

HIV/AIDS AS AN ECONOMIC DEVELOPMENT RISK IN SOUTH ASIA

Prepared for volume on
HIV/AIDS as an Economic Development Risk in South Asia,
World Bank, 2007

Word count: 16638

By Markus Haacker

Contents

Page

HIV/AIDS as an Economic Development Risk in South Asia	1
Introduction.....	1
HIV/AIDS an Economic Development Risk in South Asia?.....	2
The State of HIV/AIDS and the Demographic Impact	6
The Economic Impact of HIV/AIDS: Aggregate Approaches	10
Beyond Aggregate Measures of the Impact of HIV/AIDS.....	16
Economic Development Aspects of the Response to HIV/AIDS	23
Summary and Conclusions	34
References.....	37

Tables

1. Key HIV/AIDS Statistics.....	8
2. The Demographic Impact of HIV/AIDS in South Asia.....	9
3. South Asia: Welfare Effects of Increased Mortality	15
4. Household Savings by Income Category	19
5. Access of Orphans to Education, Six Countries.....	22
6. Enrolment Rates by Income Category	23
7. HIV Awareness Across Population Groups.....	24
8. Access to Antiretroviral Treatment in South Asia	26
9. The Costs of Antiretroviral Treatment.....	30
10. Expanding Access to Antiretroviral Treatment	32
11. Antenatal Care Visits to a Medically Trained Person	33

Figures

1. South Asia and India: Contribution of HIV/AIDS to Mortality.....	4
2. Estimating HIV Prevalence and the Demographic Impact of HIV/AIDS	6
3. India: HIV/AIDS and Mortality by Age and Sex	10
4. Evaluating the Loss from Reduced Life Expectancy	14
5. Access to Treatment and Key Development Indicators	29

HIV/AIDS AS AN ECONOMIC DEVELOPMENT RISK IN SOUTH ASIA¹

Introduction

The epidemiology of HIV/AIDS in South Asia, as well as the economic context, are very different from the situation in high-prevalence countries which have motivated most of the studies on the economic development implications of HIV/AIDS, and the extent to which we can learn from this literature is therefore unclear. Against this background, the purpose of this present paper is two-fold – (1) summarize the available information on the impacts of HIV/AIDS specifically in South Asia, and (2) arrive at a comprehensive perspective of HIV/AIDS as an economic development issue in South Asia.

At the outset, we provide a discussion that refines our concept of **HIV/AIDS as an economic development issue in South Asia**. While the contribution of HIV/AIDS to the burden of disease in the region is relatively low in the region, the nature of the epidemic (concentrated among several high-risk groups) means that well –targeted prevention efforts can make a big difference regarding the scale of the epidemic. Much of our discussion here and further below focuses on ways in which HIV/AIDS affects other development objectives, and the challenges and development implications associated with the policy response to HIV/AIDS.

The second part of the paper addresses the **epidemiology and the demographic impact** of HIV/AIDS in South Asia. It sets out with a discussion of available source data and discusses the challenges involved in deriving estimates of overall HIV prevalence and the impact of HIV/AIDS on key demographic variables like mortality rates, life expectancy, or population growth, and presents measures of the demographic impact of HIV/AIDS based on estimates by the United Nations Population Program.

The third part addresses **aggregate measures of the economic impact of HIV/AIDS**. First, we discuss the magnitude of the impact of HIV/AIDS on economic growth. Second, we present estimates of the welfare effects of HIV/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/AIDS that arise when the impact of HIV/AIDS is asymmetric across population groups.

Part 4 summarizes the available information on the **impact of HIV/AIDS across population groups**. The main part of this section deals with the economic impact and

¹ The author is an Economist at the African Department of the International Monetary Fund. The views presented here are the author's and do not necessarily represent those of the IMF, the World Bank, or their Executive Boards. An earlier version of this study was prepared for a session on "The Economics of HIV/AIDS in Asia: Economic Development Risks," sponsored by the American Committee on Asian Economic Studies, at the 2007 AEA Meetings, Chicago, January 5-7, 2007.

coping, discussing issues such as the income and employment losses associated with HIV/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/AIDS across population groups, e.g., differentiating by wealth. One item on which we place particular emphasis throughout this section is the gender dimension of HIV/AIDS (HIV awareness, economic impact); a separate section deals with the impact on orphans.

Part 5 focuses on challenges associated with and development aspects of the response to HIV/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, by containing pressures on health services in the future. Meanwhile, **access to treatment** has the potential of mitigating the health and economic impacts of HIV/AIDS. At the same time, inequities in access to treatment can be an important source of inequities in the development impact of HIV/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/AIDS is complex. We find the impact of HIV/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/AIDS in an economic development context arise on a sub-national level, in terms of inequities according to socio-economic status (e.g., wealth, access to education) in terms of the susceptibility to HIV/AIDS, as well as the ability to cope with the economic impact. Also, we present evidence regarding an asymmetric impact of HIV/AIDS on women, arising especially from the socio-economic 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 exacerbating inequities in terms of the socio-economic impact of HIV/AIDS.

HIV/AIDS an Economic Development Risk in South Asia?

At the outset, we offer some considerations towards defining HIV/AIDS as an economic development issue in South Asia. These considerations also motivate and guide our analysis further below, and introduce themes that recur throughout the analysis.

Notably, HIV prevalence in Asia is relatively low in an international context, especially when compared against regions that have motivated much of the literature on economic or

development impacts of HIV/AIDS. The role of HIV/AIDS as an economic development issue in the region, in the context of the broader development agenda with regard to objectives like the MDGs, therefore is not as obvious as for countries where HIV/AIDS has assumed catastrophic proportions.

In this initial exposition, we proceed in three steps. First, we take a narrow view, discussing HIV/AIDS in the context of the overall burden of disease in South Asia. In line with low HIV prevalence in the region, we find that the contribution of HIV/AIDS to the burden of disease – measured by the share of deaths attributed to HIV/AIDS – is modest. Second, we illustrate that indicators such as the contribution to the burden of disease are too narrow to capture the adverse development impacts of HIV/AIDS, considering, for example, the distributional aspects of or the stigma attached to the epidemic. Third, we highlight some of the policy challenges associated with the epidemic, such as the potential to contain the epidemic at low levels through well-targeted prevention efforts and the resource implications of scaling-up of access to treatment.

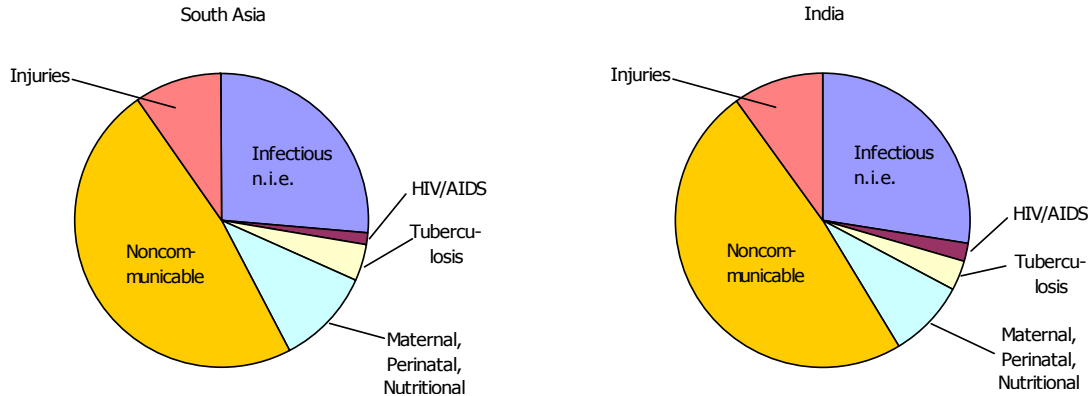
HIV/AIDS and the Burden of Disease

One aspect of the health impact of HIV/AIDS is increasing mortality. Estimates of mortality attributable to HIV/AIDS and other sources also provide an indicator for the contribution of HIV/AIDS to the burden of disease in a country or region. Estimates of the causes of deaths by country are available from WHO (2006c) for the year 2002 (see also Lopez and others, 2006). To assess the burden of disease associated with HIV/AIDS in South Asia, however, it is important to recognize that estimates of HIV/AIDS-related mortality have since been revised, especially for India. To obtain a more accurate estimate of the burden of disease associated with HIV/AIDS, we therefore substitute current estimates of HIV/AIDS-related deaths in India (190,000 in 2006, see Table 1) for the earlier WHO estimates (about 360,000, see WHO (2006c)).

Figure 0 illustrates the burden of disease associated with HIV/AIDS in the region (the eight countries covered by the World Bank's South Asia region, see Table 1), as well as for India. Overall, HIV/AIDS accounts for 1½ percent of all deaths in South Asia, about the same level as measles or diabetes. For India, the share of deaths attributed to HIV/AIDS is higher, at about 2 percent, slightly more than half the level of deaths from tuberculosis.²

² 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 for mortality, with HIV/AIDS accounting for 1.3 percent of losses of DALYs in South Asia overall, and 1.8 percent of losses in India. This reflects that HIV/AIDS affects primarily working-age adults, while diseases affecting primarily children have a larger weight in terms of losses of DALYs, and diseases associated with old age correspondingly carry a lower weight. Between these groups, the average loss in DALYs associated with an HIV/AIDS-related death is close to the average loss in DALYs across all deaths.

Figure 1. South Asia and India: Contribution of HIV/AIDS to Mortality



Source: Author's calculations, based on WHO (2006c) and UNAIDS, NACO, and WHO (2007).

The “burden of disease” estimates also allow for comparisons between countries in terms of the state of health systems, and – together with information on HIV prevalence – in terms of the implications of contracting HIV. 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/AIDS in India is about 5 times higher than in the United States, even though HIV prevalence is lower (0.36 percent, as compared to 0.6 percent).³ Thus, relative to the number of people living with HIV/AIDS, the estimated number of HIV/AIDS-related deaths in India is 8 times higher than in the United States.

Broader repercussions of HIV/AIDS

One important aspect of the development impact of HIV/AIDS is the fact that it primarily affects relatively young adults, with mortality peaking in the 30-40 age bracket. Many observers, especially those focusing on the potential impacts of HIV/AIDS on economic growth, have emphasized that the epidemic's impact therefore is disproportionately large. Another consequence of the age structure of people living with HIV/AIDS is that people dying for HIV/AIDS-related reasons frequently leave behind dependents, including orphans.

Many of the repercussions of HIV/AIDS from an economic development perspective, however, arise from the fact that the impact and consequences occurs unevenly across the population. HIV awareness differs across population groups (e.g., it is correlated with access to education). Access to health services is limited; also, even if antiretroviral treatment is provided for free through public health services, the costs of accessing services or other costs related to care and treatment exert a heavy burden on poor households, who are also less able to cope with income losses. While women represent a minority of people living

³ This comparison is based on age-standardized estimates of mortality from WHO (2006c). HIV/AIDS-related mortality for India was scaled in line with updated estimates of HIV prevalence and mortality for this country.

with HIV/AIDS in South Asia, a consequence of the pattern of infections in South Asia is that HIV/AIDS-related deaths frequently result in widowhood (including widows who got infected by their husbands). Also, with high HIV prevalence among female sex workers, HIV/AIDS has a highly disproportionate effect on a poor segment of the female population.

Key Policy Challenges

The primary mode of HIV transmission in South Asia is heterosexual, especially through commercial sex (frequently followed by passing on the virus to regular sexual partners). In addition to female sex workers and their clients, other important risk groups are men having sex with men and injecting drug users. While recent research indicates that there is no imminent risk of an escalation of HIV prevalence in South Asia to levels observed in many countries in sub-Saharan Africa, the fact that the epidemic is concentrated among these risk groups means that targeted prevention efforts can make a big difference for the future scale of the epidemic in the region. While much progress has been made in this regard, coverage rates of prevention efforts – across or within countries – remain uneven.

The other key challenge regarding the response to HIV/AIDS is improving access to treatment. Our discussion of the burden of disease associated with HIV/AIDS shows that HIV/AIDS-related mortality remains very high in the region. Partly, this reflects that access to treatment remains low in the region compared to other developing countries, especially considering the relatively low levels of HIV prevalence in the region. While the low levels of HIV prevalence observed in South Asia imply that frequently HIV/AIDS-related services can be delivered through existing health facilities, rather than requiring a major investment in facilities and personnel, a factor that complicates the health sector response to HIV/AIDS in many countries in the region is the fact that the capacities of public health services are relatively weak.

While it is frequently convenient to discuss the challenges regarding scaling up prevention efforts and access to treatment separately, it is important to recognize that in many areas these aspects of the policy response to HIV/AIDS are closely intertwined. Most generally, treatment is a consequence of infections *not* prevented, and – with treatment being complex and not providing a cure – preventing an infection is much more effective and desirable than treating one. In terms of scaling up of treatment, effective prevention helps to contain challenges associated with shortcomings in health sector capacities. Expanding treatment can also have implications for the effectiveness of prevention efforts, as the availability of treatment may affect the propensity to engage in risk behavior, or as improved survival times for people receiving treatment affect the risk of passing on the virus. Meanwhile, availability of treatment provides a powerful incentive for being tested for HIV/AIDS, and thus contributes to effective prevention.

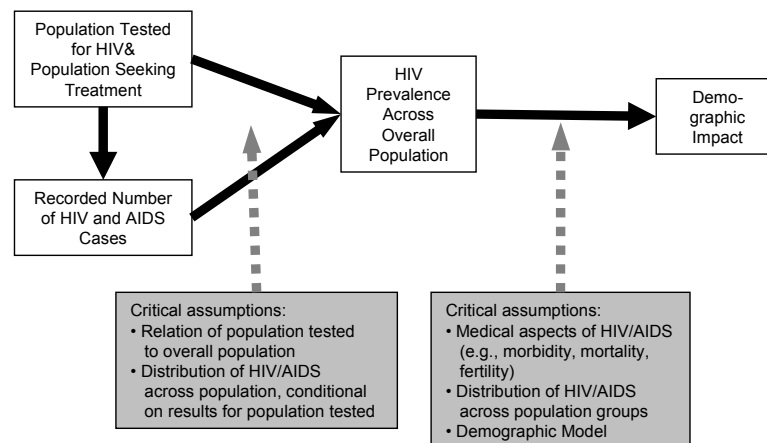
From an economic development perspective, one important aspect of measures to contain the epidemic and mitigate its impact is the distributional impact of these measures. For example, the coverage of prevention measures may be uneven across the population; if it does not fully reach economically vulnerable populations, there is a risk that the health

risks and economic repercussions of HIV/AIDS exacerbate economic vulnerabilities. Similarly, access to treatment has the potential to mitigate the adverse economic and social impacts of HIV/AIDS; however, where access to health services is limited for poor segments of the population, scaling-up of treatment, while reducing the adverse impacts of HIV/AIDS on average, may exacerbate inequities in access to health services. To understand the response to HIV/AIDS from an economic development perspective, it is therefore important to analyze the effects and the reach of these measures across population groups.

The State of HIV/AIDS and the Demographic Impact

Estimates of the scale of the HIV/AIDS epidemic and its demographic impact draw on many different types of data and assumptions, illustrated in Figure 2. The most direct measures of the state and scale of the HIV epidemic are the numbers of people found infected with HIV or of those for whom the illness has progressed to the full set of symptoms of AIDS (the left portion of Figure 2). Most commonly, these data are based on blood tests taken at antenatal clinics or other medical facilities. Drawing inferences from these data regarding the scale of the epidemic in the overall population (the middle portion of Figure 2) is a complex exercise; main challenges include the fact that the composition of the groups tested is not representative of the overall population, and that the sample size of people tested for HIV may be small relative to the overall population (especially in the early stages of the epidemic). To arrive at estimates of the *impact* of HIV/AIDS (the right portion of Figure 2), additional types of data are required. On the medical side, these include data and assumptions regarding the health implications of an HIV infection (e.g., progression to AIDS, morbidity, mortality).

Figure 2. Estimating HIV Prevalence and the Demographic Impact of HIV/AIDS



The most important sources of data on HIV prevalence among the population are blood tests conducted at medical facilities, including antenatal clinics (ANCs) or sites providing services to high-risk groups (such as clinics specializing in sexually transmitted diseases). A key challenge in terms of estimating trends in the overall population from these data is that they may not be representative of the overall population. Most obviously, the link between

ANC tests (applied to women only) and the broader population is not obvious in South Asia, where the estimated share of women among people living with HIV/AIDS (where data are available) ranges from 13 to 29 percent. Second, in light of the low prevalence rates experienced in South Asia, the coverage of HIV tests is relatively low – WHO (2006b) estimates that in 2005 a total of 1.6 million people were tested for HIV in India, corresponding to less than 0.1 percent of the population, and pointing at a coverage rate of antenatal tests of around 1 percent or less.⁴ Regarding India, an additional challenge is the heterogeneity of the epidemic within the country, with substantial differences in HIV prevalence between states, and differences in the roles of various transmission channels.

The weaknesses of the underlying data and the pitfalls in estimating the aggregate scale and impact of the epidemic were amply illustrated when the estimates of the number of people living with HIV/AIDS in India were revised, based on an increased number of sentinel observations and, most importantly, the results of the *2005-2006 National Family Health Survey* (NFHS-3). Based on these data, estimates of the scale of the epidemic in India have been revised downwards by about 60 percent, to an HIV prevalence rate of 0.36 percent among the population of ages 15-49 (UNAIDS/WHO (2006): 0.9 percent), and total of about 2.5 million people living with HIV/AIDS in the country (UNAIDS/WHO (2006): 5.7 million).

Notably, NFHS-3 is based on a sample of households which is considered representative of the composition of the overall population, and thus is not subject to the problem of mapping HIV prevalence among distinct sub-populations into estimates of the overall population. However, it is worth noting that these improved estimates are still subject to considerable uncertainty. Household surveys often miss out on population groups that are marginal in society (sex workers, drug users?), which may introduce a bias. Also, in light of the small size of the population surveyed and the low level of HIV prevalence, the margin of error around the point estimates remains large.

Table 1 presents key indicators for the state of HIV/AIDS in South Asia, based on the *2006 Report on the Global AIDS Epidemic* (UNAIDS and WHO, 2006), but also taking into account the findings of more recent studies, notably the updated numbers for India. Overall, the number of people living with HIV/AIDS in the region is about 2,700,000, of which the lion's share is located in India (in line with its population weight, but also reflecting that HIV prevalence is higher there than in most other countries in the region). The number of AIDS deaths amounted to about 200,000, using the most recent estimates. One important point is the significant differences between the countries covered in terms of the share of women among the people living with HIV/AIDS, ranging from only 12.7 (Bangladesh) to almost 30 percent (India).

⁴ UN Population Division estimate the number of births in India at about 136 million annually (over the 2005-2010 period). Depending on the breakdown of the total number of tests among pregnant women and various other groups, a coverage rate of around 1 percent or less follows.

Table 1. South Asia: Key HIV/AIDS Statistics

	HIV prevalence, ages 15-49 (Percent)		People Living with HIV/AIDS		Share of Women among PLWA	AIDS deaths	
	2005	2003	2005	2003	2005	2005	2003
Afghanistan	<0.01	<0.005	<1,000	<500	n.a.	<100	<100
Bangladesh	0.014	0.010	11,000	7,500	12.7	<500	<500
Bhutan	<0.05	<0.03	<200	<100	n.a.	<100	<100
India (UNAIDS, 2006a)	0.9	0.9	5,700,000	5,300,000	28.6	≈ 475,000 ¹	≈ 380,000 ¹
India (updated) ²	0.36	n.a.	2,500,000	n.a.	n.a.	≈ 190,000	n.a.
Maldives	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Nepal	0.5	0.5	75,000	65,000	21.6	5,100	4,000
Pakistan	0.11	0.07	85,000	56,000	16.7	3,000	1,500
Sri Lanka	0.04	0.03	5,000	3,100	n.a.	<500	<100
Memorandum Items:							
Cambodia	1.6	2.0	130,000	150,000	45.4	16,000	17,000
Cambodia (updated) ³	0.6	n.a.	43,000	n.a.	n.a.	n.a.	n.a.
China	0.09	0.07	650,000	530,000	27.7	31,000	26,000
Thailand	1.4	1.4	580,000	590,000	39.3	21,000	40,000
Myanmar	1.3	1.4	360,000	390,000	31.4	37,000	36,000

Sources: UNAIDS/WHO (2006a) and author's calculations, based on UNAIDS/WHO (2006a) and United Nations Population Division (2007).

¹ For India, UNAIDS (2006a) reports a lower and an upper range for mortality only. The figure shown represents the midpoint between these two ranges.

² Updated in line with expanded 2006 sentinel survey data and the National Family Survey-3, and relate to 2006. HIV prevalence and the number of PLWH are as reported, the number of AIDS deaths was estimated by the author by scaling down the earlier estimate. See UNAIDS, NACO, and WHO (2007).

³ Updated in line with NIPH, NIS, and ORC Macro, 2006.

One point worth noting about Table 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/AIDS. Point estimates are also not available for Afghanistan and Bhutan, and they will also not be included in our analysis below. For some countries where UNAIDS/WHO (2006a) only report point estimates of the number of people living with HIV/AIDS, but not of HIV prevalence, we have calculated the implied level of HIV prevalence, using estimates of the size of the population of age 15-49 from UN Population Division (2007) as denominator.

In order to address the impact of HIV/AIDS for the economies in question, it is also necessary to understand the impacts of HIV/AIDS on key demographic indicators. To this end, we face several challenges. The most extensive estimates of the demographic impacts of HIV/AIDS are those by the UN Population Division. However, among the 62 countries for which 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 which have meanwhile been superseded by the more recent ones discussed above. Our estimates of the demographic impact of HIV/AIDS in India are therefore based on those from 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/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. A different approach would involve

obtaining such coefficients based on the larger set of countries for which estimates of the impact of HIV/AIDS are available. We have therefore run regressions, using estimates for the 62 countries covered by UN Population Division (2007), to obtain more precise formulas 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 dataset of 62 countries, including countries with a very different demographic profile compared to the South Asian countries we focus on, may be less representative of the South Asian countries other than India than India is. 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/AIDS.

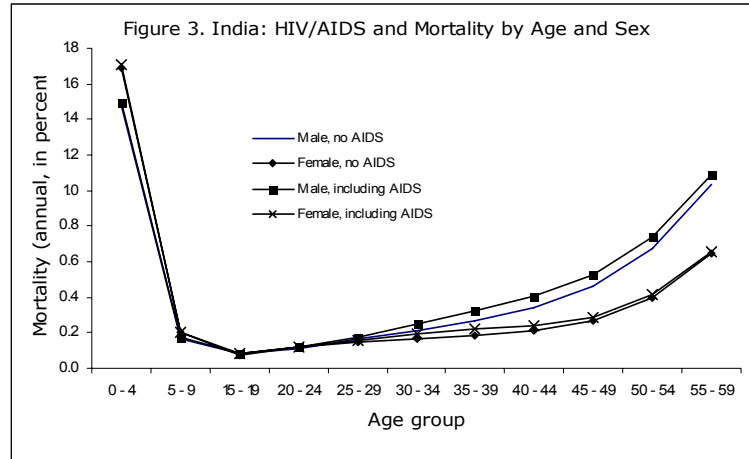
Table 2. The Demographic Impact of HIV/AIDS in South Asia (I)

	HIV prevalence, ages 15-49 (Percent)	Crude death rate (Per 1,000)	Crude death rate: Impact of HIV/AIDS	Population growth (Percent)	Pop. Growth: Impact of HIV/AIDS	Life Expectancy at Birth (Years)	Life Expectancy: Impact of HIV/AIDS (Years)
	2005	2005	2005	2005	2005	2005	2005
Bangladesh	0.015	7.5	0.01	1.67	0.00	64.1	-0.02
India	0.36	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	0.04	7.2	0.02	0.47	-0.01	72.4	-0.1
Memorandum Items:							
Cambodia	0.6	8.4	0.37	1.74	-0.08	59.7	-0.48
China	0.1	7.1	0.03	0.58	0.00	73.0	-0.1
Thailand	1.4	8.5	0.63	0.66	-0.05	70.6	-1.1
Myanmar	1.3	9.7	0.90	0.85	-0.08	62.1	-1.0

Source: UNAIDS/WHO (2006a) for HIV prevalence, UN Population Program (2007) for population indicators, author's estimates, based on data from UN Population Program (2007) and other sources, for HIV/AIDS-related indicators.

We find that HIV/AIDS does have a perceptible impact on key demographic indicators (Table 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 thousand (meaning that in India and Nepal, one in 36 or one in 25 death are estimated to be HIV/AIDS-related, respectively). Taking a broader regional perspective, we see that, in the countries where HIV prevalence exceeds one percent (Thailand, Myanmar), life expectancy declines by at least a year, and up 1 in 11 deaths are accounted for by HIV/AIDS.

One of the characteristic features of the HIV/AIDS epidemic is that the majority of those infected are young adults, and that mortality is also concentrated in at relatively young ages. Figure 3, based on estimates by the UN Population Division (modified to account for lower estimates of HIV prevalence) shows that HIV/AIDS does have a notable impact on mortality, especially at ages 30-44. As the majority (about 70 percent) of people living with HIV/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.



Obviously, the demographic projections, especially the impact of HIV/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 further below). The UN Population Division does incorporate estimates 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 3.⁵ However, even with complete coverage of antiretroviral treatment, Figure 3 would still show a significant increase in mortality among young adults; the UN Population Division assumes that the median and average survival times of adults after initiation of treatment are 6.6 years and 9.5 years, respectively.⁶

The Economic Impact of HIV/AIDS: Aggregate Approaches

The scale of the demographic impact of HIV/AIDS in some regions has motivated studies of the actual or potential economic impact of HIV/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/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, e.g. 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/AIDS on welfare arises from the increased risk to

⁵ The more recent estimates of the scale of the epidemic suggest that the coverage rates achieved in India were higher, around 15-20 percent. 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 did have on the estimated indicators of the demographic impact of HIV/AIDS.

⁶ The latest surveys of the available literature, UNAIDS (2007) and Coffie and others (2007), suggest somewhat longer survival periods.

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/AIDS on economic growth employ a neoclassical growth model in which HIV/AIDS affects parameters or factors of production that enter an aggregate production function.⁷ To capture the essence of this earlier studies, and as a reference point for a discussion of some more recent efforts to calibrate the macroeconomic impact of HIV/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

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

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

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

In this framework, HIV/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/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 2-3 percent; for India, the implied loss in GDP per capita through this channel would be about 0.08 percent.⁸ Changes in labor force participation would reflect both people living with HIV/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

⁷ Haacker (2004b) provides an overview, Bloom and others (2004) discuss this and other approaches and draw some inferences regarding the impact of HIV/AIDS in Asia.

⁸ 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.

former, assuming that 5 percent of people living with HIV/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 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/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/AIDS on the 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/AIDS tend to dis-save to finance treatment and care. This, however, does apply less to wealthy households who 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 down from 1.51 percent to 1.49 percent (for 2005-2010), which would raise GDP per capita by about 0.1 percent.

Overall, the impact of HIV/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), 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 2001-2006). A decline in the level of steady-state GDP per capita of 0.16 percent thus corresponds to a one-off loss of about 1½ 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/AIDS on the level and growth of GDP per capita above, it is also important to understand the impact on long-term GDP growth. As $Y = yP$, and the most concrete effects of HIV/AIDS on GDP per capita (y) we described relate to the level, but not the rate of growth of GDP per capita, the key channel through which HIV/AIDS affects GDP growth in our preliminary analysis is the rate of population growth, which slows down by about 0.02 percentage points in 2005-2015, after which the negative impact gradually tapers off through 2050 (according to UN Population Division, 2007), and the accumulated effect of HIV/AIDS on the level of the population is projected at 0.5 percent by 2050. Assuming an average GDP growth rate of 5 percent over this period, the slowdown in GDP growth owing to an HIV/AIDS-related slowdown in population growth thus corresponds to the loss of about 0.6 working days of growth each year.

Two aspects of the impact of HIV/AIDS on growth could result in a somewhat more adverse 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/AIDS is not normally rated among key factors affecting growth prospects or production costs in the context of South Asia,⁹ and apparently does not factor into investment decisions in the region. For similar reasons, we also do not employ formal models which would rely heavily on expectations about the impact of HIV/AIDS on the state of the economy. Second, HIV/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/AIDS on orphans, the socio-economic profile of the epidemic, and the consequences of orphanhood in the region.

Welfare

While the scale of the impact of HIV/AIDS on GDP or GDP per capita is important for many reasons, observers agree that the adverse impact of HIV/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/AIDS. One line of reasoning emphasizes the distributional aspects of HIV/AIDS, which arise if the risk of infection, the ability to cope with the economic impact, and 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/AIDS, and are discussed in some length in Section [xxx]. A second approach, which we now turn to, focuses on the direct implications of HIV/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, e.g.,

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

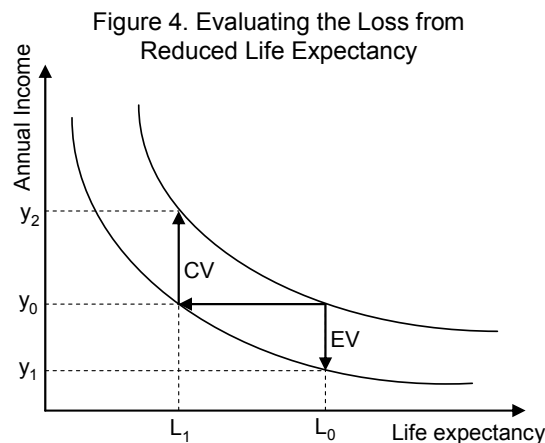
This individual's well-being in period t , $h_t u(c_t)$ depends on consumption in that period (c_t) and an indicator of the individual's state of health (h_t). The individual's lifetime welfare also includes expectations ($E[\dots]$) about well-being in future periods, taking into account a

⁹ For example, Shantayanan and Nabi (2006) do not identify HIV/AIDS among the challenges to sustaining growth in South Asia. Some earlier studies, e.g. Eberstadt (2002), predicted a more significant impact on longer-term growth, but on the basis of demographic scenarios that have not borne out.

possible discount factor (D_{ti} , – frequently, it is assumed that $D_{ii} = e^{-\gamma(i-t)}$) 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 (for a given annual income). 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 to 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 4. The indifference curves describe combinations of life expectancy and annual income which 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, and will be used as a measure of the welfare costs of HIV/AIDS further below. A different measure of the costs of HIV/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 Fig. [(2)]).¹¹



¹⁰ A note is in order regarding the role of surviving dependents, especially children, which 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/AIDS 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/AIDS relate to the equivalent variation.

The shape of the curves in Figure 4, 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 are the indifference curves in Figure, and the higher is the income loss that is equivalent to a given decline in life expectancy.

The approach sketched here has originally been used to estimate the contribution of improving life expectancy to living standards. It has first been applied to illustrate the welfare effects of HIV/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 one-percent decline in life expectancy, in terms of its welfare effects, is equivalent to a loss in income of 3.68 percent.¹²

Table 3. South Asia: Welfare Effects of Reduced Life Expectancy, 2006

	HIV prevalence, age 15-49 (Percent)	Life expectancy (Years)	Impact of HIV/AIDS (Years)	Welfare Effects of HIV/AIDS (Percent)
Bangladesh	0.015	64.1	-0.02	-0.1
India	0.36	64.7	-0.5	-2.8
Nepal	0.5	63.8	-0.7	-4.0
Pakistan	0.11	65.5	-0.2	-0.9
Sri Lanka	0.04	72.4	-0.1	-0.3

Sources: UNAIDS and WHO (2006), UN Population Division (2007), and author's estimates and calculations.

Drawing on the estimates of the impacts of HIV/AIDS on life expectancy discussed earlier, it is then possible to estimate the welfare impacts of HIV/AIDS owing to higher mortality. Table 3 presents these estimates for the 5 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/AIDS on living standards is substantial (minus 4 and minus 3 percent, respectively), mirroring the declines in life expectancy of . We thus find that the welfare costs associated with higher mortality (or lower life expectancy) are much higher than the impact of HIV/AIDS on economic growth discussed above. Our framework also allows comparisons of the costs of HIV/AIDS with the rate of growth of GDP per capita. In India, an economy growing very fast in international comparison (with growth of GDP per capita of about 6 percent), the costs of HIV/AIDS correspond to about half a year of economic growth. While the impact of HIV/AIDS in Nepal is lower, so is GDP growth, and the costs of HIV/AIDS exceed the annual gains in GDP per capita (3 percent annually in 1996-2006).

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).

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

Summary and Outlook

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 fry, corresponding to the equivalent of ½ to 1 years 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 1-2 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/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/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 (an issue we have already discussed above [see demographics, this section still missing]). Further, we need to understand how the epidemic affects key development goals (e.g., in the areas of poverty reduction, education, gender, beyond the direct health impact); this issue we will turn to next. Finally, in the final main section we will discuss the challenges involved in addressing the demand for health services associated with HIV/AIDS, especially regarding access to treatment.

Beyond Aggregate Measures of the Impact of HIV/AIDS

As noted above, much of the economic development impact of HIV/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/AIDS; a situation – in terms of the 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 differs according to socio-economic status, regarding the costs of care and treatment or the need to compensate for the loss of a breadwinner. Third, HIV/AIDS particularly affects certain population groups (e.g., 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/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 care-giving, increased medical expenditures, and the financing of any additional household needs (or of income shortfalls associated with HIV/AIDS). Owing to data limitations, most of our discussion in this section draws on two studies of the household level impacts of HIV/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/AIDS, the implications of orphanhood and access to treatment, are treated in dedicated sections further below.

HIV/AIDS can be associated with *employment loss or reduced income* as people living with HIV/AIDS (or care-giving 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/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: 4.3 percent) and for women of 4.5 percent (non-HIV: 2.9 percent), the latter finds an unemployment rate among males living with HIV/AIDS of 13 percent (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/AIDS are those of Pradhan and others (2006), who find that 36.5 percent of people living with HIV/AIDS who were able to retain their employment nevertheless reported an income loss, with averaged about 9 percent for those reporting an income loss. Among those who lost their employment (about 9 percent of the sample of people living with HIV/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 loss in income of care givers employed is relatively modest on average (3.5 percent) and few caregivers had to give up employment (reported from about 0.5 percent of households affected by HIV/AIDS).

Another important aspect of the adverse income effects is the losses associated with the death of a person living with HIV/AIDS. One area where such losses are particularly pervasive is the situation of HIV-positive widows. As noted, widows account for a substantial share of women living with HIV/AIDS in Pradhan and others (2006); this study also reports that about half of the widow household have an annual income of less than Rs. 20,000, compared to about one-sixth of other households affected by HIV/AIDS, and 10 percent of the households not affected by HIV/AIDS. However, as this study does not provide more information on the composition of widow households, it is difficult to interpret these findings. Das and others (2006) report much lower income for widow households compared to widower households.

The *medical aspects* of HIV/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 also provides estimates of the welfare costs of such declines in the health state of affected individuals, based on a compensating variation (see Figure 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/AIDS in their sample.

An additional component of the adverse effects of HIV/AIDS is the presence of *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/AIDS on affected individuals and households. According to Pradhan and others (2006), about 10 percent of respondents living with HIV/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, 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 the job played an important role. Similarly, Das and others report for their sample that about three-quarters of people living with HIV/AIDS did not disclose their HIV status to family and friends, and 85 percent did 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/AIDS that many households experience shortfalls in income, which in some cases can be very significant, HIV/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/AIDS-affected households, as compared with 3 percent for households not affected by HIV/AIDS. This comparison, however, understates the impact of HIV/AIDS as households affected by HIV/AIDS increase their total expenditure as well. When measured against expenditure of the non-HIV/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/AIDS) receive

it at government hospitals, and another 5 percent through NGOs. With monthly costs of antiretroviral treatment through private providers between Rs. 1141 (through chemist shops) and Rs. 1669 (through private nursing homes or doctors), the latter exceeding total monthly household expenditure for many households affected by HIV/AIDS, government facilities (Rs. 246) and NGOs (Rs. 547) clearly are the only mode of provision of antiretroviral treatment accessible to a large share of people living with HIV/AIDS. Also, it is important to bear in mind that – reflecting that only 15 percent of people living with HIV/AIDS among the respondents receive treatment – the reported increases in medical expenditures largely reflect the pre-ART stage of HIV/AIDS, and likely understate the eventual impact of HIV/AIDS on medical (and, by implication, other) expenditures.

Table 4. Household Savings by Income Category

Household income category	Non-HIV Households		Households Affected by HIV	
	Household Savings	Savings Rate	Household Savings	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	4.61
84,001 and above	26,801	21.3	35,123	24.66

Source: Pradhan and others (2006).

As incomes shrink, while the need for expenditures on care and treatment increases, households affected by HIV/AIDS frequently borrow or dis-save by selling off or drawing down household assets. Pradhan and others (2006) observe that 46 percent of households affected by HIV/AIDS borrow, but only 27 percent in the control group, with a modestly higher average borrowing among households that borrowed (Rs. 10,992 vs. Rs. 9,167). Regarding saving, their data illustrate the asymmetric economic impact of HIV/AIDS according to income category, specifically the adverse impact of HIV/AIDS for the two lowest income categories for which they report data. For the income between Rs. 20,001 and 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 4).¹³

Orphans

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

¹³ The declines in the savings rate may be larger than reported in Table [zzz], as it is not clear whether household borrowing is factored in.

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

Regarding cross-country evidence, a number of countries in Southern Africa,¹⁴ before the arrival of HIV/AIDS, had similar mortality profiles to the countries in South Asia we focus on, and estimates of the impact of HIV/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 0.4-0.5), this would translate into a rise 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 so far does not show the full impact yet. More substantially, even if one accepts that the demographics of the respective countries allow for 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 importantly, 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/AIDS, see Table [1]). Additionally, adverse health conditions may affect fertility, and – especially for men – certain types of risk behavior (male homosexual intercourse, intravenous 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 double orphans.

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.¹⁵ (3) To estimate the total number of orphans by age, we add up maternal and paternal orphans, adjusting for an assumed share of double orphans among AIDS orphans

¹⁴ E.g., Botswana, Namibia, or South Africa.

¹⁵ The assumed cap on paternal mortality is consistent with the scant evidence suggesting high rates of co-infection 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.

of one-quarter.¹⁶ (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/AIDS will result in an increase in the number of orphans of about 0.4 percent of the young population in India, representing an increase in the number of orphans of about 4 percent. By age 17, about 0.9 percent of the young population will have experienced orphanhood owing to HIV/AIDS. The estimates for Nepal are similar; while estimated HIV prevalence is higher, the share of women among people living with HIV/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 in 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) – also 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 most concentration of two-parent orphans among the poor are Asian (Laos, Indonesia, and Philippines).

The second main channel that has been studied relatively widely through which orphanhood can affected living standards is access to education. Table 5 reports the findings from Ainsworth and Filmer (2006) on enrolment rates for orphans and non-orphans. At least for the first four studies shown, orphanhood is associated with substantially lower enrollment rates, with a difference between enrolment rates for non-orphans and two-parent orphans between nine percent and 27 percent., and paternal or maternal orphans somewhere in between.¹⁷ The literature points at various reasons for the apparent link between orphanhood and educational status or attainment. While enrolment 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

¹⁶ 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.

¹⁷ These findings are similar to estimates by Case, Paxson, and Ableidinger (2002) for sub-Saharan Africa.

a bearing on orphan rates include the degree to which the household head and an orphan living in the household are related,¹⁸ or the non-monetary aspects of the relationship between parents and children.¹⁹

Table 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 one percent of 7-14 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 non-orphans sometimes come out insignificant.²⁰

Table 5. Access of Orphans to Education, Six Countries

	Sample size (Number of 7-14 year olds)	Households with at least one orphan (Percent)	Enrolment Rate of 7-14-Year-Olds by Orphan Status (Percent)			
			Parents Alive	Paternal	Maternal	Two-Parent Orphan
				Orphan	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
Laos 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. For orphans' enrolment rates, italics indicate that enrolment rates are not statistically significantly different from the non-orphan rate at the 5-percent level.

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/AIDS in India. Das and others (2006) report on school attendance among households affected by HIV/AIDS. They find that school attendance rates for children of widows or widowers living with HIV/AIDS is about 15 percentage points lower than for households not affected by HIV/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 sex and household income category (Table 6). Whereas enrolment rates are virtually the same for high-income households affected or not affected by HIV/AIDS, enrolment rates are 7-8 percentage points lower for the lowest income category. They Table also provides some evidence regarding a differential impact by sex – for the income groups between Rs. 20,000 and 41,000, the decline in enrolment rates is more pronounced for girls.

¹⁸ On this issue, see Case and Paxson (2006), or Case, Paxson, and Ableidinger (2002); however, both studies are dealing with sub-Saharan Africa.

¹⁹ See Gertler, Levine, and Martinez (2006) for a study using data from Indonesia.

²⁰ For example, the studies quoted for Mongolia and Vietnam only have 24 and 11 observations for two-parent orphans, respectively.

Table 6. Enrolment Rates by Income Category, Ages 6-14(Percent)

Household income category	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/AIDS

By reducing the scale of the epidemic and mitigating the impacts of HIV/AIDS, the international and national responses to HIV/AIDS have implications for the economic development impact of HIV/AIDS, which can be analyzed in a similar fashion as the direct impacts discussed above. At the same time, information about the impacts of HIV/AIDS across population groups, as well as of measures to 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/AIDS and the implications for effective prevention, we focus on the outcomes of prevention effort. 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 of ages 15-49 suggests that the demand for treatment would rise to an equivalent of between 10 and 35 percent of total health expenditures.²¹ These findings accentuate the key role of effective prevention (mitigating the demand for HIV/AIDS-related health services) in scaling up treatment in a sustainable fashion. Third, while data on access to treatment across socio-economic groups are barely available, we discuss some indirect evidence on access to treatment across population groups, looking – among other factors – at access to antenatal care.

Access to Prevention

One important measure of the susceptibility to HIV/AIDS across population groups is HIV awareness. As questions in this regard are regularly included in surveys, there also is a fair amount of cross-country data, in our case covering Bangladesh, India, and Nepal. Table 7 summarizes available data on knowledge about sexual transmission of HIV/AIDS, and also

²¹ The range primarily reflects differences in GDP per capita across countries, although differences in health spending across countries also play a role (see Table 10).

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 socio-economic 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 50-60 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 in HIV awareness resemble data on school completion rates, and studies conditioning directly on years of schooling (such as IIPS (2007), see lower panel of Table 7) find a similar pattern by level of education.

Table 7. HIV Awareness Across Population Groups
(Percent)

	Knowledge about sexual transmission of HIV/AIDS							
	Average	Wealth Quintile					Urban (Avg.)	Rural (Avg.)
		Lowest	2 nd	3 rd	4 th	Highest		
Bangladesh (2004)								
Men	51.5	27.5	36.6	47.6	59.8	78.4	45.7	69.7
Women	31.6	9.7	17.0	26.4	40.2	64.2	25.7	51.7
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 Getting HIV/AIDS							
		No					Urban	Rural
	Average	education	<8 years	8-9 years	>=10	years	(Average)	(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 are inconsistent with the aggregates, as the average for both urban and rural is higher than the aggregate. As it is not clear yet where the error arises, this draft version reports the inconsistent data.]

To understand how differences in HIV awareness, risk behavior, and other factors translate into a socio-economic profile of HIV/AIDS across the population, we would ideally be able to draw on the results of population studies identifying households and individuals affected by HIV/AIDS and other households 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 source are surveys which compare households affected by HIV/AIDS with households in the same area. While this approach is geared towards identifying household *impacts* of HIV/AIDS, it bears little information on the composition of the population living with HIV/AIDS, because the sample is confined to households that have been identified because they receive some medical HIV-related services, and thus are not representative of the entire population living with HIV/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/AIDS, this results in high rates of co-infection (both partners infected) and in high rates 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/AIDS 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/AIDS, both adults are infected with HIV/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,” and that 76 percent of household heads who are “ever married” (largely widows and widowers) are female. Similarly, Pradhan (2006) finds that 36 percent of women living with HIV/AIDS are widowed, but only 4 percent of the men are widowers.

Another key dimension of differences in susceptibility to HIV/AIDS are groups engaging in high-risk behavior, such as commercial sex workers, men who have sex with men, and injecting drug users. While much of the literature regarding prevention strategies focuses on such risk groups (see Wilson, 2007), we have little information on the socio-economic profile of these population groups, as they are not easily accessible to standard survey techniques. While they are some obvious linkages between HIV/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/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 therefore 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 8. Access to Antiretroviral Treatment in South Asia

	HIV Prevalence, end-2005 (Ages 15- 49) (Percent)	Estimated number of people requiring treatment, end-2006	Estimated number of people receiving treatment, end-2006	Antiretroviral treatment coverage, end-2006 (Percent)	Antiretroviral treatment coverage, end-2005 (Percent)
Afghanistan	<0.01	0	<100	n.a.	0
Bangladesh	0.014	1,700	60	3	1
Bhutan	<0.05	<100	13	n.a.	n.a.
India (UNAIDS, 2006) ¹	0.9	1,115,000	95,000	6-15	7
India (updated) ¹	0.36	490,000	95,000	14-34	16
Maldives	n.a.	n.a.	1	n.a.	0
Nepal	0.5	13,000	500	4	1
Pakistan	0.11	12,000	167	1	2
Sri Lanka	0.04	710	56	8	6
Memorandum Items:					
China	0.09	110,000	31,000	27	25
Thailand	1.4	130,000	112,000	88	60
Myanmar	1.3	76,000	5,000	7	7

Source: WHO (2006), UNAIDS (2006), and WHO, UNAIDS, and UNICEF (2007).

¹ For India, the estimated number of people requiring treatment represents the midpoint of the range reported in UNAIDS (2006). The updated estimate for the number of people requiring treatment at end-2006 and the estimated treatment coverage rate for end-2005 have been scaled in line with the revised point estimates of people living with HIV/AIDS, the estimated range for the end-2006 coverage rate has been scaled in line with new upper- and lower-range estimates for the number of people living with HIV/AIDS.

Table 8 summarizes the available data on access to treatment in South Asia. Generally, access to treatment is low in an international context. WHO, UNAIDS, and UNICEF (2007) estimate that the coverage rate for low- and middle-income countries has risen to 28 percent as of end-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, the upper range of the estimates for treatment access is in the vicinity of the global average. There are two sets of factors which 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/AIDS (Figure 5). First, high levels of *GDP per capita* indicate both the availability of financial public resources to address increasing demand for health services associated with HIV/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/AIDS may benefit from *external aid*, including for scaling up access to treatment, we therefore illustrate the correlation between HIV/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 countries with an HIV prevalence rate lower than one percent only.

Figure 5 illustrates the correlation of access to antiretroviral treatment with these development indicators. The data on access to treatment are based on 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 [add number].

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 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.²²
- 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 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 Asia 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 ten 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

²² The upper panel of Figure [yyy] also illustrates another aspect of the correlation between HIV/AIDS and GDP per capita regarding South Asia. The South Asian economies are among the few low-income economies which have been successful in containing HIV prevalence at levels below one percent.

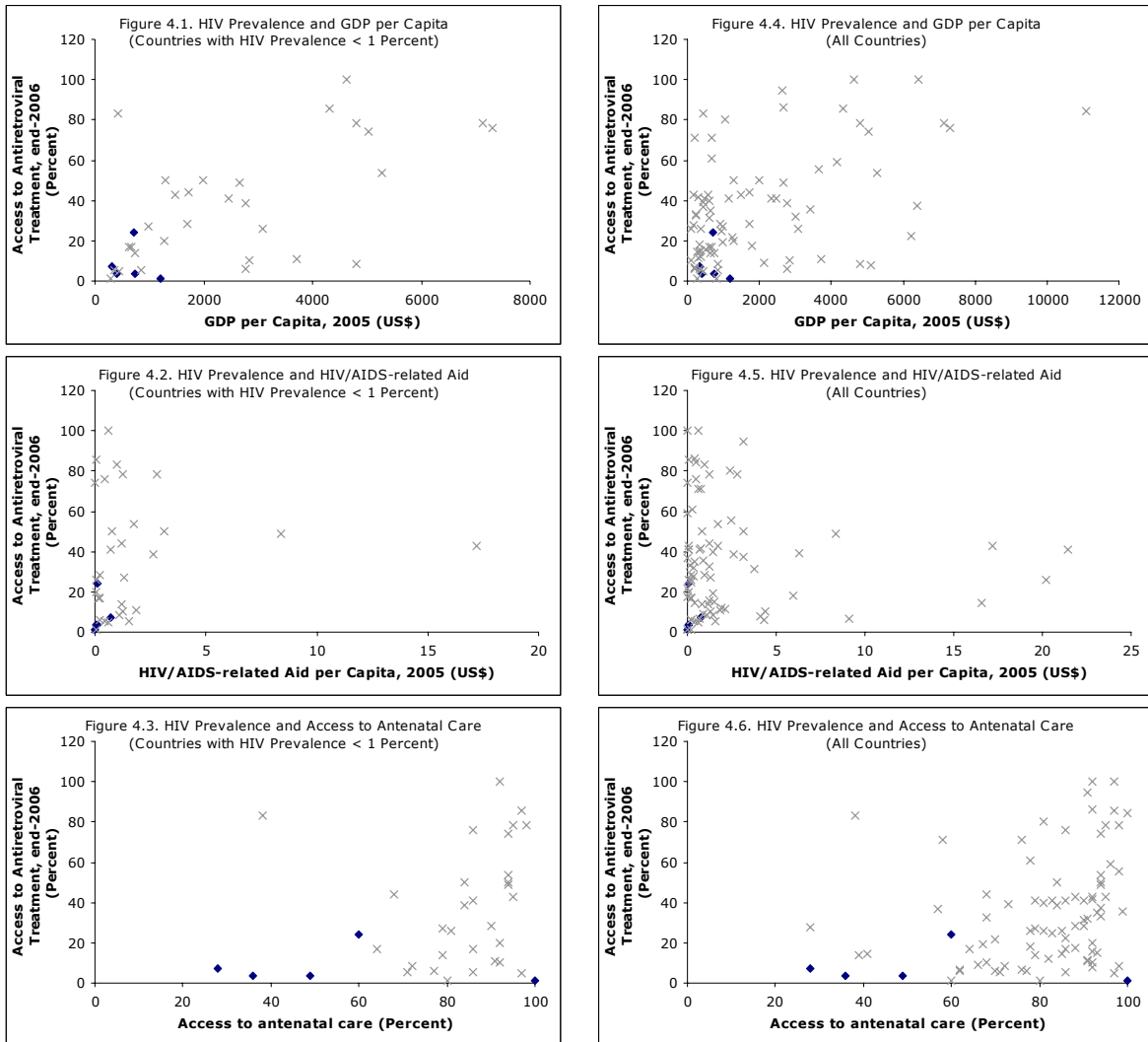
services need not be an insurmountable obstacle to attaining high coverage rates of antiretroviral treatment.

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.²³ Eq. (4) suggests that an increase in HIV prevalence translates into a treatment coverage rate that is lower by 1.1 percentage point, a difference in GDP per capita of US\$ 1,000 is associated with a difference in treatment access of 7 percentage points, 1 US\$ in external aid per capita with higher treatment access of 2.9 percentage points, 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.

$$TREAT = -6.0_{(-0.5)} - 1.11_{(-2.4)}^{**} \cdot HIV + 0.007_{(6.9)}^{***} \cdot GDPPC + 2.90_{(6.9)}^{***} \cdot AIDPC + 0.3_{(2.2)}^{**} \cdot ANCCARE, \\ \text{with } R^2=0.49.^{24} \quad (4)$$

²³ See Haacker (2007) for more details.

²⁴ Standard errors in parentheses. Three and two stars indicate coefficients significant at the 1- and 5-percent confidence level, respectively.

Figure 5. Access to Treatment and Key Development Indicators

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

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/AIDS. Most directly, for budgeting or soliciting external aid, it is important 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/AIDS 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/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 and/or require treatment, and to ensure that the required resources (human, financial, drugs, etc.) are provided for.

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 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.

Table 9. The Costs of Antiretroviral Treatment
(Annual Costs, per Patient, in U.S. dollars)

	Costs of drugs	Costs of monitoring etc.	Total
Cambodia (1)	350
China (2)	400
India (3)	340
India (4)	397	420	817
Indonesia (5)	600
The Philippines (6)	456-576	407	863-983

Sources: (1) Morineau and others, 2006; (2) Ma and others, 2006; (3) Priya and others, 2006; (4) Gupta, Trivedi, and Kandamuthan, 2006; (5) Gunawan, Kosen, and Simms, 2006; and (6) Monzon and Poblete, 2006.

To understand the full financial implications of expanded access to treatment, it is necessary to also 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 costs of around US\$ 400. In the absence of estimates of the total costs of treatment 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.²⁵ There are two principal uncertainties regarding this estimate. First, the prices of

²⁵ 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.

drugs or other supplies (e.g. CD4-testkits) may fall, reducing the costs of treatment.²⁶ Second (although this may also be subject to the first point), 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. *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 end-2006 (from WHO, UNAIDS, and UNICEF (2007)). *Scenario 2* presents the hypothetical costs of providing treatment to all people living with HIV/AIDS requiring treatment as of end-2006, i.e., 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/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/AIDS and, even more pronouncedly, 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 treatment as of end-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/AIDS as given (as reported in Table 1). (2) Regarding the immediate costs of a scenario with full access to treatment, it assumes that 20 percent of people living with HIV/AIDS require treatment.²⁷ (3) Regarding the longer term, it assumes that – as a consequence of a comprehensive treatment program – the number of people living with HIV/AIDS would rise by 80 percent, and that 60 percent of the number of people living with HIV/AIDS in this scenario receive treatment. Equivalently, 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 from year 7 after infection, and that treatment extends the life span by 8 years (i.e., 11 years after initiation of treatment).²⁸

²⁶ Das and others (2006) provide a discussion of the quantitative impact of changes in prices of antiretroviral drugs and CD4 testkits.

²⁷ 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/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.

²⁸ These assumptions are motivated by UNAIDS, 2007, and Coffie and others, 2007.

Scenario 3 is built in the same way as Scenario 2, but it assumes that HIV prevalence among the population of age 15-49 rises to one percent in all countries. 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 “one-percent” scenario is motivated primarily by providing a common indicator for the vulnerability of the respective countries’ health sectors to an escalation of the epidemic.

Table 10. Expanding Access to Antiretroviral Treatment

	HIV Prevalence, end-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 (impact)	Scenario 2		Scenario 3	
					(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	1355	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. Estimates for Afghanistan, Bhutan, or Maldives are not shown as point estimates of HIV prevalence are not available for these countries.

We find that the current costs of providing treatment to people living with HIV/AIDS is modest both from a fiscal perspective and relative to total health expenditures. Based on the numbers of patients receiving treatment as of end-2006, the costs were highest in India at 0.01 percent of GDP, corresponding to 0.2 percent of total health expenditures. If the coverage of treatment were to rise to 100 percent, the costs of treatment in India would rise to 0.05 percent of GDP, and eventually to 0.27 percent of GDP (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, 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 5 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 one percent. In four countries (Bangladesh, Nepal, and Pakistan, and Sri Lanka), the demand for treatment would immediately exceed the equivalent of 5 percent of total health expenditure, and – in a comprehensive treatment scenario – would eventually rise to between 10 and 35 percent of total health expenditure.

Distributional Aspects of Access to Treatment

As we have argued above (in our discussion of socio-economic impacts of HIV/AIDS), it is important to understand the impact of HIV/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/AIDS and differences in the impact of HIV/AIDS across population groups. One principal obstacle to an analysis of the distributional aspects of access to antiretroviral treatment is lack of socio-economic data on people receiving antiretroviral treatment. As a starting point, we therefore discuss socio-economic 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 discussion of some evidence regarding differences in access to treatment across population groups, focusing on differences by sex and access to treatment for injecting drug users (an important group among people living with HIV/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 survey across countries. Also, HIV/AIDS-related health services are typically delivered in larger health facilities rather than clinics catering only for people affected by HIV/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/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/AIDS are men. Table 11 summarizes data on antenatal care visits for Bangladesh, India, and Nepal.

Table 11. Antenatal Care Visits to a Medically Trained Person
(Percent)

	Average	Wealth Quintile				
		Lowest	2 nd	3 rd	4 th	Highest
Bangladesh (2004)	48.8	24.9	38.6	48.8	60.6	81.1
o/w doctor	31.3	12.3	18.9	26.8	42.0	65.6
o/w 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
o/w doctor	49.3	26.9	37.0	48.6	65.1	83.3
o/w 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
o/w doctor	16.6	6.2	8.5	12.7	18.5	48.2
o/w 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

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

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 3 for Bangladesh. Second, differences in the quality of services reinforce inequalities in overall access. While the wealthiest quintile predominantly draw on the services of a doctor, the poorer quintiles frequently (in case of Nepal predominantly) have access to a nurse or trained midwife only.

Third, controlling for wealth, there are gaps in access to services between the urban and rural population, especially for the lower wealth quintiles.²⁹

Another potential dimension of inequities in access to treatment regards differences by sex. While this is an important aspect of the socio-economic impacts of HIV/AIDS, access to treatment seems to 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, higher than their share in the population of people living with HIV/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/AIDS of 29 percent, while they account for 33 of people receiving treatment.

Finally, one factor that may be relevant regarding access to treatment in South Asia is the role of injecting drug users. While published data on the number of injecting drug users (as opposed to HIV prevalence among injecting drug users) are not generally available for South Asian countries, drug use is regarded as an important factor in the spread of HIV/AIDS in South Asia (at least in those countries where substantial data on HIV prevalence are available). The one available estimate of access to antiretroviral treatment for injecting drug users is included in Aceijas (2006), who report that they accounted for 1.4 percent of people receiving treatment in India at end-2004; given that injecting drug use is credited as the main factor in the spread of HIV/AIDS in North-East 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/AIDS. Thus, this factor points at the possibility that low access rates to treatment may be partly associated with the difficulties involved in providing treatment to high-risk populations.

Summary and Conclusions

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

- The impacts of HIV/AIDS on GDP per capita are small. For India, the level effect on GDP (-0.16 percent) corresponds to a one-off loss of about 1½ weeks of GDP growth, and the slowdown in population growth implies a slowdown in economic growth equivalent to less than one working day per year in the longer run. (Some factors, e.g. regarding human capital accumulation, may exacerbate the negative impacts, but we have no basis for quantifying this effect at present.)

²⁹ 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/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/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.)

- Using a simple model that evaluates the direct welfare costs of increasing mortality, we find that these welfare costs are substantial, accounting for 3-4 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 or for rural households.
- In a household study on India, 36.5 percent of people living with HIV/AIDS who were able to retain their employment nevertheless reported an income loss, with averaged about 9 percent for those reporting an income loss. Among those who lost their employment (about 9 percent of the sample of people living with HIV/AIDS), the income loss was severe, at about 66 percent.
- The ability to cope with the financial effects of HIV/AIDS differs strongly across wealth quintiles. For the lowest wealth quintile, Pradhan and others (2006) report savings rates of -23 for households affected by HIV/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/AIDS [(probably reflecting the status of widows in general)]. As many women living with HIV/AIDS are widows (reflecting an infection pattern whereby women frequently are infected by their husbands, who acquire the virus through various forms of risk behavior), this means that HIV/AIDS does have a disproportionate economic impact on women.
- In India and Nepal, the number of orphans will increase by about 0.4 percent of the young population (and increase of about 4 percent). By age 17, about 0.9 percent of the young population will have experienced orphanhood owing to HIV/AIDS.
- We find access to antiretroviral treatment (about 20 percent in India, and lower 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.
- Using largely circumstantial evidence (e.g., access to other forms health services), we find indications for inequities in access to health services across socio-economic 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 socio-economic dimension of HIV/AIDS in South Asia, especially as it goes beyond India. Our discussion of the impacts of HIV/AIDS largely rests on surveys matching households affected by HIV/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/AIDS, which means that the sample

largely consists of people living with HIV/AIDS who do receive some kind of HIV/AIDS-related medical attention, and who likely are not be representative of the population affected by HIV/AIDS. At least for India, the recently completed *2005-2006 National Family Health Survey* may provide some improved insights regarding the socio-economic dimension of HIV/AIDS. Relatedly, 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 socio-economic profile of the epidemic. In terms of the susceptibility to HIV/AIDS, 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 towards understanding the impacts of the epidemic, as many of the implications of HIV/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/AIDS, 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.

References

- Aceijas, Carmen, and others, 2006, "Antiretroviral treatment for injecting drug users in developing and transitional countries 1 year before the end of the 'Treating 3 million by 2005. Making it happen. The WHO strategy' ('3by5')," *Addiction*, Vol. 101 No. 9, pp. 1246-53.
- Ainsworth, Martha, and Deon Filmer, "Inequalities in Children's Schooling: AIDS, Orphanhood, Poverty, and Gender," *World Development*, Vol. 34, No. 6, pp. 1099–1128, 2006.
- Bloom, David E., and others, 2004, *Asia's Economies and the Challenge of AIDS* (Manila: Asian Development Bank).
- Bloom, David E., And Peter Godwin (eds.), *The Economics of HIV/AIDS – The Case of South and South East Asia* (Oxford and New York: Oxford University Press).
- Case, Anne, and Christina Paxson, 2006, "The Care and Future of Orphans in Africa," presented at Amsterdam Institute for International Development, Workshop on "The Economic Consequences of HIV/AIDS," December 2006.
- , and Joseph Ableidinger, 2002, "Orphans in Africa," NBER Working Paper No. 9213 (Cambridge, Massachusetts: National Bureau of Economic Research).
- Coffie, Patrick Ahuatchi, Raoul Moh, Didier Koumavi Ekouevi, and François Dabis, 2007, "Survival of HIV-infected Adults and Children on Antiretroviral Therapy in Low- and Middle-Income Countries" (Bordeaux: Institut de Santé Publique, Epidémiologie et Développement (ISPED), Université Victor Segalen – Bordeaux 2).
- Crafts, Nicholas, and Markus Haacker, 2002, "Welfare Implications of HIV/AIDS," IMF Working Paper 03/118 (Washington DC: International Monetary Fund).
- , 2004, "Welfare Implications of HIV/AIDS," in: M. Haacker (ed.), 2004, *The Macroeconomics of HIV/AIDS* (Washington DC: International Monetary Fund).
- Das, Sanghamitra, Abhiroop Mukhopadhyay, and Tridip Ray, 2006, "Towards Measuring the Economic Cost of HIV/AIDS: The Indian Experience," unpublished manuscript, Indian Statistical Institute, Delhi Centre, Delhi.
- Devarajan, Shantayanan, and Ijaz Nabi, 2006, "Economic Growth in South Asia: Promising, Un-equalizing,...Sustainable?" (Washington DC: World Bank).
- Eberstadt, Nicholas, 2002, "The Future of AIDS," *Foreign Affairs*, Vol. 81, No. 6 (November/December 2002), pp. 22-45.
- Gertler, Paul, David Levine, and Sebastian Martinez, 2006, "The Presence and Presents of Parents: How Parental Death and Disability Affects Children," presented at Amsterdam Institute for International Development, Workshop on "The Economic Consequences of HIV/AIDS," December 2006.

- Gunawan, Suriadi, Soewarta Kosen, and Chris Simms, 2006, "Indonesia," in: Beck, Eduard, and others (eds.), 2006, *The HIV Pandemic – Local and Global Implications* (Oxford and New York: Oxford University Press).
- Gupta, Indrani, Mayur Trivedi, and Subodh Kandamuthan, 2006, "An Analysis of Recurrent Costs of the Free ART Programme of the Government of India," South Asia Human Development Sector, Discussion Paper No. 18 (Washington DC: World Bank).
- Gwatkin, Davidson R., and others, 2007a, "India - Socio-Economic Differences in Health, Nutrition, and Population," (Washington DC: World Bank).
- Gwatkin, Davidson R., and others, 2007b, "Bangladesh - Socio-Economic Differences in Health, Nutrition, and Population," (Washington DC: World Bank).
- Gwatkin, Davidson R., and others, 2007c, "Nepal - Socio-Economic Differences in Health, Nutrition, and Population," (Washington DC: World Bank).
- Haacker, Markus, 2007, "Financing the Response to HIV/AIDS: Some Fiscal and Macroeconomic Considerations," unpublished manuscript, based on presentation at conference on HIV/AIDS Interventions in Developing Countries, Harvard School of Public Health, Boston, September 13-15, 2006.
- Haacker, Markus, 2004, "HIV/AIDS: The Impact on the Social Fabric and the Economy," in: Haacker, Markus (ed.), 2004(a), *The Macroeconomics of HIV/AIDS* (Washington DC: International Monetary Fund).
- International Institute for Population Sciences (IIPS), 2007, "2005-2006 National Family Health Survey (NFHS-3) – National Fact Sheet India (Provisional Data)" (Deonar, Mumbai: IIPS).
- Jamison, Dean T., Jeffrey D. Sachs, and Jia Wang, 2001, "The Effect of the AIDS Epidemic on Economic Welfare in Sub-Saharan Africa," CMH Working Paper Series No.WG1:13 (Geneva: Commission on Macroeconomics and Health, World Health Organization).
- Joint United Nations Programme on HIV/AIDS (UNAIDS), 2007, "Improving Parameter Estimation, Projection Methods, Uncertainty Estimation, and Epidemic Classification," Report of a meeting of the UNAIDS Reference Group on Estimates, Modelling and Projections held in Prague, Czech Republic, Nov. 29 – Dec. 1, 2006 (Geneva: UNAIDS).
- Joint United Nations Programme on HIV/AIDS (UNAIDS) and World Health Organization (WHO), 2006a, *2006 Report on the Global AIDS Epidemic* (Geneva: UNAIDS and WHO).
- Joint United Nations Programme on HIV/AIDS (UNAIDS) and World Health Organization (WHO), 2006b, *AIDS Epidemic Update – December 2006* (Geneva: UNAIDS and WHO).
- Joint United Nations Programme on HIV/AIDS (UNAIDS), National AIDS Control Organization (NACO), and World Health Organization (WHO), 2007, "2.5 Million People in India Living with HIV, According to New Estimates," press release, July 6, 2007 (New Delhi: UNAIDS, NACO, and WHO).

- Joint United Nations Programme on HIV/AIDS (UNAIDS), United Nations Children's Fund (UNICEF), and U.S. Agency for International Development (USAID), 2004, "Children on the Brink 2004" (Geneva, New York, and Washington).
- Lopez, Alan D., Colin D. Mathers, Majid Ezzati, Dean T. Jamison, and Christopher J. L. Murray, 2006, *Global Burden of Disease and Risk Factors* (Washington DC: World Bank).
- Monzon, Ofelia T., and Roderick E. Poblete, 2006, "The Philippines," in: Beck, Eduard, and others (eds.), 2006, *The HIV Pandemic – Local and Global Implications* (Oxford and New York: Oxford University Press).
- Morineau, Guy, and others, 2006, "Cambodia," in: Beck, Eduard, and others (eds.), 2006, *The HIV Pandemic – Local and Global Implications* (Oxford and New York: Oxford University Press).
- National Institute of Public Health (NIPH), National Institute of Statistics (NIS), and ORC Macro, 2007, *Cambodia Demographic and Health Survey 2005* (Phnom Penh and Calverton MD: NIPH, NIS, and ORC Macro).
- Ojha, Vijay P., and Basanta K. Pradhan, 2006, "The Macro-Economic and Sectoral Impacts of HIV and AIDS in India – A CGE Analysis" (New Delhi: United Nations Development Program).
- Over, Mead, 2004, "Impact of the HIV/AIDS Epidemic on the Health Sectors of Developing Countries," in: Haacker, Markus (ed.), 2004(a), *The Macroeconomics of HIV/AIDS* (Washington DC: International Monetary Fund).
- Over, Mead, Peter Heywood, Julian Gold, Indrani Gupta, Subhash Hira, and Elliot Marseille, 2006, *HIV/AIDS Treatment and Prevention in India – Modeling the Cost and Consequences* (Washington DC: World Bank).
- Philipson, Thomas J., and Rodrigo R. Soares, 2005, "The Economic Cost of AIDS in Sub-Saharan Africa: A Reassessment," in: López-Casasnovas, Guillem, Berta Rivera, and Luis Currais (eds.), 2005, *Health and Economic Growth: Findings and Policy Implications* (Cambridge MA: MIT Press).
- Pradhan, Basanta K., Ramamani Sundar, and Shalabh K. Singh, 2006, "Socio-Economic Impact of HIV and AIDS in India" (New Delhi: United Nations Development Program).
- Pradhan, Basanta K., Ramamani Sundar, and Shalabh K. Singh, 2006, "Gender Impact of HIV and AIDS in India" (New Delhi: United Nations Development Program).
- Priya, R., and others, 2006, "India," in: Beck, Eduard, and others (eds.), 2006, *The HIV Pandemic – Local and Global Implications* (Oxford and New York: Oxford University Press).
- Shao-Jun, Ma, and others, 2006, "China," in: Beck, Eduard, and others (eds.), 2006, *The HIV Pandemic – Local and Global Implications* (Oxford and New York: Oxford University Press).[Confirm whether author correct.]

- Sundar, Ramamani, 2005, "The Household Impact of HIV/AIDS on the Education of Children – A Study of HIV High Prevalence States of India," paper presented at XXV. International Population Conference, Tours, France, July 18-23, 2005.
- United Nations Population Division, 2007a, "World Population Prospects: The 2006 Revision – Highlights" (New York: United Nations).
- United Nations Population Division, 2007b, "World Population Prospects: The 2006 Revision Population Database" (New York: United Nations).
- Wilson, David, 2007, "HIV in South Asia," unpublished draft (Washington DC; World Bank).
- World Health Organization (WHO), 2006a, *Progress on Global Access to HIV Antiretroviral Therapy – A Report on "3 by 5" and Beyond* (Geneva: WHO).
- , 2006b, "India – Epidemiological Fact Sheet on HIV/AIDS and Sexually Transmitted Infections" (Geneva: WHO).
- , 2006c, "Death and DALY Estimates for 2002 by Cause for WHO Member States," available online at <http://www.who.int/healthinfo/bod/en/index.html> (Geneva: WHO).
- , 2007, *World Health Statistics 2007* (Geneva: WHO).
- , Regional Office for South-East Asia, 2007, HIV/AIDS in the South-East Asia Region (New Delhi: WHO Regional Office for South-East Asia).
- , Joint United Nations Programme on HIV/AIDS, and United Nations Children's Fund (WHO, UNAIDS, and UNICEF), 2007, "Towards Universal Access - Scaling up Priority HIV/AIDS Interventions in the Health Sector" (Geneva and New York: WHO, UNAIDS, and UNICEF).