-HIV group.
- Based on household data from India, we find that the situation of HIV-positive widows is worse than for other people living with HIV and AIDS, probably reflecting the status of widows in general. As many women living with HIV and AIDS are widows (reflecting an infection pattern whereby women frequently are infected by their husbands, who acquire the virus through various forms of risky behavior), this means that HIV and AIDS does have a disproportionate economic impact on women.

- In India and Nepal, the number of orphans will increase by about 0.4 percent. By age 17, about 0.9 percent of the young population will have experienced orphanhood owing to HIV and AIDS.
- We find access to antiretroviral treatment (about 20 percent in India, and less than 10 percent in the other countries) in the region to be low in an international context. In many countries in the region, one key factor that appears to limit progress in scaling up is the low capacity of national health systems, as well as less support from international initiatives (countries in other regions with low capacity and weak systems have higher ART coverage).
- Using largely circumstantial evidence (for example, access to other forms health services), we find indications for inequities in access to health services across socioeconomic groups. To the extent that these inequities also extend to access to antiretroviral treatment, they exacerbate the disproportionate impact on poorer population groups.

One point that needs emphasizing is the lack of data on the socioeconomic dimension of HIV and AIDS in South Asia, especially beyond India. Our discussion of the impacts of HIV and AIDS largely rests on surveys matching households affected by HIV and AIDS with a control group; while this may represent a best-available approach, it is problematic because it rests on first identifying households affected by HIV and AIDS, which means that the sample largely consists of people living with HIV and AIDS who receive some kind of HIV and AIDS-related medical attention, and who likely are not representative of the population affected by HIV and AIDS. At least for India, the recently completed *2005–2006 National Family Health Survey* may provide some improved insights regarding the socioeconomic dimension of HIV and AIDS. Along the same lines, our knowledge of the extent and determinants of access to antiretroviral treatment is very limited, beyond estimates of the overall number of people receiving it on a national level.

In terms of policy implications and a research agenda, the key findings from our analysis (data permitting) relate to the socioeconomic profile of the epidemic. In terms of the susceptibility to HIV, as well as the implications for living standards, we find that the vulnerability to and the impact of the epidemic differs strongly across population groups by wealth, education, and gender. This is an important finding toward understanding the impacts of the epidemic, as many of the implications of HIV and AIDS in the context of attaining the Millennium Development Goals arise from these discrepancies across population groups. At the same time, our

findings highlight the complexities of the response to HIV, as evident, for example, from our findings regarding the linkages of access to treatment and the strength of health systems, or the apparent relationship between access to education and HIV awareness.

Notes

1. This comparison is based on age-standardized estimates of mortality from WHO (2006c). AIDS-related mortality for India was scaled in line with updated estimates of HIV prevalence and mortality for this country.
2. A different approach would involve obtaining such coefficients based on the larger set of countries for which estimates of the impact of HIV and AIDS are available. We have therefore run regressions, using estimates for the 62 countries covered by UN Population Division (2007), to obtain more precise approximations for the underlying demographic model that could be used to fill in the blanks. However, we adopt the simpler approach because HIV prevalence explained most of the variation in key indicators in these regressions (typically, around 95 percent), the role of interactions with other variables is limited, and because the data set of 62 countries, including countries with very different demographic profiles compared to the South Asian countries we focus on, may be less representative of the South Asian countries (excluding India) than India is.
3. While adjusting for the overestimates of the scale of the epidemic by scaling the estimated demographic impacts accordingly, we are not able to disentangle the effects that the corresponding underestimate of the coverage rate of treatment had on the estimated indicators of the demographic impact of HIV and AIDS.
4. More recent surveys of the available literature, for example, UNAIDS (2007) and Coffie and others (2007), suggest somewhat longer survival periods.
5. Haacker (2004b) provides an overview; Bloom and others (2004) discuss this and other approaches and draw some inferences regarding the impact of HIV and AIDS in Asia.
6. This assumes a direct effect productivity of 0.05 percent, in the interior of the range quoted. The multiplier effect (taking A to the power $(1/(1–\alpha)$; see equation (2)) increases the direct effect to about 0.08 percent.
7. Similar to our simple analysis, many studies of the economic impacts of HIV and AIDS in various African countries find large declines in GDP (relative to a baseline scenario), but much smaller declines in GDP per capita. In other words, the slowdown in GDP is dominated by a decline in population growth.
8. For example, Shantayanan and Nabi (2006) do not identify HIV and AIDS among the challenges to sustaining growth in South Asia. Some earlier

studies, such as Eberstadt (2002), predicted a more significant impact on longer-term growth, but on the basis of demographic scenarios that have not borne out.

9. A finer point is that the impact of HIV and AIDS may not be fully captured in national income accounts, for example, when commercial sex work takes place in the informal sector.
10. A note is in order regarding the role of surviving dependents, especially children, who are not included in the above presentation, but could well be captured in the individual's welfare function by adding a term describing the appropriately weighted welfare of an individual's offspring to eq. [(3)]. This would not yield fundamentally different results, especially when the individual expects that his or her children would be affected by an epidemic like HIV in a similar fashion.
11. As the compensating variation, in our context, is always larger than the equivalent variation, it is important to make clear which measure is used. If we do not state so explicitly, all our estimates of welfare costs of HIV and AIDS relate to the equivalent variation.
12. This estimate is motivated by empirical studies analyzing the link between wage differentials and differences in mortality risk across occupations. The fact that the "conversion factor" is higher than one reflects risk aversion and the declining marginal utility of consumption. Philipson and Soares (2005), drawing on similar sources, use a somewhat lower value (about 2.9, obtained as the inverse of the consumption elasticity of the utility function of 0.346 quoted in their study).
13. An alternative approach that is sometimes used values the economic losses to households based on earnings lost owing to premature death. Under certain assumptions (full employment, fully integrated labor market), the earnings lost are equal to the accumulated losses to GDP over time owing to a premature death (but substantially understate the individual costs of the risk of premature mortality according to the micro-based framework we apply). Using this approach, the Asian Development Bank and UNAIDS (2004a, 2004b) estimated that the cost of HIV and AIDS amounted to US$13.7 billion in 2004, corresponding to about US$17,000 per AIDS death.
14. The declines in the savings rate may be larger than reported in table 3.4, as it is not clear whether household borrowing is factored in.
15. For example, Botswana, Namibia, or South Africa.
16. The assumed cap on paternal mortality is consistent with the scant evidence suggesting high rates of coinfection among couples, which would not allow for large differences in HIV prevalence between parent couples. Alternatively, this adjustment is consistent with an assumption that men engaging in high-risk behavior may have a lower propensity to procreate.

17. A rate of double orphans among AIDS orphans of one-quarter is lower than in countries for which estimates exist (essentially, Sub-Saharan Africa, where double orphans account for about one-third of AIDS orphans). However, the differences in male vs. female HIV prevalence imply a lower share of double orphans.
18. These findings are similar to estimates by Case, Paxson, and Ableidinger (2002) for Sub-Saharan Africa.
19. On this issue, see Case and Paxson (2006), or Case, Paxson, and Ableidinger (2002); however, both studies are dealing with Sub-Saharan Africa.
20. See Gertler, Levine, and Martinez (2006) for a study using data from Indonesia.
21. For example, the studies quoted for Mongolia and Vietnam only have 24 and 11 observations, respectively, for two-parent orphans.
22. The range primarily reflects differences in GDP per capita across countries, although differences in health spending across countries also play a role (see table 3.10).
23. The upper panel of figure 3.4 also illustrates another aspect of the correlation between HIV and AIDS and GDP per capita regarding South Asia. The South Asian economies are among the few low-income economies that have been successful in containing HIV prevalence at levels below 1 percent.
24. See Haacker (2008) for more details.
25. Standard errors in parentheses. Three and two stars indicate coefficients significant at the 1 and 5 percent confidence levels, respectively.
26. As the costs of monitoring include personnel costs, they may differ across countries in line with different levels of income and, on a macroeconomic level, GDP per capita. However, GDP per capita for most countries shown is within or close to the range spanned by India and the Philippines (about US$500–US$1,000), so these estimates probably are not unreasonable for most low- and low-middle-income countries in the region.
27. Das and others (2006) provide a discussion of the quantitative impact of changes in prices of antiretroviral drugs and CD4 test kits.
28. Depending on the state of the epidemic, the share of people requiring treatment may differ across countries. For example, in the context of an escalating epidemic, following a rise in HIV prevalence, the share of people living with HIV and AIDS requiring treatment would be relatively low. Using a common benchmark for the share of PLWH requiring treatment neutralizes this short-term effect on our cost estimates.
29. These assumptions are inspired by UNAIDS 2007, and Coffie and others 2007.
30. This finding about the urban/rural differential is in line with findings reported in Pradhan and others (2006), who report that 17.7 percent of the people living with HIV and AIDS they surveyed were receiving antiretroviral treatment in urban areas, as compared to 10.3 percent in rural areas.

(As the sample includes people living with HIV and AIDS already identified and receiving some kind of medical attention, the share in this group receiving treatment is much higher than for the general population).

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CHAPTER 4

Economic Cost of HIV and AIDS in India

Sanghamitra Das, Abhiroop Mukhopadhyay, and Tridip Ray

Introduction

According to the latest available estimates, there are currently about 2.5 million people living with HIV or AIDS in India, corresponding to a HIV prevalence rate of 0.36 percent for the population ages 15–49 (IIPS 2007). While HIV prevalence thus remains relatively low, there are several factors that are unique to India's HIV epidemic, and need to be taken into account when assessing the impact of HIV and AIDS. (1) The scale of the epidemic and patterns of infection differ across states, and even between neighboring districts (see Wilson, this volume). Together with the fact that some of these states and districts are larger than many African countries affected by HIV and AIDS, this illustrates the complexities of the response to HIV and AIDS in India. (2) Of the two types of HIV virus—a slow-progressing one and a fast-progressing one that kills within six to nine years without any antiretroviral therapy—the latter type of virus is the predominant one in India. (3) India is a predominantly poor country with low levels of nutrition and high exposure to various types of bacteria and viruses, including tuberculosis—factors that exacerbate the morbidity and mortality of HIV and AIDS.

Against this background, our study of the economic costs of HIV and AIDS in India relates to two different strands of literature on the economic implications of HIV and AIDS.

- Studies estimating the aggregate economic impact of HIV and AIDS. The most important approaches under this heading are (1) studies focusing on the impacts on GDP or GDP per capita, and (2) studies estimating welfare costs, which are defined more broadly, including by making explicit allowance for the impacts of HIV and AIDS on mortality.
- Studies focusing on the household-level effects of HIV and AIDS. Findings from such studies frequently accentuate not only the high costs of HIV and AIDS to the affected households and individuals, but also differences in the vulnerability to and the impacts of HIV across population groups.

Our study draws from and builds on both of these strands of literature. In terms of the *theoretical framework*, it is related to prior studies using an explicit utility framework to capture the welfare costs of increased mortality (see the discussion by Haacker, this volume). One important shortcoming of these approaches is that they put strong emphasis on the welfare effects of increased mortality, while estimates of the impacts of HIV and AIDS based on household surveys typically suggest a much more complex impact on the well-being of household members.

Meanwhile, much of the evidence of the impacts of HIV and AIDS obtained from *household surveys* is indirect. One reason for this is that, owing to the generally low HIV prevalence in South Asia, household studies include few questions that offer direct insights regarding the impacts of HIV and AIDS. For example, much of our understanding of the implications of HIV and AIDS on orphanhood or widowhood derives from studies focusing on the status of orphans and widows in general, but are not specific to HIV and AIDS.

Our study provides added value relative to both of these strands of literature. First, we offer a theoretical framework that captures more of the richness of the impacts of HIV and AIDS evident from household surveys. A key aspect of the impacts of HIV and AIDS in this framework is the impact on "mental health" (as opposed to physical health), which we measure based on survey responses regarding the subjective well-being of respondents. Second, our survey is designed from the outset to

capture the multiple impacts of HIV and AIDS. In addition to data on the economic impacts and consequences of HIV and AIDS (income, medical expenditure, wealth), we obtain measures of the impact of HIV and AIDS on both mental health and physical health.

The chapter is organized as follows. We start out by discussing in more detail the *context* of our chapter in terms of the available studies of the economic impacts of HIV and AIDS in terms of the impacts on growth, GDP, or income, and in terms of the broader welfare effects (typically focusing on increased mortality). Additionally, we also introduce some of the literature from which our notion of "mental health" draws. This section is followed by a summary of our findings from a *survey of households affected by HIV and AIDS*. This is followed by an *outline of the model* used to analyze the costs of HIV and AIDS to the households affected, and a section describing the process of *estimating the costs of HIV and AIDS* and presenting our findings. A *concluding section* closes the chapter.

Context

Most of the studies projecting the impact of HIV and AIDS on the growth rate of per capita GDP use some version of the neoclassical growth model and typically estimate declines of 0.5 percent to 1.5 percent, even for the worst affected countries with more than 20 percent HIV prevalence rates.[1] For countries like India, with an HIV prevalence rate of less than 0.5 percent, this translates into very small effects of HIV and AIDS on growth (see Haacker, this volume). Somewhat differently, Young (2005) emphasizes the decline of fertility associated with the HIV epidemic. Using South African data, he estimated that the positive effects of lower population growth on real wages would be strong enough to offset other adverse effects.

A growing body of relatively recent literature (see, for example, Ferreira and Pessoa 2003; Bell, Devarajan, and Gersbach 2004, 2006; Corrigan, Gloom, and Mendez 2004, 2005) emphasizes the transmission of human capital across generations and concludes that by disrupting the mechanism that drives the process of the transmission of knowledge and abilities from one generation to the next, the AIDS epidemic will result in a substantial slowdown of economic growth. Part of the analysis relies on the dynamic implication of the mechanism that AIDS lowers investment in human capital of children since ". . . the expected pay-off (*from this investment*) depends on the level of premature mortality among the children when they

attain adulthood" (see Bell, Devarajan, and Gersbach 2006, page 59; our italics). This mechanism may be applicable for high-prevalence countries such as South Africa, but is not quite relevant for India, with a prevalence rate of just 0.36 percent and where there are many other compelling reasons for not sending children to school. Overall, it thus appears likely that the adverse impacts of HIV and AIDS on economic growth or GDP per capita in India will remain limited.

A different approach estimated the welfare impacts of HIV and AIDS as a decline in the utility that can be derived from a consumption stream over the lifetime of an individual. Using this type of model, Crafts and Haacker (2003, 2004) find that the primary impact of HIV and AIDS arises from its impacts on mortality (reducing the expected duration of the lifetime consumption stream). For India, Haacker (this volume), using this approach, estimates that the annual welfare costs of HIV and AIDS amount to around 3 percent of GDP, much higher than any estimates of the impact of HIV and AIDS on GDP.[2]

However, this approach is also not very well suited to capture the complexities and the implications of the impacts of HIV and AIDS at the household level. The most significant household survey regarding the impacts of HIV and AIDS in India to date is the one by Pradhan and others (2006, also discussed by Haacker, this volume). Their findings highlight the adverse impacts of HIV and AIDS in particular on households in poorer wealth quintiles and on widows affected by HIV and AIDS. More generally (not specific to India), studies using household data find a considerable impact of HIV and AIDS on income, consumption, and children's education. Booysen and Bachmann (2002) find that the decline in per capita income in HIV households in South Africa is 40 percent to 50 percent. while the fall in per capita food expenditure is 20 percent to 30 percent. In Indonesia, Gertler et al. (2003) find that death of a male in his prime is associated with a 27 percent reduction in mean per capita household consumption. Many studies have reported a negative impact of HIV and AIDS on children's schooling. Deininger et al. (2003) show that foster children were at a distinct disadvantage in both primary and secondary school attendance before introduction of universal primary education. Gertler et al. (2003) find that orphans are less likely to start school and more likely to drop out. Yamano and Jayne (2005) and Evans and Miguel (2005) find the negative impact of adult mortality on school attendance of children to be more severe in poor households.

Finally, we provide some background that motivates our interest in integrating mental health in the evaluation of the welfare costs of HIV

and AIDS. Most directly, counselors and doctors working with HIV patients in India are unanimous in their opinion that the psychological and emotional costs on the HIV patients and their families are enormous. The medical science literature has long appreciated this aspect of terminal illnesses (see, for example, Emanuel et al. 2000; Grunfeld et al. 2004 for some recent work). In social sciences, this is related to an emerging body of literature on happiness and mental well-being (see, among others, Easterlin 1974, 2003; Blanchflower and Oswald 2004, 2007; Clark and Oswald 1997; Frey and Stulzer 2002; Gilbert 2006; Graham 2007; Helliwell 2006; Kahneman et al. 2006; Layard 2005; Lucas et al. 2004; Smith et al. 2005; Ubel et al. 2005). The mental well-being research is proven to be well suited in situations with limited information on welfare effects of unemployment, divorce, smoking, and so on. This approach can be used to evaluate effects of HIV and AIDS on significant fear of early death and stigma. While researchers have worked in painstaking details to investigate the determinants of happiness and mental well-being (see, for example, Andres 2004; Blanchflower and Oswald 2004, 2007; Case and Deaton 2006; Helliwell 2006), very little research has been done to quantify the value of mental health.[3] Given the importance of the psychological and emotional costs, the HIV experience in India gives us this unique opportunity to integrate mental health in welfare evaluation and to quantify its significance in welfare loss of the family.

A Survey of Households Affected by HIV and AIDS

In light of the low level of HIV prevalence in the population, our sampling process involves identifying households affected by HIV and AIDS through networks of physicians. The control group of "non-HIV households" is based on interviews of households from similar locations (villages, residential clusters). This process and other issues regarding the sampling process are discussed among our *considerations regarding data collection*. The presentation of our findings then proceeds in two steps. First, we present data on *socioeconomic characteristics of individuals and families affected by HIV and AIDS*. Second, we discuss our findings regarding variables included in the survey to serve as *indicators of the impact of HIV and AIDS*, such as measures of physical health, mental health, or the impact of HIV and AIDS on the household's labor supply and income. Our discussion is rounded out by a presentation of several case studies of households affected by HIV and AIDS (box 4.1).

Box 4.1

Case Studies of Financial Impact of HIV and AIDS

Case 1. Both adults HIV-positive (time since detection: 1 month). The surveyed patient is a 28-year-old woman from Jamalpur, U.P., who has been diagnosed with HIV a month ago. She had studied up to eighth grade and her husband up to ninth grade. She is a housewife and is getting herself treated in a free government clinic in Delhi. She spends about three days on the trip to Delhi to get her medicines. Her husband, who used to own a truck and drive it, was also diagnosed with HIV a couple of months ago and was probably the source of her infection. He used to earn about Rs. 15,000 a month, but recently, due to recurring fever, has been unable to work any more. The patient recently had a stomach surgery at the cost of Rs. 30,000 in a private hospital. The family has sold their truck for only Rs. 50,000. Jewelery valued at Rs. 7,000 has been sold out of the stock valued at Rs. 9000. Their entire personal savings of Rs. 10,000 has been spent, and the patient's husband has borrowed Rs. 10,000 from one of his siblings. The couple lives in a joint family with his parents in their ancestral home. Currently her father-in-law, with an income of Rs. 4,000–5,000 per month, provides for their living expenses. The family has cut down on their food, clothing, and entertainment expenses.

Case 2. Both adults HIV-positive (time since detection: 2 months): The patient is a 37-year-old man in Orissa who owns a tea stall, and three months ago used to earn Rs. 4,000 per month. He has five years of schooling, while his wife has four years of schooling. He has been suffering from TB for six months and was diagnosed with AIDS two months ago. His wife has also been detected with HIV, but has no symptoms. Her ex-husband died of TB. The patient thinks that he got infected during tattooing, but he may have contracted the infection from his wife, who in turn had the virus transmitted from her ex-husband. The family lives in an ancestral house. They have spent Rs. 12,000 on testing and medicines in the last three months. Currently, the family income is zero, whereas the medical bill is Rs. 7,000 per month. The patient firmly believes that with good medicines he will recover fast and go back to work. The monthly household expenses of Rs. 9,300 are being paid by his brothers. It is not clear how long it is feasible for this transfer to continue.

Case 3. HIV-positive widow (time since detection: 1 year): The patient is a 40-year-old illiterate widow living in Delhi. She lives with her two sons' families. She owns the house she lives in, but her sons pay for her living expenses. The family income is only Rs. 4,000 per month, and, not surprisingly, the family did

not have any savings when she fell ill. She says that she got infected due to unprotected sex with her neighbors after her husband died. During detection of her infection a year ago, the family spent Rs. 36,000 on testing and medicines, and currently her monthly medical expenditure is Rs. 1,500 per month. But since her detection she has sold one room of her two-room house for Rs. 75,000 and jewelry of Rs. 5,000. In addition, she has taken a loan of Rs. 50,000 from a money-lender. The loss of assets and increase in indebtedness do not match her medical needs. Perhaps there is some other reason that has not been mentioned. She is still in a state of depression. As compared to the family income, the financial loss in just one year is quite staggering.

Case 4. Man HIV-positive, woman HIV-negative (time since detection: 1.8 years): The patient is a 24-year-old male from U.P. who lived away from his family while working in Orissa for two years. He is a college graduate and his wife has studied up to two years in college. He used to earn Rs. 6,000 a month at a government job. He suspects that he got infected due to unprotected sex with commercial sex workers (CSWs). His infection was detected only when he returned home two years ago with TB and recurring fever and was unable to work any more. He believes he will not be able to work ever again. He now stays in his ancestral home with his wife, one child, parents, and two siblings. His wife is not infected and is a housewife. As he is unable to work, his parents, with an income of Rs. 8,100 per month, support him and his family. Since the time of detection they have spent Rs. 31,000 on testing and medicines. In addition, their monthly expenditure on medicine has gone up by Rs. 1,000. But the nuclear family is managing well due to the support of the extended family. The patient has current personal savings of Rs. 10,000 and has not had to sell any assets or take loans to cover his expenses.

Case 5. Both adults HIV-positive (time since detection: 2.8 years): The patient is a 27-year-old male from Haryana, who has been living with his wife, children, parents, and siblings. He has studied up to fifth grade and before detection he earned Rs. 5,000 per month working as a truck driver, staying away from his wife an average of 12 days in two weeks. He suspects that he got infected due to unprotected sex with CSWs. Currently he is unable to take the strain of his earlier job in which he worked for 12 hours every day, and instead works on his family farm for two hours daily. After his detection, his wife was tested and was also diagnosed with HIV the same month, most likely infected by her husband. But she is totally asymptomatic and continues to work on the family farm as before. Their

(continued)

Box 4.1 *(Continued)*

family income is Rs. 3,300 per month. Their loss of income due to HIV is Rs. 5,000 per month. He has spent a total of Rs. 3,850 on his medicines and testing. As a result of low income they have to curtail their monthly expenditure on food and clothing by Rs. 140, but have increased medical expenditure from nothing to Rs. 600. His father now pays Rs. 1,000 per month. In addition, the family has borrowed Rs. 50,000 from a moneylender at a monthly interest rate of 2 percent, which they believe they would be able to pay off in the coming two years. But given that they are barely surviving with their current income, it is not clear how they will manage to do so.

Case 6. Man HIV-positive, woman HIV-negative (time since detection: 5 years): The patient is a 41-year-old male from Orissa who lived away from his family in Surat working as a factory worker. He was diagnosed with HIV five years ago. He worked for 12 hours a day, 7 days a week, and made Rs. 3,000 per month. Both husband and wife have studied up to third grade. Since his detection he lives with his family in Vishakhapatnam (closer to Orissa than Surat), where he and his wife sell snacks. His wife is not HIV positive. Earlier his wife did not work. Their family income is now only Rs. 1,600 per month. In the five years since his detection, the family has sold Rs. 35,000 worth of jewelery, and spent their entire personal savings of Rs. 20,000. In addition, they have also borrowed Rs. 40,000 from a moneylender at a monthly interest rate of 2 percent for treatment.

Source: Authors' study.

Considerations Regarding Data Collection

To better understand the social and economic impact of HIV and AIDS for the individuals affected and their households, and—ultimately—to arrive at estimates of the economic cost of HIV and AIDS in India, we need a data set describing the socioeconomic characteristics of households affected by HIV and AIDS, as well as corresponding data for a control group not affected by HIV and AIDS. In some countries with high prevalence rates of HIV and AIDS (for example, South Africa, with an estimated HIV prevalence of 19 percent of the population ages 15–49), such data are usually obtained by adding questions regarding the HIV status or the impact of HIV and AIDS to household surveys. The same approach does not work well in India, especially for a survey specifically designed to capture the impacts of HIV and AIDS, as obtaining responses

from an adequate number of people living with HIV and AIDS (say, 500) would require sampling a very large number of people not affected by HIV and AIDS (about 100,000, assuming an HIV prevalence around 0.5 percent) as opposed to a sample of about 2,600 in South Africa to locate 500 with HIV and AIDS. .

Second, in light of the paucity of data on the socioeconomic effects of HIV and AIDS in India, we designed a relatively elaborate questionnaire, which took about 1.5 to two hours to fill out. Also, soliciting responses from families affected by HIV and AIDS is a formidable task to start with due to the confidential nature of HIV infection. To ensure the necessary trust of patients, we expected that only doctors who knew us personally (including some of our field surveyors who worked with HIV patients earlier) would agree to the surveying of their patients, and the latter would trust our word of confidentiality.

We thus started with our professional network of physicians in New Delhi, who referred us to other doctors/NGOs in various parts of the country. In this manner, we collected data from both high- and low-prevalence states where transmission was predominantly heterosexual, as 86 percent of all transmission in India is through this route (table 4.1). At the same time, the sample states represent the four different regions of India: north (Delhi and Uttar Pradesh), south (Tamil Nadu and Andhra Pradesh), east (Orissa), and west (Maharashtra). Overall, our sample comprises 371 families where there is at least one member who is infected by HIV (*HIV families*).[4] We have also collected data from 479 families where there is no reported incidence of HIV (*non-HIV families*). The selection of non-HIV families was based on geographic proximity (same district and, where possible, same village or same residential cluster in a town)[5] and economic similarity (based on similar kind of residence) to the surveyed HIV

Table 4.1 Regional Distribution of Sample (Units)

State	*Families affected by HIV*	*Families not affected by HIV*
Low-prevalence states (Delhi, Uttar Pradesh, Orissa)	179	268
High-prevalence states (Tamil Nadu, Andhra Pradesh, Maharashtra)	192	211
Total	371	479

Source: Authors' survey.

families.[6] The distribution of HIV and non-HIV families across the different regions is given in table 4.1. In our analysis, we look at the effect of HIV on the infected adult, his or her spouse (if living) and his or her children (if present). We define this unit as "*family*." This is different from a *household*, as there may be members other than the above individuals in cohabitation, but we ignore the effects on them.

The doctors/NGOs explained the motives of our study to their patients, but the choice to be surveyed was ultimately left to individual patients. All patients contacted by an NGO in a state (Andhra Pradesh and Orissa) agreed to be surveyed and were surveyed by local personnel of the NGO (due to language constraints) in their households, but after being trained by our surveyor from Delhi. Consent forms were signed by all. Patients of doctors were mainly surveyed at the hospital or clinic of the doctors. A few declined the survey due to shortage of time. Seven of the patients mentioned only their district of residence rather than their village.

Even though this sample is not random, it is not a result of endogenous sampling, either. The criterion on which our sampling was done is largely uncorrelated to the nature of HIV infection, and standard econometric methodology is valid. We may be missing some rich urban patients who go to private doctors and are reluctant to participate in surveys, or infected individuals who do not receive treatment by a doctor. But this criticism is equally valid with regard to the profile of patients collected by the official National AIDS Control Organisation (NACO), or essentially any other HIV and AIDS-related survey, and we are therefore confident that our approach represents best practice. To account for oversampling of HIV patients in the overall population, we have used appropriate weights using NACO figures in our prediction of the effects of HIV and AIDS for the entire country.

Socioeconomic Characteristics of Individuals and Families Affected by HIV and AIDS

The total number of HIV-affected individuals in our sample is 497, of which 58 percent (288) are male and 42 percent (209) are female. HIV prevalence is highest among the cohorts ages 25–35 (table 4.2). Women tend to become infected at an earlier age. More than half of the women diagnosed with HIV and AIDS are age 30 or younger, but only 38 percent of males belong to this age group. The mean age of people living with HIV and AIDS is 33.

The occupation profiles of people living with HIV and AIDS (table 4.2) differ significantly by gender. Most of the males worked as factory

Table 4.2 Age Distribution and Occupation of HIV-infected Individuals
(Percent)

Age range	*Male*	*Female*	*Occupation (before being diagnosed with HIV)*	*Male*	*Female*
			Agricultural laborer	4	10
0–5	2	2	Unskilled worker	6	6
6–10	0.7	1	Truck driver	6	0
11–14	0.4	0.4	Auto/taxi/car/bus driver	10	0
15–18	0.8	0.0	Industry and factory worker	26	3
19–24	7	16	Hotel staff	3	0
25–30	27	32	Business owner	3	0
31–35	33	20	Petty shop owner	4	3
36–40	20	11	Housewife	0	60
41–45	11	2	Student	4	2
46–49	3	1	Other services	5	2
50+	5	2	Unemployed	5	3
TOTAL	100	100	Other occupations	24	10
			Total	100	100

Source: Authors' survey. Data may not add up to 100 due to rounding.

workers, or in certain types of services.[7] We highlight this here because of the increasing concern of HIV being spread among migrant laborers. Most of the factory workers and auto/bus drivers belong to this group. Among HIV-affected females in our sample, about 60 percent were housewives, while the next biggest group is agricultural laborers. The high share of female agricultural laborers may reflect that these are frequently spouses of migrant workers, suggesting one way in which the HIV virus enters the rural economy, that is, through migrant workers infecting their spouses when they visit home.

The average years of schooling among HIV-infected males is 10.3 years, while the average years of schooling among males in the control group is 8.4 years. The corresponding figures for females are 5.46 years and 5.2 years, respectively. While the PLWHA (people living with HIV and AIDS) in our sample are not very educated, it is interesting to note that the level of education among males is higher than that in the control group.

Additionally, our data capture the amount of time passed since a person was diagnosed with HIV, varying from less than a month to seven years (table 4.3). Consistent with our findings regarding the composition of "ever-married" households (mostly female or female-led, suggesting that in many cases of coinfection, males die first), we see that

Table 4.3 Time since HIV Detection

Age range	*Total*	*Males*	*Females*
Less than or equal to 6 months	30	28	34
7 months – 1 year	17	17	17
1–2 years	17	17	17
2–4 years	26	28	24
4–7 years	10	12	8
Total	100	100	100

Source: Authors' survey. Data may not add up to 100 due to rounding.

Table 4.4 Distribution of Households by Family Type
(Percent)

Family type	*HIV*	*Non-HIV*
Currently married	61	71
Never married	14	22
Ever married	25	7
Total	100	100

Source: Authors' survey. Data may not add up to 100 due to rounding.

among people living with HIV and AIDS, males are—on average—infected earlier than women.

Table 4.4 shows the various kinds of family structures in our data. Our sample includes "currently married" families where both adults are alive, never-married families (unmarried males or females) and "ever-married" families (widows, widowers, separated, and divorced). The higher proportion of ever-married families among HIV families is in most cases a consequence of death of an adult due to HIV and AIDS.[8] Our data point at the important role of coinfection between couples—in 54 percent of the "currently married" families affected by HIV and AIDS, both adults are infected with HIV and AIDS, while in 42 percent of them, only the male adult is infected, and in only 6 percent of cases only the female adult is infected. A one-member family is "male" or "female," depending on the gender of the only adult member. Of the never-married HIV "families" 84 percent are male, while 76 percent of the ever-married families are female. These cross-sectional data also provide some pointers regarding the dynamics of infection and coinfection between couples, as they are consistent with a pattern in which HIV in many cases is acquired first by a male, who then passes the virus on to his wife.

There are 1,418 children in our sample, of whom 1,189 are less than 18 years of age. The average number of such children per HIV family

(among families who have children) is 2.16, while the average number of such children per non-HIV family is 2.22. We assume that parents make decisions for children who are 18 years old or younger, and that children older than 18 are able to make decisions for themselves. For obvious reasons, schooling decisions are considered only for children of age 6 and older. The total number of such children is 892. Among HIV families, the average number of such children is 1.9, while the corresponding number for non-HIV families is 2.1.

Indicators of the Impact of HIV and AIDS

While the preceding section focused on indicators of the socioeconomic structure of families and individuals affected by HIV and AIDS, the present section discusses findings regarding variables that capture the impacts of HIV and AIDS on health, well-being, and the economic status of those affected.

Physical health status (H). The survey asked a number of questions on the occurrence of common symptoms of infection (fever, diarrhea, cough and cold, loss of appetite, general body ache, headache), and regarding some diseases and symptoms that are seen more often in HIV patients than non-HIV, such as tuberculosis, oral ulcers, and genital ulcers. The reference period for the above symptoms was the last three months.[9]

Given the symptoms, we enlisted an expert on HIV and AIDS assessment and treatment at a government antiretroviral treatment (ART) clinic, who assigned a numerical index based on the symptoms for all of the HIV and non-HIV respondents. This study uses that index as a measure of morbidity. The index ranges from 1 to 11, with 11 being the healthiest and 1 being the worst health. Where possible, we also tried to measure height and weight of individuals to be able to calculate a body mass index (BMI), which is commonly used as a measure of physical health. We also asked HIV patients to recall their normal weight before HIV detection, but in many cases where we felt the patient was not sure we did not record his or her weight. Table 4.5 summarizes various health indices by gender and HIV status.

Our data suggest a moderate decline in BMI following detection, and a lower BMI for people living with HIV and AIDS relative to the non-HIV group. However, none of these differences are statistically significant at a 5 percent confidence level. The health index based on morbidity is significantly lower for HIV individuals as compared to that of non-HIV individuals (t value of 16.5; significant at 1 percent under the alternative

Table 4.5 Health Indices

Age range	*Health index (Current)*	*Body mass index: BHD**	*Body mass index: Current*
HIV			
Male	7.8 (1.8)	20.26 (2.95)	19.04 (3.03)
Female	8.6 (1.9)	21.67 (5.72)	19.76 (3.72)
Average family	8.5 (1.5)		
Non-HIV			
Male	10.3 (1.1)	n.a.	20.78 (3.61)
Female	10.5 (0.9)	n.a.	20.90 (4.29)
Average family	10.3 (0.8)	n.a.	

Source: Authors' survey.
Note: Standard errors in parentheses.
* Based on a smaller sample.

hypothesis that non-HIV morbidity is higher). In our sample, the morbidity of HIV males is significantly higher than that of HIV females, which may reflect that usually husbands are infected earlier.

Since our analysis is at the family level, we construct the average health of a family by taking the mean over the health of existing adults in the family. This controls for the different number of adults in families. Thus, as expected, HIV families have lower physical health as compared to non-HIV families.

Mental health (M). Indicators of mental health (IMH) are based on self-reported occurrence of some feelings in a reference period by the respondent and spouse (for married respondents). Questions on feelings were asked using the questions in Case and Deaton (2006). The following statements were made and the respondents were asked if in the last 15 days the feeling captured by each statement occurred "hardly ever, sometimes, most of the time, or never."

- I felt that I could not stop feeling miserable, even with the help of my family and friends.
- I felt depressed.
- I felt sad.
- I cried a lot.
- I did not feel like eating; my appetite was poor.
- I felt everything I did was an effort.
- My sleep was restless.

The ranking of mental health was obtained by assigning a number to each answer: "never" was given 4 points, "hardly ever" 3 points, "sometimes" 2 points, and "most of the time" 1 point. Using these values, we constructed two indices: The minimum of the points across all questions answered by the respondent and, where present, by his or her spouse (denoted IMH_1 in table 4.6). This is the Rawlsian "maximin" criterion and is consistent with basic axioms regarding aggregation (Sen 1986). It does not rely on cardinality (as an average would have), and gives equal importance to all questions. It does, however, assume comparability of this ordinal measure across different subjects. To check if this makes a big difference, we also consider another index (denoted IMH_2 in table 4.6) which is similar in its Rawlsian flavor but uses responses to only one question: "I felt depressed."

Table 4.6 summarizes the distribution, with higher values of the index indicating a higher level of mental health. It is clear that the distribution of IMH_1 as well as IMH_2 for non-HIV families always dominates the distribution for HIV families. Thus, non-HIV families are mentally better off whichever index one considers.

Presence of stigma. What makes HIV different from many other diseases is the fear of stigma. In our sample, there are a large number of individuals who have not disclosed their infection to either their household members or their neighbors or their friends or at their workplace. Table 4.7 summarizes the proportion of HIV-positive individuals who have not disclosed their HIV status. This information is available only for the main respondent with HIV of the family. In cases where spouses are HIV positive we do not have the necessary stigma information for each separately.

It is apparent that patients generally avoid telling people outside their immediate household about their HIV infection. However, it could be

Table 4.6 Mental Health: Relative Frequency
(Percent)

	HIV families		*Non-HIV families*	
	IMH_1	*IMH_2*	*IMH_1*	*IMH_2*
"Most of the time" (1)	82.43	57.77	37.74	5.76
"Sometimes" (2)	14.05	28.34	17.82	15.57
"Hardly ever" (3)	3.24	7.36	24.95	23.67
"Never" (4)	0.27	6.54	19.50	55.01

Source: Authors' survey.

Table 4.7 HIV Patients Who Do Not Disclose Their Infection
(Percent)

Not disclosed to household members	25
Not disclosed to neighbors	74
Not disclosed to friends	72
Not disclosed at the workplace	85

Source: Authors' survey.

argued that this is merely a personal choice and not because of fear of discrimination. In our sample, among those who chose not to tell some of the above list of people, 64 percent reported that they did not do so because of one of the following reasons:

- They would think I was a person with bad moral values.
- They would force me to leave the community.
- My family would get a bad name.
- They would reject my whole family.

Thus the fear of stigma is not unfounded.

Labor supply. Our data regarding the employment status of people living with HIV and AIDS illustrate the impact of HIV and AIDS, but also the differences in the socioeconomic status of men and women. Table 4.8 shows that, for an employed HIV-positive male, the probability of becoming unemployed upon the HIV-positive status being detected and the workplace finding out is 20 percent. While some of that is offset by males who have gained employment since being diagnosed with HIV, the data point to a negative impact of HIV and AIDS on employment. Similarly, the sample unemployment rate among males living with HIV and AIDS (13 percent) is much higher than the rate of 5 percent for this group before being diagnosed with HIV (table 4.8). The picture for women is different: 21 of the 132 women living in families with HIV and AIDS who were unemployed or housewives before detection subsequently gained employment. One key factor behind this appears to be the loss of an income earner in the family, as 13 of these 21 women were widows.

Table 4.9 shows a similar picture. As expected, the health status of non-HIV males supplying labor outside the household is higher than for males living with HIV and AIDS, as well as for the non-HIV males who do not supply labor outside of the household. While the causality behind this correlation may run either way, we note that the gap between those

Table 4.8 Transition in Employment Status Following HIV Diagnosis
(Percent)

	Probability of Changing Status to:		
Status before HIV diagnosis;	*Employed*	*Unemployed*	*Housewife*
Employed			
Males	80	20	0
Females	90	8	2
Unemployed			
Males	7	93	0
Females	29	71	0
Housewife			
Nonwidow	11	0	89
Widow	35	0	65
Proportion of people living with HIV and AIDS by different status	74	15	11

Source: Authors' survey.

Table 4.9 State of Health by HIV Status and Gender (index)

	Non-HIV	*HIV*
Male labor supply is positive	10.34 (0.97)	8.09 (1.72)
Male labor supply is zero	10.08 (1.66)	7.02 (2.03)
Female labor supply is positive	10.45 (0.99)	8.53 (1.75)
Female labor supply is zero	10.57 (0.82)	8.72 (2.00)

Source: Authors' survey.
Note: Standard errors in parentheses. For details on the definition of the health index, see the discussion of the physical health status and table 4.5 above.

supplying labor and those who don't is much higher for people living with HIV and AIDS, suggesting that the impaired health status is causing the withdrawal from the labor market. For women, the health status of the group not supplying labor outside the household is somewhat higher than for those supplying labor outside the household, especially for women living with HIV and not supplying labor. This may reflect that the group not supplying labor is dominated by women from wealthier households, who withdraw from the labor market voluntarily and are in a better position to cope with the impact of the epidemic.

The effect of HIV can also be observed in terms of the quality of labor that is supplied. Table 4.10 highlights the self-reported effects on concentration during work and on problem-solving abilities. While in the short run these may not affect the wage earnings of the employed, they definitely affect their productivity and hence will affect the economy. Since

Table 4.10 Indicators for Impact of HIV and AIDS on Labor Productivity
(Percent)

Employed HIV patients who said "concentration/attention in daily work" had declined after HIV detection	54
HIV patients who said "speed in problem solving and decision making" had declined after HIV detection	56

Source: Authors' survey.

we do not explicitly model the production sector, we are not able to capture this effect here.

Morbidity may also affect the quantity of labor supplied, but there are also other factors that could play a role. For example, individuals could choose to supply labor based on wages; however, a simple correlation between wages and labor supply may be misleading if education levels sort individuals into various occupations, and a well-paying job comes with more certain employment and therefore more days of work.

For working males, we therefore check if the number of days of work in a week depends on the wage per day after controlling for their occupation, education, health status, the number of members in the family, and a dummy indicating whether the male is HIV-positive. We find that only the occupation dummies are significant (see appendix B, table B.1, for estimation results). This suggests that, conditional on being able to work, individuals cannot choose the number of days of work. This is consistent with the common notion of India being a labor-surplus economy. Hence, for the rest of the analysis, we take the labor days of males as exogenous with respect to wages.[10]

Effects on children. Does HIV in families affect school attendance? To answer this question, we measure the proportion of children in the age group 6–18 in a family (multiplied by the schooling expenditure on them to adjust for the quality of schooling) attending school. It seems that while both parents are alive, there is no big impact of HIV on school attendance. However, it is clear from the data on one-parent families that there are significant effects on school attendance when one parent is dead. From table 4.11 below, we can see that financial resources cannot be one of the reasons. This reflects the long-run adverse impact of HIV on human capital development.

Income, expenditure, and external funding. In order to obtain an impression of the forms the financial impacts of HIV and AIDS on families may

Table 4.11 HIV and AIDS and Children's Enrollment

	School attendance, ages 6–18 (Percent)	*Quality-adjusted attendance*
Families affected by HIV and AIDS		
Widow	73	71
Widower	75	106
Currently Married	93	152

Source: Authors' survey.

take, box 4.1 discusses a few cases in some detail. The first two cases examine the impacts around the time of an HIV diagnosis; the other four are spread out over the sample time span since HIV diagnosis. Most of the families covered in box 4.1 experienced a loss in income following the HIV diagnosis, an increase in medical expenditures, and a curtailing in nonmedical expenditures. In four of the six cases, the families received support from relatives. In many cases, the increased financial needs (owing to lower income and higher expenditures) were financed by liquidating family assets or borrowing from family or moneylenders.

Table 4.12 summarizes the income and expenditure profiles of families affected by HIV and AIDS, as well as those of the control group. In many cases, it is not possible to "translate" family support, the sale of assets, or borrowing into monthly financial flows. Our summary table therefore captures such flows only indirectly under the heading "dissaving/financial support," in terms of the excess of household expenditure over incomes.[11]

Per capita incomes of the HIV and non-HIV families are not significantly different from each other. Families headed by widows have the lowest income. In comparing married families with HIV and families headed by widows, it is interesting to note that while income falls for both families, per capita consumption does not. The main reason for this is likely the rather large amounts of net external funding.

Outline of the Model

The measurement of the economic cost of HIV and AIDS for India is based on a model given in detail in Das, Mukhopadhyay, and Ray (2007). This section sketches out the main arguments of that paper. The unit of analysis is the nuclear family, consisting of a man, woman, and their children. All economic decisions of the family, including the decisions for the children, are taken by the adult members. The family maximizes its utility

Table 4.12 Per Capita Inflow and Outflow of Funds (rupees per month)

	HIV	*Non-HIV*	
Family type	*Sample average (standard errors in parentheses)*		t *values**
Currently Married			
Income	930 (1,116)	1,109 (1,121)	**1.87**
Consumption expenditure	760 (721)	690 (764)	1.10
Medical expenditure	190 (276)	69 (186)	**5.80**
Schooling expenditure	40 (75)	37 (56)	0.51
Dissaving/Financial support	60 (913)	–312 (1,039)	**4.5**
Never Married			
Income	2,054 (3,156)	2,171 (2,510)	0.23
Consumption expenditure	2,664 (1,873)	2,123 (1,556)	**1.77**
Medical expenditure	1,675 (7,069)	237 (578)	1.44
Dissaving/Financial support	2,285 (7,639)	188 (2,594)	**1.89**
Ever Married (Widows)			
Income	541 (1,314)	178 (224)	**2.28**
Consumption expenditure	753 (831)	419 (285)	**2.70**
Medical expenditure	159 (272)	29 (41)	**3.75**
Schooling expenditure	25 (55)	18 (34)	0.65
Dissaving/Financial support	396 (1,134)	288 (439)	0.61
Ever Married (Widowers)			
Income	1,375 (2,264)	1,969 (2,033)	0.68
Consumption expenditure	706 (663)	901 (798)	0.59
Medical expenditure	349 (550)	254 (472)	0.43
Schooling expenditure	56 (78)	6 (11)	**2.51**
Dissaving/Financial support	–264 (1,207)	–808 (1,351)	0.96

Source: Authors' survey.

Note: Standard errors in parentheses.

*The *t*-value relates to the one-sided test with a null hypothesis H_0: $|\text{Mean}_1 - \text{Mean}_2| = 0$ and an alternate hypothesis H_A: $|\text{Mean}_1 - \text{Mean}_2| > 0$. Bold type indicates that H_0 is rejected at the 5% level.

by allocating consumption expenditure (c), spending on children's education, and medical expenditure, with a utility function of the form

$$u = \alpha \log c + \beta \log(1 + M) + \gamma \log(1 + SC \cdot P_s) \quad (1)$$

for families with school-age children, and

$$u = \alpha \log c + \beta \log(1 + M). \quad (2)$$

for families without school-age children. Expenditure on children's schooling is defined as the product of per capita schooling expenditure SC and the proportion of school-going children P_S.[12] We observe that a

significant proportion of families in our sample (48 percent) do not have any children. We assume that these families do not put any weight on children's education, and hence maximize their utility only with respect to consumption and medical expenditure. Medical expenditure (*md*) enters the households' utility function indirectly as it affects the level of mental health (*M*), which is determined by

$$M = \delta_0 + \delta_1 \cdot md + \delta_2 \cdot H + \delta_3 HIV + 1 \cdot X. \quad (3)$$

Specifically, the link between medical expenditure and mental health may reflect the positive effect on expected future health for a given level of current health. Other key factors affecting mental health are the state of physical health *H* and whether a household is affected by HIV and AIDS (captured by an *HIV* dummy), as well as other household characteristics captured by the vector X (such as wealth, employment status, age, and gender) used in the recent literature on mental health and subjective well-being.[13]

Estimating the Costs of HIV and AIDS

In all our estimated equations we have pooled the relevant HIV and non-HIV samples. Since we have oversampled the former, we put low weights on those observations and higher weights on the non-HIV observations, so as to be representative of the Indian population (for details see Das et al.). The weights are computed using the overall prevalence data of the IIPS (2007) and the gender composition that is available from the National AIDS Control Organisation's last annual report.

We first estimate the mental health technology for all types of families for both indices of mental health—minimum mental health based on responses to all questions (IMH_1), and minimum mental health based on the question "I felt depressed" (IMH_2). Note that our mental health data are in discrete form, whereas the utility function uses a continuous measure. We easily obtain a continuous measure from the underlying latent variable obtained by estimating the mental health equation by ordered probit, which is appropriate for our observed ordered discrete measure of mental health. This is what we use in our utility function and empirical analysis below.

For both IMH_1 and IMH_2, better current health leads to better mental health. As hypothesized, controlling for health or HIV status, the higher the medical expenditure, the higher is mental health. This is an important

result for our model. We also find that HIV infection affects mental health negatively, irrespective of which measure one chooses. For the rest of the analysis, we report the results based on the mental health measure IMH_1 as it is a comprehensive measure based on all questions asked relating to mental health.

Given the continuous mental health measure, we then estimate the parameters of the optimum conditions of utility maximization separately for families with and without school-age children. In each case we pool HIV and non-HIV families. These estimates pin down our indirect utility functions for the families. Then the impact of the HIV epidemic at the family level is calculated by comparing the indirect utility functions of the families affected by HIV and AIDS with those of families not affected. To distinguish among different types of families, we represent the status of a family by the vector *(i,j)*, with *i* representing the male adult, and *j* the female adult. The markers *i* or *j* can take the values +, –, 0, or *na* to indicate whether the respective family member is HIV-positive (+), HIV-negative (–), deceased (0), or not available for unmarried, one-adult families. The position of *na* is determined by the missing gender in the family adult vector.

Let $V^{(i,j)}(S)$ denote the indirect utility function when the family HIV status is (i,j), as defined above.[14] The loss to the country then is:

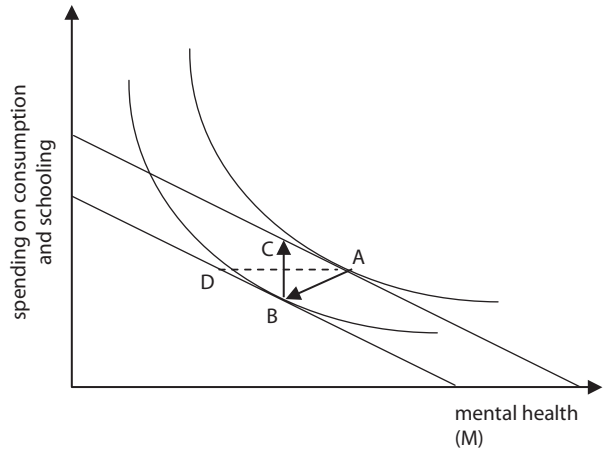
$$\int_{(i,j)} \left(V^{(-,-)}(S) - V^{(i,j)}(S)\right) \cdot d\mu(i,j),$$

where $\mu(i, j)$ stands for the measure of families with HIV status *(i, j)*. To calculate the amount that would be required to compensate a family for the losses associated with HIV and AIDS, we introduce the parameter τ to denote the hypothetical transfer that is needed to equate the indirect utility of a given type of HIV family with the reference non-HIV family. In other words, the monetary equivalent of the loss to the family *(i,j)* is given by the transfer $(\tau^{(i,j)})$ measuring the compensating variation to the family *(i, j)* and is defined by:

$$V^{(i,j)}(S|\tau) = V^{(-,-)}(S|0)^{-15}.$$

Our findings are summarized in figure 4.1 and table 4.13. First, in terms of the direct impacts of HIV on mental health, we find that most of the reduced mental health can be attributed to impaired physical health (table 4.5) and to the HIV dummy, which may capture the implications for future health as well as some of the economic repercussions discussed

Figure 4.1 Estimating the Cost of HIV/AIDS



Source: Authors' calculation.

Table 4.13 Losses by Family Types

	Utility loss (per family per month): IMH_1 (Rs)	*Utility loss (per family per month): IMH_2 (Rs)*	*Loss from transfers (per family per month) (Rs)*
Currently Married			
Only male HIV	85,727	89,631	1,363
Only female HIV	68,502	83,658	574
Both HIV	91,663	101,266	1,327
Ever Married			
Widow HIV	94,394	106,063	2,214
Widower HIV	78,764	61,808	901
Never Married			
Males	86,324	61,039	2,084
Females	87,148	99,655	2,134

Source: Authors' estimates.

above. The impact of HIV and AIDS can therefore be summarized as a contraction in the combinations of mental health on one hand, and spending on consumption and schooling on the other hand, which can be attained by the household, with the shift from A to D in figure 4.1 representing this direct impact. As a consequence of this shift, the household, after reallocating its expenditures, may find itself at point B, representing a lower level of utility than before. To return to its previous level of utility, it would require a transfer corresponding to the distance between points B and C (compensating variation).[16]

Table 4.13 reports the money equivalent of welfare losses in the first two columns for both measures of mental health, in terms of the compensating variation illustrated in figure 4.1. We use a married non-HIV family as the reference group because being a widow, a widower, or unmarried can be a consequence of HIV infection. The losses for each category are weighed by the sample proportions of families with children and without children to calculate the current loss to each kind of family.

Table 4.13 shows that in the case of "currently married" families, the loss (using either measure), as expected, is greatest when both members are HIV positive. The highest loss among all family types occurs for widows living with HIV and AIDS or widow-led families. For this group, the adverse impacts of HIV and AIDS are exacerbated by a drop in family income.

In the last column of table 4.13, we report the losses associated with dissaving for each type of family (again with married non-HIV families as the reference group). These are positive because of lower savings or because of increases in money transfers from relatives. We treat these as losses as they represent reductions in the material wealth of the respective households due to loss of labor income and increased medical expenditure. These losses are the highest for the unmarried families and widows.

In order to obtain estimates of the costs of HIV and AIDS for all of India, we need to "scale up" our family-level estimates. However, we only have estimates of the total number of males and females living with HIV and AIDS in India, but no breakdown across the different types of "HIV" families listed above. We therefore use our estimates to impute the loss for males and females in our sample, and then impute estimates for India, assuming that the distribution of various family types is the same as in our data. To this end, we first compute the loss to each family (depending on its type). For married couples with one infected member, widow, widowers, and unmarried individuals, we ascribe the whole loss to the infected member. For married couples where both members are infected, we split the loss equally between both members. We then add up all the losses for our sample, and derive the loss per male and per female. We then scale these up in proportion to the number of HIV-positive males and females in India.

The total loss (using IMH_1) per month is Rs. 67,601 for a male living with HIV and AIDS and Rs. 65,120 for a female (the respective figures using IMH_2 are Rs. 76,986 for males and Rs. 84,272 for females). Based on a total number of 1.55 million males and 950,000 females living with HIV and AIDS in India,[17] this implies that the loss to the male population living with HIV and AIDS in India (using IMH_1) is Rs. 104.78 billion per month, and that for the female population is Rs. 61.86 billion per

month, adding up to a total of Rs. 166.64 billion per month. The total annual cost of HIV and AIDS per year, with 0.36 percent of the population affected, comes out at Rs. 1,999.8 billion (7 percent of GDP), which is more than the annual health expenditure of Rs. 1,356 billion (2004) for all ailments in India!

One obvious point of comparison for our findings is the literature estimating the costs of increased mortality. Haacker (this volume) summarizes this literature, and estimates these costs at about 3 percent of GDP for India (based on the most recent data on HIV prevalence), a similar order of magnitude (though somewhat lower) as our estimates. While it may be tempting, on the face of it, to add up these estimates of the impacts of increased mortality and our findings of the costs of HIV and AIDS based on mental health, the two approaches overlap more than it appears at first sight. First, mortality-based estimates such as the ones discussed and applied by Haacker are based on valuations of mortality risks implied by data on wages and professional mortality risks. However, these underlying estimates do not generally separate the adverse effects of the possibility of premature death and the expectation of a period of sickness; the estimated impacts of the welfare effects of increased mortality therefore also capture an increased expectation of sickness. Second, our estimates of mental health likely also capture the expectation of a premature death. Against this background, the fact that the two different approaches return broadly similar estimates of the costs of HIV and AIDS is encouraging.[18]

Concluding Remarks

Using primary household data, we estimate household utility function parameters that measure the relative importance of consumption, schooling of children, and mental and physical health effects of HIV and AIDS in India. Since mental health is not directly observable, we first compute an ordinal measure based on a series of questions following Case and Deaton (2006). Then we use an ordered probit model to obtain a continuous measure, which is then used to estimate the parameters of the family utility function. The welfare loss due to HIV is then obtained using the principle of willingness to pay to come up to the utility level of non-HIV married families, used as the benchmark.

We find that mental health effects are far more important than the effect of consumption or children's schooling in determining utility and the total welfare loss per month. The total annual loss for the entire country exceeds

India's annual health expenditure in 2004 and is 7 percent of GDP. This huge magnitude is not surprising as it includes private valuation of one's own life, as well as the loss from stigma. The additional loss due to loss of labor income and increased medical expenditure measured by the external transfers account for 5 percent of the country's health expenditure and 0.23 percent of GDP. Given that the HIV incidence rate is only 0.36 percent in India, these losses are quite staggering. Further, these losses are an underestimate since they do not take into account the long-term fall of transfers from relatives, borrowing, and sale of assets, and because we do not have any orphaned children in our sample.

Annex 4.1 Summary Statistics

	Mean	*Std Dev.*
Per capita monthly consumption (c)	1,019	1,189
Education (PS. SC)	70	170
Medical expenditure (md)	591	2,748
Family size (N)	2.9	1.38
Average physical health of family (H)	8.5	1.44
Maximum time span (ts)	2.07	1.71
Square of max time span (ts^2)	7.23	9.5
Wealth (W)	18,634	50,168
Age of child	11.6	3.5
Square of age of child	136	82
Average years of schooling of family members (E)	5.72	3.9
Number of children in family	3.04	1.42
Health of male member (H_m)	9.35	1.87
Age of male member (A_m)	29	14
Education of male member (E_m)	8.4	4.5
Number of school-age children (n_s)	1.04	1.24
Number of children under 6 years (n_p)	0.34	0.63
Education of female member (E_f)	5.2	4.5
Family resides in north India (D_{NORTH})	0.52	0.49
Family has female adult member (D_{FEM})	0.80	0.39
Patient lives in a joint family (D_{JOINT})	0.63	0.48
Family has at least one unemployed adult (D_{UNEMP})	0.12	0.32
Average age of adult members (Av_age)	32.4	8.7
Square of average age of adult members (Av_age^2)	1125	659

Annex 4.2 Determinants of Male Labor Supply

	Male Labor Supply (p-values)
Male wage *(w_m)*	–0.005 (0.603)
Male education *(E_m)*	–0.01 (0.198)
Female education *(E_f)*	0.007 (0.488)
W	0.0000006 (0.41)
Health of male *(H_m)*	0.0055 (0.84)
Number of school-age children *(n_s)*	0.02 (0.447)
D (Male member is HIV = 1)	–0.111 (0.173)
D (Unskilled laborer = 1)	0.59 (0.013)
D (Truck driver = 1)	0.77 (0.017)
D (Auto driver = 1)	0.84 (0.00)
D (Industry and factory workers = 1)	0.75 (0.00)
D (Hotel staff = 1)	0.79 (0.00)
D (Business owners = 1)	0.60 (0.04)
D (Shopkeepers = 1)	1.07 (0.00)
D (Service sector = 1)	0.65 (0.02)
D (Self-employed = 1)	0.57 (0.07)
D (Agriculture = 1)	1.58 (0.00)
D (Others = 1)	0.762 (0.00)
Number of observations	642
R^2	0.12

Source: Authors' survey and calculations
Note: Unskilled labor excludes agriculture laborers.

Notes

1. See, for example, Kambou, Devarajan, and Over (1992); Cuddington (1993a and 1993b); Cuddington and Hancock (1994); Bloom and Mahal (1997); Arndt and Lewis (2000); Bonnel (2000); and the Joint United Nations Programme on HIV and AIDS (UNAIDS 2004). Recent reviews of this literature can be found in Haacker (2004), Bell, Devarajan, and Gersbach (2006), and Corrigan, Gloom, and Mendez (2005).
2. Other papers using a similar approach include Bell (2005) and Philipson and Soares (2005).
3. Blanchflower and Oswald (2004) is the only work we are aware of that has used the coefficients of a subjective well-being equation to estimate welfare losses from incidents like divorce or unemployment. We compare our work with Blanchflower and Oswald (2004) in section 9.
4. Since an extremely small proportion of HIV patients in India get direct support from NGOs such as YRG CARE in Tamil Nadu, where the HIV families live in an HIV community, we did not survey such families even though we could have done so relatively easily.

5. In Delhi and Maharashtra, HIV patients were surveyed in the hospitals. We have home addresses of all these patients except seven for whom we have only the district. Hence in most cases it was feasible to sample non-HIV families from the same neighborhoods. In a few exceptions, the non-HIV families were sampled from neighborhoods with similar wealth levels in the same districts as the patients.
6. Since the data have not been collected to calculate prevalence, the proportions of HIV to non-HIV families should not be used to deduce prevalence.
7. We do not report current occupation data here as that is endogenous. While we do not use recall data for most of our analysis as it is unreliable, it is unlikely that the occupation before HIV detection will be misreported. Hence we use this part of the recall data.
8. While in many cases widows do not list AIDS as the reason for death of their spouse, they mention diseases like TB, which make it likely that the spouse did suffer from HIV but it was not detected.
9. We are aware that health experts are in favor of much shorter reference periods, for example last 15 days. We extended the period to pick up the fact that PLWHA do, on the average, have higher morbidity but go through periods of "normal" health and so we wanted a long enough period to pick up this difference.
10. It appears unreasonable to assume that in mainstream Indian society, not working is a choice for males, and only 6 percent of males not infected with HIV (who are less health constrained than those living with HIV and AIDS) do not work. Female labor supply is ignored because, as seen in table 4.2, 65 percent of them did not work before HIV detection in the family, and after it only a few do so.
11. Apart from labor income, in some cases, there are rental incomes, which we add to calculate total income of a family.
12. *Proportion* seems to be the right weight rather than the *total number*. Multiplying with the total number has the undesirable property that it gives undue advantage to having more children. We focus on the quality of a representative child.
13. While medical expenditures can be considered to improve health, poor health triggers higher medical expenditures. Consequently, medical expenditure and current health are negatively correlated in our sample. With our data set, we are not able to disentangle these two effects and therefore treat the current state of health as predetermined.
14. Here S stands for all the exogenous variables in the model: $S = (Y, H, N, n_s, W, \text{ts}, D_{HIV}, D_{FEM}, D_{JOINT}, \text{Av\_age})$.
15. We do not differentiate between the equivalent variation (an income loss equivalent to the welfare loss associated with the impacts of HIV and AIDS

on economic status, physical health, and mental health) and the compensating variation (a transfer that would return the household to the same utility level as it enjoyed before the onset of HIV and AIDS, because the log-linear structure of the utility function, coupled with the linear mental health specification, mean that these two measures coincide.

16. Differences in the composition of households would change the shape of the indifference curves in figure 4.1. As we find that such changes have a minor impact on our findings, figure 4.1, for illustrative purposes, abstracts from this effect.
17. This assumption is in line with the latest estimates of the total number of people living with HIV and AIDS in India (2.5 million), while assuming the same breakdown by sex as NACO.
18. Another reference point is the literature attempting to quantify subjective well-being. For example, Blanchflower and Oswald (2004) estimate large figures for welfare loss associated with adverse events. For example, they estimate that a typical individual in the United States or Britain would need US$100,000 per annum to compensate for the loss in well-being resulting from divorce. The corresponding figure for job loss for an average male is US$60,000 per annum.

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