PART III

The Burden of HIV and AIDS on the Health Sector

CHAPTER 5

The Fiscal Burden of AIDS Treatment on South Asian Health Care Systems

Mead Over

Introduction

In South Asia, HIV and AIDS are less prevalent than in Sub-Saharan Africa or in severely affected countries of the Caribbean, Southeast Asia, or the Pacific Islands. The slower spread of AIDS, combined with the fact that most South Asian countries have higher per capita incomes than the most severely affected countries of other regions, suggest that the various impacts of the disease will be smaller in South Asia than in other regions. While this conclusion is generally justified with respect to the impact of the disease on economic output, poverty, or orphanhood, it does not necessarily follow with respect to the health sector, where particular features of supply and demand can magnify the impact of any given rate of HIV infection.

Our analysis is broadly divided into two main parts. The first part of the chapter takes stock of the scale of the challenge to health sectors in South Asia. This part sets out with an overview of the estimated numbers of AIDS cases and the availability of treatment in South Asia (section 2), including a review of the available evidence regarding the provision of antiretroviral therapy through public and private health services. Section 3 looks forward, providing new estimates of the costs of AIDS treatment through the year 2020 for six South Asian countries,[1]

on the assumption that countries will attempt to provide universal access to AIDS treatment.

The second part of the chapter considers the implications of specific features of the supply and demand for health care in South Asia for the impact of the projected increased demand for AIDS treatment on South Asian health sectors, focusing on the roles of private vs. public health care providers. This emphasis reflects the fact that the public health systems of the South Asian region provide a much smaller proportion of their citizens' health care than do the systems of countries outside the region that are severely affected by AIDS (section 4). With the notable exception of Sri Lanka, three-quarters or more of health expenditures in the region are financed privately, and little or none of the private payments are mediated by third-party payers like insurance agencies. The fact that much of South Asia is poorly provided with public facilities or public sector health finances suggests that many of these people who would frequent public facilities in other countries will instead seek care from a nearby private practitioner, either modern or traditional.

In a context where public health services and third-party payers like insurance agencies play a relatively minor role, the high costs of ART have implications for access to such treatment and expose households to the risk of poverty. Section 5 discusses the impact of health expenditures on poverty in general, and arrives at conjectures regarding the impacts of HIV AND AIDS-related health expenditures on poverty.

Since AIDS treatment cannot be presumed to slow HIV transmission and may speed it, the usual argument for paying for such treatment with public funds is on equity grounds—that it will prevent poverty and orphanhood. However, section 6 of this chapter argues that publicly provided AIDS treatment might crowd out lower-quality private AIDS treatment, thereby preventing some negative spillovers of poor-quality treatment. The section reviews the evidence that suggests that this effect of public treatment might be sufficient to justify government support on efficiency grounds.

Finally, a concluding section summarizes the findings of the chapter, and suggests their policy implications for South Asian governments.

Overview of AIDS Cases and Treatment in South Asia

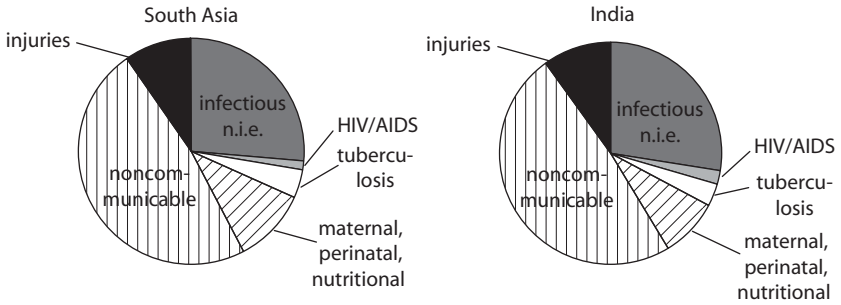
Knowledge of the burden of AIDS in South Asia became dramatically more precise with the release in 2006 of India's first population-based survey, which collected and analyzed blood samples in order to accurately

measure the proportion of India's population that is infected with HIV. Since India is the region's largest country, the adjustment of its estimated prevalence rate from almost 1 percent early in 2006 down to approximately 0.3 percent after release of the survey has erased more than 3 million putative cases of HIV infection from the region.

In other chapters in this volume, the implications of this correction for the epidemiology and the economic impact of AIDS in India are spelled out (Haacker, chapter 3; Claeson and Wilson, chapter 1). Here it is sufficient to note that a smaller prevalence rate means that the epidemic has caused a smaller increase in the demand for health care than might previously have been conjectured. Figure 5.1 repeats Haacker's pie chart of the current burden of disease, showing that HIV and AIDS account for 1.5 percent of all deaths in South Asia and about 2 percent of all deaths in India. Haacker (chapter 3) points out that these numbers of deaths are comparable to the numbers from diabetes, tuberculosis, and measles.

What will these pie charts look like in the future? Recent evidence suggests that, in accordance with the pattern typically observed during an epidemiologic transition, measles is declining as a cause of death in the region, while diabetes and tuberculosis are both increasing. While diabetes is a lifestyle disease associated with the increasing prevalence of obesity, tuberculosis is an opportunistic illness that takes advantage of weakened immune systems, and thus can be spread by AIDS. Thus, if HIV continues to spread at the rate it has in the past, it is likely to grow to be substantially more important than measles and may outpace diabetes. Whether HIV or TB will grow faster will depend on the vigor of programs to prevent and treat them.

Figure 5.1 South Asia and India: Contribution of HIV/AIDS to Mortality



Source: Haacker (present volume).
Note: n.i.e. = not included elsewhere.

Table 5.1 Estimated Numbers of People Requiring and Receiving ART, end of 2007

	People Receiving ART			*People Needing ART*		
	Point estimate	*Lower range*	*Upper range*	*Point estimate*	*Lower range*	*Upper range*
Bangladesh	<200		<200	2,400	1,500	4,000
Bhutan	<100		<100	<100	<100	
India	158,000	138,000	178,000	…	630,000	1,600,000
Nepal	1,400	1,300	1,600	20,000	13,000	30,000
Pakistan	600	500	600	20,000	13,000	34,000
Sri Lanka	<200	<100	<200	780	540	1,100

Source: Adapted from World Health Organization, UNAIDS, UNICEF 2008.

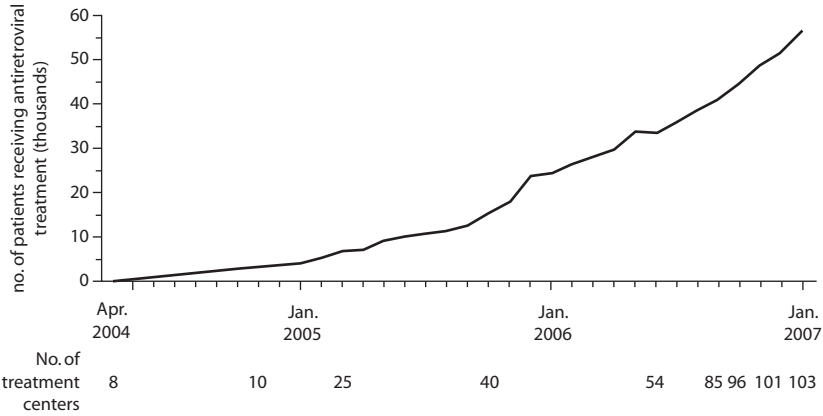
Table 5.1 presents estimates by WHO, UNAIDS, and UNICEF (2008) of the number of people receiving AIDS treatment and the number needing it but not receiving it (unmet needs) in each South Asian country. While the number of people receiving treatment is based on real, even if somewhat incomplete, data from regional health ministries, the number of people estimated to need treatment is extrapolated from epidemiologic projection models and is thus dependent on the available HIV-prevalence data.

In India, the recently announced adjustments in the estimated number of HIV-infected people give credence to the lower estimate of 630,000 needing treatment, and suggest that the upper estimate of 1.6 million is obsolete. Since the ratio of those receiving treatment to those needing it is defined as the coverage rate, the choice of 630,000 as the denominator means that India has achieved a 15 percent coverage rate rather than only a 6 percent coverage—welcome news to those striving for maximal coverage.

Figure 5.2 presents data on the scale-up of central government-financed ART to a total of about 56,500 patients in January 2007. The most remarkable feature of the scale-up depicted in figure 5.2 is its constantly increasing upward slope. Like Thailand, Botswana, and a few other countries, India has been able to accelerate its treatment program. While one can ask whether the patient numbers represent surviving patients or replacements recruited when a patient dies or is lost to follow-up, the achievement of continued acceleration over a three-year period is remarkable and sets a high standard for coming years.

Estimates for the number of patients receiving ART in India from nongovernmental sources are extremely conjectural. Steinbrook (2007)

Figure 5.2. HIV Treatment in Centers Supported by the Indian National AIDS Control Organisation, April 2004 through January 2007



Source: NACO as cited by Steinbrook 2007.

estimates they number between 10,000 and 20,000. WHO's April 2007 progress report gives an estimate of 25,000 receiving ART in the unorganized or "unstructured" private health sector (see WHO, UNAIDS, and UNICEF 2007). This brings the estimated total under treatment in 2006 to about 95,000. By December 2007, the updated WHO report estimates a total of 158,000 under treatment, including about 5,000 treated by NGOs, and 35,000 in the for-profit private sector. Thus, for two years running, the Indian government has estimated that it is treating three out of four Indian ART patients, with one out of four being treated in the formal and informal private sectors. Since the private sector provides over 80 percent of all health care in India, these estimates suggest that Indians depend much more on the public sector for AIDS treatment than they do for other health care services.

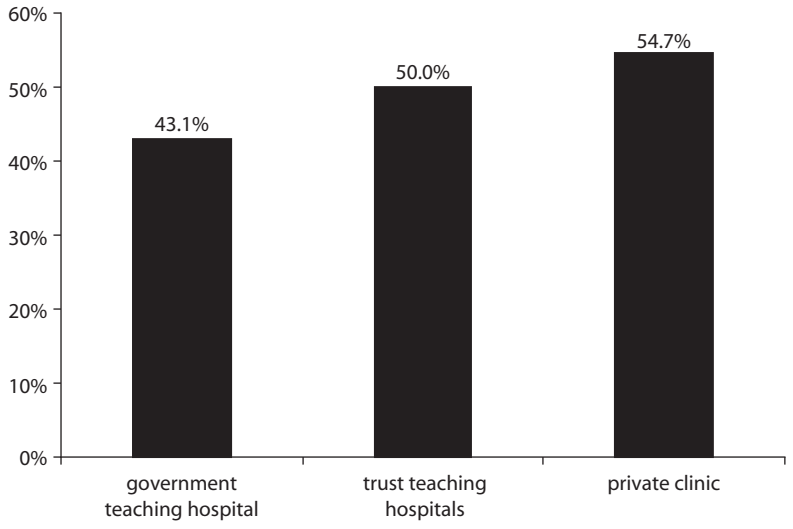
It is also possible, however, that NACO and WHO have greatly underestimated the amount of private sector provision. For example, using data from two surveys of Indian physicians, one by mail and another conducted by the representatives of a major pharmaceutical firm, a study performed in 2002 found substantial prescribing of ART among nongovernment physicians (Hira 2002). The representativeness of neither of these samples can be assured. The former suffered from a response rate of only 30 percent, while the latter was a convenience sample selected by the pharmaceutical company, which is likely to be biased toward high-volume prescribers. Within the sample collected by the pharmaceutical

companies, about a third of the respondents were employed by government hospitals, while 46 percent were in private clinics, and 22 percent were in trust hospitals. Given that many of the government employees in the sample also practice part time at private clinics, this distribution plausibly represents the population of Indian physicians.

Respondents were asked whether they prescribed antiretroviral medications. Their self-reported answers were coded as "never," "occasionally," or "frequently." Figure 5.3 presents the results. Note that in 2002, the more independent the practicing physician was from any affiliation with the government, the more likely he was to prescribe ART, with the highest frequency being practitioners in private clinics. This was in 2002, before India began to expand the availability of ART with the establishment of AIDS Treatment Centers. The pattern partly reflects the fact that the pharmaceutical company was approaching and surveying its usual clients, who are probably high-volume prescribers. However, even taking this possible source of bias into account, the pattern shows that many private sector physicians were fully engaged in ART treatment.

Assuming these surveys to be representative—a perhaps heroic assumption—the authors of the study estimated that about 90,000 Indians were receiving ART in 2002, at a time when the government was

Figure 5.3 Percent of Physicians Who Report Prescribing ART "Frequently" by Type of Institutional Affiliation in India in 2002



Source: Hira 2002.

formally delivering treatment to only a few thousand patients. Thus an upper bound to the number of patients receiving ART in the private sector in 2005 is on the order of 100,000 to 200,000. Assuming that most of the patients previously treated in the private sector in 2005 remain under treatment in the private sector, then the 118,000 patients receiving government-financed ART in December 2007 are only one-third to one-half of all the Indians currently under treatment. Thus, it is safe to say that somewhere between 25 percent and 67 percent of AIDS care in India is currently being delivered by the private sector.

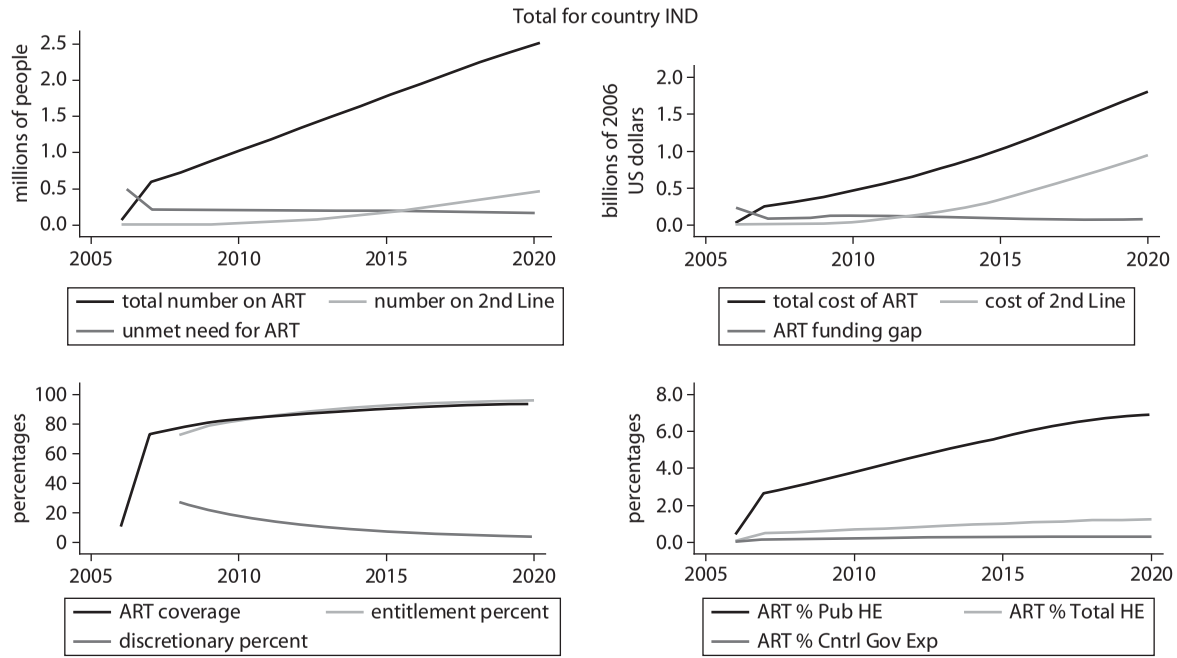
Future Growth of South Asian Treatment Costs

For patients who benefit from antiretroviral therapy, AIDS is a chronic disease. Given current technology, patients will need to take their AIDS medication every day for the rest of their lives. Thus, the fiscal and organizational burden of treating AIDS patients accumulates over time as patients who begin treatment this year are added to the stock of patients still alive from previous years.

Figures 5.4 and 5.5 present the projected burden of treatment costs for two of the South Asian countries, India and Nepal. Both figures are generated by the same model that is described in annex 3. Given assumptions regarding the success of antiretroviral therapy and the rate of new cases of HIV infection, the calculations presented in these figures are based on the assumption that all South Asian countries adopt a rapid scale up of antiretroviral therapy consistent with the ambition to achieve "universal coverage" as quickly as possible (Shrestha, Bhatta, and Bhatta 2006). The four panels in the two figures present the projected number of patients (in the northwest panel), the costs of the program each year (in the northeast corner), the percentage of the cost for those remaining from previous years, here called the "entitlement," (in the southwest corner), and the treatment cost as a percent of health and total public expenditure (southeast).[2]

The first thing to note in comparing the figures for India and Nepal is the difference in scale, measured on the vertical axis in each of the four panels. While India's number of patients in treatment rises from less than 100,000 to 2.5 million in the year 2020, Nepal's number is 30 times smaller, rising to about 100,000 at the end of the period. Similarly the ratio between projected annual AIDS expenditures in the year 2020 also differ by a factor of 30, with India projected to spend about US$2 billion that year, and Nepal spending "only" US$60 million.

Figure 5.4 Projected AIDS Treatment Burden in India Assuming Rapid Scale Up

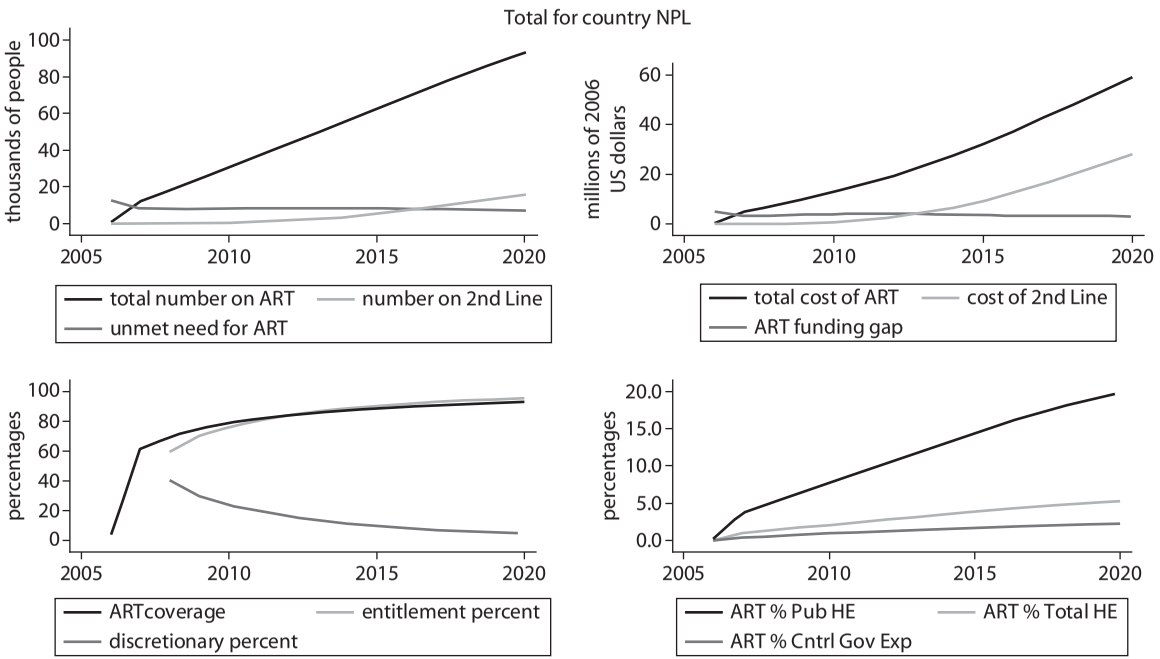


adjusting at 95.0 % of unmet need each year

adrate1 = .13, adrate2 = .04, bdrate = .01, Erate = .11, ndrate = .3, incdwn = .95

Source: Author's projections.

Figure 5.5 Projected AIDS Treatment Burden in Nepal Assuming Rapid Scale Up



Source: Author's projections.

Among other assumptions detailed in annex 3, the model assumes that 4 percent of those who survive one year on AIDS treatment will experience "treatment failure" each year, and then be given much more expensive "second-line" therapy. We assume that on top of a constant US$278 per year in clinic time, first-line drugs cost US$227 a year, while second-line therapy costs US$2,681. As a result of these assumptions, the projections for both India and Nepal (and for the other countries shown in annexes 1 and 2) for the portion of total costs consumed by second-line therapies are much larger than the portion of patients who receive them. (Compare the line for second-line patients in the northwest quadrant with the line for second-line patients in the northeast quadrant.) By 2020, more than 20 percent of treatment costs will be for second-line therapy, a fact that raises the urgency of efforts to bring down the cost of these more sophisticated and newer AIDS drugs.[3]

Government will also want to know what share of their various budgets will be consumed by the accumulating costs of AIDS treatment. One way to address this issue is to project forward each country's total health expenditure under the assumption that it remains the same percentage of GDP as in 2004 (the last year for which we have data). The southeast panel of the two figures shows the projections that AIDS treatment in India will rise to absorb about 6 percent of the central health budget, while in Nepal it would rise to consume about a fifth of the health care budget. Of course in both countries, the health budget might be expanded in order to absorb AIDS treatment expenditure, meaning that the major cost of AIDS treatment would be forgone funding in sectors from which the funds are reallocated.

These projections for India and Nepal both assume rapid scale-up of ART, indeed more rapid than was promised by the Indian National AIDS Control Organisation in its various announcements. At the other extreme, suppose that countries are able to maintain only the rate of scale-up that they have already demonstrated since 2004. As we saw for India in figure 5.2, this "historical" rate of expansion has been steady and accelerating, but moderate. The result will be much lower costs in the year 2020. Comparing the top and bottom rows of annex 5.4 we can see that rapid scale-up will cost about six times as much per year by 2020, compared to historical scale-up. Of course, under slower scale-up the governments will lose millions to AIDS deaths who might otherwise have had extended lives.

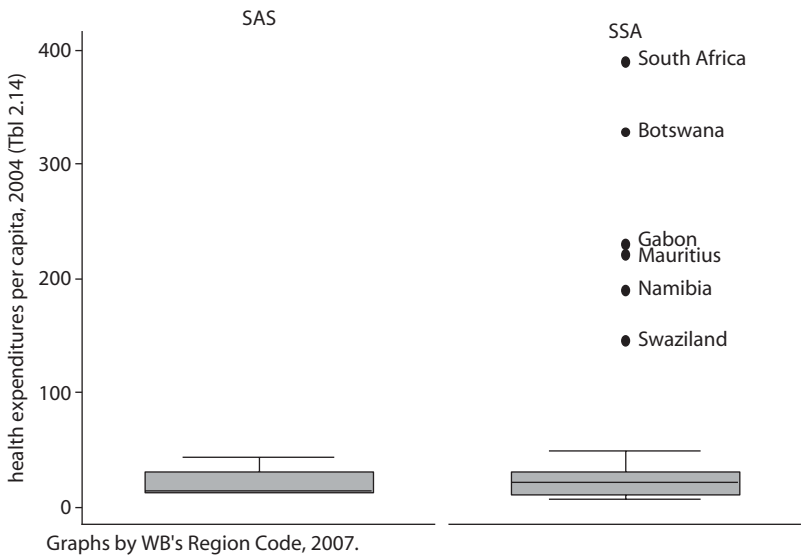
Annex 5.1 presents similar projections for the South Asian countries of Bangladesh, Bhutan, Sri Lanka, and Pakistan. Annex 5.2 presents a single graph for the aggregates across all the countries of South Asia

(comparable to the tables in annex 5.4) and a second single graph for all of Sub-Saharan Africa. Sub-Saharan Africa as a unit is projected to be treating 30 million people by 2020, at an annual cost of US$25 billion. In the absence of assistance, AIDS treatment will be consuming about 80 percent of what would have been the health budget of the average African country. Since Africa benefits from greater inflows of grant support for AIDS treatment than does South Asia, the African governments will not be asked to cover a large share of these extraordinary costs.

Health Care Financing in South Asian Countries

Although per capita incomes are higher in South Asia than in many African countries, the two continents are on par with respect to total health expenditure per capita. Figure 5.6 presents a box and whisker plot showing the distribution of total health expenditure per capita in the six South Asian countries on the left side, and the distribution of the same variable for Sub-Saharan Africa on the right side. Although there are several outliers above the African graph, capturing the wealthiest countries

Figure 5.6 Total Health Expenditure per Capita Is Similar in Most South Asian and Sub-Saharan African Countries



Source: Author's construction from World Bank (2007).

Table 5.2 Shares of Private and Public Health Care Production in India

	1986–87		*1995–96*		*2004*	
	Rural	*Urban*	*Rural*	*Urban*	*Rural*	*Urban*
Not treated	18	11	17	9	18	11
Treated as outpatients						
Public	26	28	19	20	22	19
Private	74	72	81	80	78	81
Treated as inpatients						
Public	60	60	44	43	42	38
Private	40	40	56	57	58	62

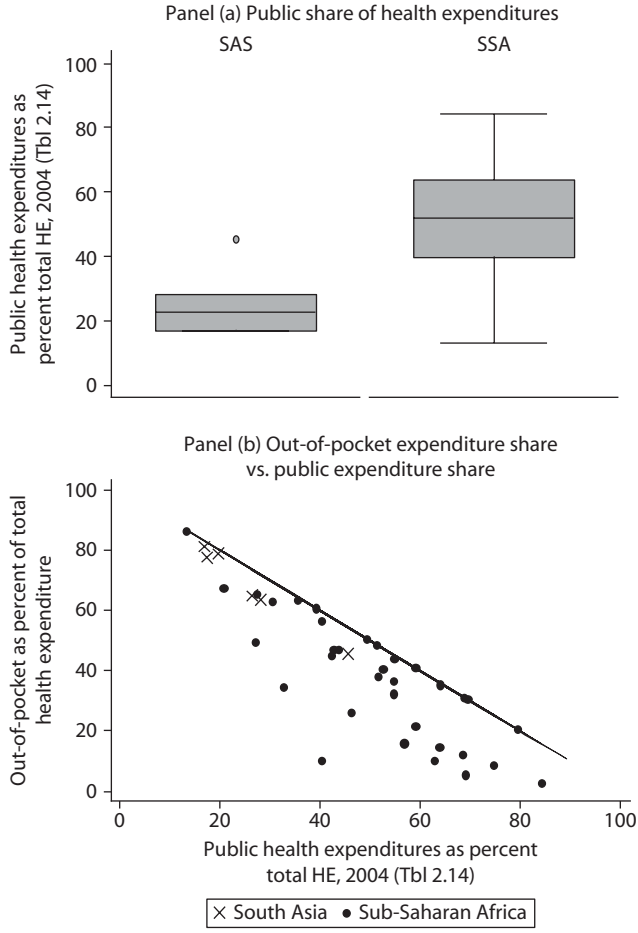
Source: Indian National Sample Survey Organization (1992, 1998) as cited in Peters, Yazbeck, and others, Better Health Systems for India's Poor, 2002, Chapter 2, Table 2.4, p. 48.

on that continent, the center of the distribution is similar in both cases, with the median for both distributions being under US$20 per person.

The importance of the private health care sector in a country can be analyzed from either the production or the expenditure perspective. Table 5.2 presents data on the production side of the Indian health sector for 1986–95. The public share of both public and private health care production clearly declined in that decade, with the private share reaching 80 percent of outpatient care and almost 60 percent of inpatient care (Sengupta and Nundy 2005). Data from the 2004 National Sample Survey shows no change in private sector dominance of outpatient care and increased private sector dominance of inpatient care.[4] In view of the growth of the private sector Indian economy since 1995 and the greatly increased inequality of the income distribution, it would not be surprising to find that the private component accounted for an even larger share of the health care sector in 2008 than it did in 2004. Since successful AIDS treatment is delivered on an outpatient basis, these data support the view that many Indian patients are likely to seek and receive ART from the private sector.

The two panels of figure 5.7 analyze the public and private roles from the expenditure perspective, comparing the South Asia region to Sub-Saharan Africa. Panel (a) of figure 5.6 shows that unlike total health expenditure, public health expenditure is distributed very differently in the two regions, with African governments being typically more generous than South Asian ones. While the median country in South Asia covers only about one-fifth of health care costs out of public money (with India covering even less and Sri Lanka much more), the median country in Africa covers about half of health expenditure.

Figure 5.7 South Asian Countries Offer Less Public Financing and Less Insurance Financing Than Most African Governments



Source: World Bank 2007.

Whether low public funding makes health care accessible depends on how much of the balance must be covered by the patient out of pocket. Panel (b) of figure 5.6 shows that there is generally a negative relationship between the share of total health expenditure covered by government and the share covered by patients out of pocket for both South Asian and Sub-Saharan countries.[5] This is not surprising since the private individual's percentage contribution plus the government's percentage contribution cannot exceed 100 percent. If the government and the private

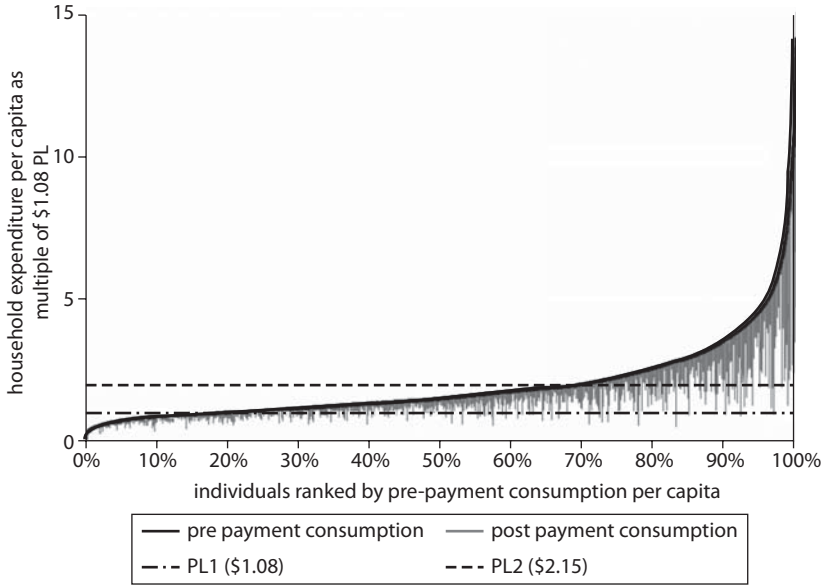
person's out-of-pocket payments were the only contributors to financing health care, all of the countries in both regions would lie exactly on the straight line that is at a 45-degree angle from the two axes. The reason that the country markers are not on the downward-sloping diagonal is that some patients' costs in every country are partly covered by a "third-party payer." These "third parties" might be public or private insurance schemes or employers. The farther a country marker is to the southwest of the downward-sloping straight line, the larger the share that third-party payments assume of the total cost of medical care in that country. For example, the country that is farthest from the diagonal is South Africa, with Botswana, Zimbabwe, and Uganda also having substantial coverage of private health expenditure from third-party payers. In contrast, none of the South Asian countries benefits from more than 9 percent coverage of health care expenditure by third-party payers. Sri Lanka and Nepal have the most developed health insurance systems, covering about 8.7 percent of total expenditure. In India, the coverage of third-party payers in 2004 was only about 5.1 percent.

Access to Private Health Care and the Risk of Poverty

When a household has no access to subsidized public health care and no third-party coverage, it is completely exposed to the possibility of severe sickness episodes and the health care expenses they entail. Traditional analyses of poverty use household expenditure to gauge the household's well-being. But a household that has experienced life-threatening illness will sell assets and borrow in order to finance higher-than-normal health care expenditure. Analysis of total household expenditure per capita makes it appear that such a household is doing very well, simply because they spent a lot. Only by netting out the health care expenditure can one approximate the household's actual well-being. To the extent that South Asian AIDS patients are spending out of pocket for AIDS treatment, one can surmise that their household expenditure will be similarly inflated.

In studies of a number of European and Asian countries, Adam Wagstaff, Edie Van Doorslaer, and their co-authors have developed an interesting graphic technique for displaying the impact on poverty of sickness episodes and the consequent health care expenditure in the absence of government subsidies or insurance coverage. Figure 5.8 is reproduced from their analysis of Bangladeshi household expenditure in 2000 before the AIDS epidemic had generated many patients paying for AIDS treatment. The upward-sloping curve displays the cumulative distribution

Figure 5.8 Impact of Health Expenditure on Household Net Consumption Patterns in Bangladesh



Source: Van Doorslaer and others 2006.
Note: Vertical lines represent reductions in household expenditure per capita caused by health spending. Lines that drop below the poverty lines (blue and green lines) represent individuals pushed into poverty by health expenditure in 2000.

of household expenditure in Bangladesh. The vertical axis measures the household's expenditure per member per day in multiples of the poverty line of US$1.08 per day. A second horizontal line is constructed at another less strict Bangladeshi poverty line of US$2.15 per day. The overall distribution shows that according to conventional measures, about 20 percent of the population lived in households where daily consumption was less than US$1.08 per day, and about 70 percent lived in households below US$2.15 per day.

However, these conventional calculations omit consideration of health expenditure. The downward dropping "paint drips" from the curved shape of the cumulative expenditure distribution show the effect of subtracting out-of-pocket health expenditure from total expenditure. The impact of this "correction" to the traditional measure of household well-being is dramatic for some households, bringing their net consumption per household member below one of the poverty lines. Health expenditure

large enough to reduce a family to penury can be fairly classified as "catastrophic." Note that even households that would otherwise have been in the top decile of household expenditure were reduced to poverty by one of the two measures once health expenditure was netted out of their annual consumption.[6]

Figure 5.8 dramatically depicts the problem of catastrophic health expenditure in Bangladesh, but unavoidably overstates the prevalence of the problem. For one of the vertical "paint drips" to be visible, the line must have a certain width. Given the horizontal dimension of the printed page, even a small number of "paint drips" will occlude the surface of the page, making it look as if virtually all households suffer substantial reductions in well-being from health expenditure. Consequently, the only way to assess the prevalence of the problem of catastrophic out-of-pocket health expenditure is to consider a table that gives the percentage of individuals whose household expenditure net of health care costs is in fact below the poverty line.

Table 5.3, which is excerpted from Van Doorslaer et al. (2004), presents the impact on poverty in four South Asian countries by analyzing household expenditure per capita net of health expenditure. In India, this redefinition of poverty would push an additional 20.6 million below the higher poverty line, and 37.4 million people below the lower one, increasing the proportion of Indians suffering from the most extreme form of poverty by 12 percent. In Bangladesh, Nepal, and Sri Lanka, health expenditure increases the number of those below the lower poverty line by 17 percent, 6 percent, and 8 percent, respectively. Although these increases in measured poverty are smaller than might be inferred from figure 5.8, they are nevertheless substantial.

Many who have sought private sector treatment for AIDS are likely to have been pushed below the poverty line. Suppose that an individual spends approximately US$365 a year out of pocket on AIDS treatment, which is enough to cover the full cost of first-line triple-drug therapy at generic prices, plus doctor visits and some laboratory tests. In a four-person household, this would add US$0.25 per member to daily health expenditures. From figure 5.7 we can see that households at about the 40th percentile of India's expenditure distribution, which had no other health expenditure, would be pushed down below the lower Indian poverty line by a single AIDS patient, to be on a par with households at the 20th percentile. Two AIDS patients in a household would severely impoverish a household that had previously been at the 45th percentile of the expenditure distribution.

Table 5.3 Poverty Head Counts: Effect of Accounting for Out-of-Pocket Payments for Health Care, Various Years

	Poverty Line of US$1.08 per Day Change in poverty head count					*Poverty Line of US$2.15 per Day Change in poverty head count*				
	*Prepayment head count**	*Postpayment head count*	*Percentage point change†*	*Number of individuals‡*	*Percentage change§*	*Prepayment head count**	*Postpayment head count*	*Percentage point change†*	*Number of individuals‡*	*Percentage change§*
Bangladesh	22.5%	26.3%	3.8%	4,940,585	16.8%	73.0%	76.5%	3.6%	4,653,875	4.9%
India	31.1%	34.8%	3.7%	37,358,760	11.9%	80.3%	82.4%	2.1%	20,638,361	2.6%
Nepal	39.3%	41.6%	2.2%	515,933	5.7%	80.4%	81.7%	1.3%	290,280	1.6%
Sri Lanka	3.8%	4.1%	0.3%	60,116	8.3%	39.1%	40.8%	1.7%	325,783	4.3%

Sources: Van Doorslaer et al. Table 4 and the Equitap project working papers.

Suppose that all of the 500,000 to 1.6 million people who are estimated to be living with AIDS in India are in households that would otherwise be above the US$1.08 poverty line, but not above the 40th percentile of the Indian income distribution. Since there were between 300 and 500 million Indians living under the US$1.08 poverty line in 2000, AIDS would increase the number of "strictly" poor by less than half of a percent. In so doing, it would increase the percentage of the population below the stricter poverty line from about 35 percent to 38 percent.

This analysis does not take into account the fact that AIDS treatment must continue for the rest of the patient's life. Most of the "paint drips" in figure 5.8 are probably associated with acute illness, not chronic illness. A household might recover its economic status after a single catastrophic expenditure depresses their net expenditure for a single year. But that same household would need more robust coping strategies to deal with a stream of equivalently catastrophic expenditure every year. To analyze chronic disease, one would need a graph like figure 5.8, which would be constructed for wealth (or "permanent income") instead of expenditure.

In order to push this analysis further, it would be useful to have information on the distribution of South Asian HIV infections across the income or expenditure distributions depicted in graphs like figure 5.8. It would be useful to know whether a poor person in South Asia is more or less likely to have HIV infection than a person of middle or higher income. Reports of mostly poor people accessing government subsidized antiretroviral therapy in the last few years can be set against anecdotes and rumors about the spread of AIDS among the relatively wealthy in Bollywood. Unfortunately, until recently there has been no population-based information available on the distribution of HIV infection by socioeconomic class in India, or indeed in almost any country in the world.[7] The fact that India's recent reassessment of the extent of HIV infection was based on a household survey offers hope that India will be able to correlate HIV infection to socioeconomic status for the first time.

Even without data on the socioeconomic distribution of HIV infection in South Asia, the absence of either a large public presence in health care delivery or significant health insurance coverage for 19 of 20 South Asian citizens renders the population unusually vulnerable to the financial risk of catastrophic health expenditures to treat AIDS. The efforts by governments in the region to assume public sector responsibility for rolling out AIDS treatment is a movement against the trend toward private sector dominance in the health care market. The next section presents projections of the growing number of patients needing treatment, and poses the

question whether government-subsidized care can grow fast enough to meet all of that demand.

Quality of Private vs. Public ART

The consequences of private sector health care for AIDS are largely unknown. One view is that the newer formulations of antiretroviral drugs are so inexpensive, convenient, and easy to understand that private sector care might be as high quality as public sector care, and might extend treatment access to many people who could not otherwise obtain it in the South Asian countries. An alternative view is that private providers have insufficient incentive to ensure patient adherence to the drug regimen, without which the treatment will fail, and the patient may transmit a resistant form of HIV and then die. The worst possibility one can imagine is that private sector distribution would expand rapidly in the form of casual over-the-counter sales of a mixture of full-strength, diluted, and counterfeit antiretroviral medications, without any prescription or medical supervision. This kind of private sector expansion is a recipe for exacerbating both the spread and the cost of the AIDS epidemic. Within the complex private health care sectors in South Asian countries, there are surely examples of both adherence-maximizing and adherence-minimizing private care. The heterogeneity of private care between these two extremes remains to be determined. Of course, similar questions can also be raised about the quality of public sector care.

To the extent that private care is less successful at supporting patient adherence to ART regimes than the average public care facility, public financing of public sector ART delivery can be seen as crowding out some of the private sector care. If public sector care is less expensive to the patient than private care, and patients have at least a little knowledge of the relative merits of different service providers, the public sector care will crowd out the worst of the private care, thus preserving patient lives while stemming the development and spread of resistant strains of HIV.

The possibility that publicly provided AIDS treatment might crowd out lower-quality private care is an unusual and notable feature of public sector AIDS treatment in South Asia. Usually, when public subsidy or subsidized provision of a good or service crowds out private provision, any redistributive benefits that accrue must be weighed against the consequent efficiency losses. In this case, assuming that the public sector succeeds more than the low-quality private sector at facilitating patient adherence, the crowding out is preventing negative spillovers and is thus

contributing to an improvement in efficiency. Given the right magnitudes for these various effects, crowding out could provide a sufficient justification for public financing and provision even in the absence of the distributive arguments.

Model delivery of ART includes the following essential components: (i) standardized, competency-based training of physicians in ART management; (ii) prescription of a standard triple-drug regimen; (iii) support from a multidisciplinary team, including a counselor and a nutritionist; (iv) regular clinical and laboratory-based monitoring of the patient's treatment status; (v) counseling to prevent transmission; (vi) prophylaxis for opportunistic illnesses when indicated; and (vii) diagnosis and treatment of opportunistic illnesses (Over and others 2006). Thus, the question of whether private sector delivery of ART would improve or worsen the quality of care in South Asia depends on what proportion of the privately delivered ART meets these criteria.

In previous work, this author and his coauthors have conjectured that the private sector care used by India's poorest AIDS patients would be "unstructured" in the sense that it would not typically include these seven essential components (Over and others 2004). Since the publication of that book, only a single study has been published that addresses this conjecture. Sheikh and co-authors interviewed 215 providers in Pune, India, and found that three-quarters had been consulted by HIV-infected clients. Of these, 14 percent had prescribed ART, "sometimes without adequate knowledge of the guidelines for their use" (Sheikh and others 2005).

On the other hand, it is not clear that public sector ART programs will necessarily be of higher quality. One study analyzed the treatment of 32 HIV-infected patients prior to 2004 at the B.P. Koirala Institute of Health Sciences, a major teaching hospital in eastern Nepal (Shrestha, Bhatta, and Bhatta 2006). Thirteen of these were discharged with virtually no care. Among the rest, six of the seven prescriptions to fight opportunistic infections, and all four ART prescriptions were incorrect. The authors concluded that "the care of HIV-infected patients even at a major tertiary care teaching hospital in Nepal was sub-optimal." Since the Nepalese government has invested in the expansion of ART since 2003, a new study would hopefully reveal substantial improvement.

In a study of the quality of the delivery of general outpatient medical services (where there was no HIV diagnosis), Das and Hammer found that quality was extremely variable in the public as well as the private programs (Das and Hammer 2004). But deviations from best practice

care occurred in different directions and for different reasons in the two sectors. According to the authors, "in the public sector providers are more likely to commit errors of omission—they are less likely to exert effort compared with their private counterparts. In the private sector, providers are prone to errors of commission—they are more likely to behave according to the patient's expectations, resulting in the inappropriate use of medications, the overuse of antibiotics, and increased expenditures."

Both types of errors, of omission or commission, threaten the quality and therefore the success of AIDS treatment in India. Either can lead to early treatment failure for the patient and transmission by the patient of a drug-resistant strain of HIV to someone who consequently requires much more expensive second-line or salvage drug therapy. Thus, a government that is committed to providing subsidized AIDS treatment to all has an important role to play in assuring minimum quality standards for AIDS care in the private as well as the public sector.[8]

Conclusions

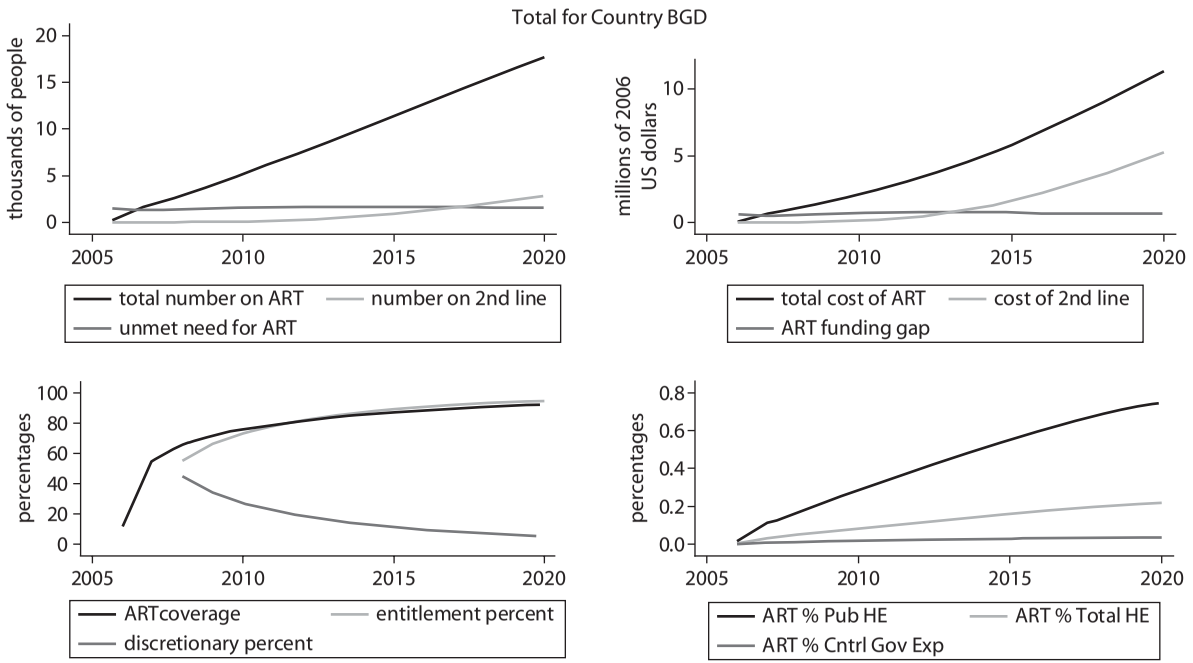
To the extent that patients seek out and obtain good-quality AIDS treatment from the private sector, South Asian governments can achieve the benefits of rapid scale-up without directly bearing the costs. However, it is difficult to project what the share of private treatment is now or will be in the future. If HIV infections are evenly distributed across the range of South Asian living standards, then only 30 percent of the cases would be above the more generous poverty line of US$2.15 given in figure 5.8. And the poorest 10 percent of these (the third decile of the expenditure distribution) would be pushed down into poverty by AIDS treatment expenditures. Under these assumptions, only 20 percent of AIDS patients could afford to pay for treatment without becoming impoverished. Without government subsidy, AIDS treatment would be beyond the reach of 80 percent of patients.

Against this background, the South Asian governments have three choices. They can strive to meet the goal of universal access as best they can with public delivery of ART. This policy will lead to the greatest expansion in costs and incidentally will swim against the current of the increasing privatization of South Asian health services.[9] They can allow the expansion of private AIDS care for those who can afford it, while trying to reduce its cost and assure its quality. Or they can use the AIDS epidemic as one more incentive to push for greater health insurance and other third-party payment of health care costs. The latter policy would be

difficult to follow in a population with extremely high prevalence rates, because AIDS treatment is an expensive risk and would raise issues of adverse selection. But a policy to expand health insurance that includes coverage of AIDS treatment may succeed in India and other South Asian countries where an HIV-positive diagnosis is still relatively rare.

Whether or not the South Asian governments decide to explicitly encourage the private sector in AIDS care, they have a fundamental responsibility to collect data on the quality of private AIDS care as it occurs, beyond the easy observation of government health workers. Only through data collection on private AIDS care will it be possible to gauge the severity of the quality difference between the local public and private delivery systems. Since private providers may have little incentive to retain clients over the many months and years required for treating this chronic illness, regulation of the private AIDS treatment sector is recommended. Depending on the findings of such a data collection and monitoring project, the government could decide to accelerate public provision (in order to crowd out the lowest end of the AIDS care spectrum) or to develop explicit strategies for delegating a part of the care burden to the private sector. It might be necessary to do both, each with a different segment of the private market.

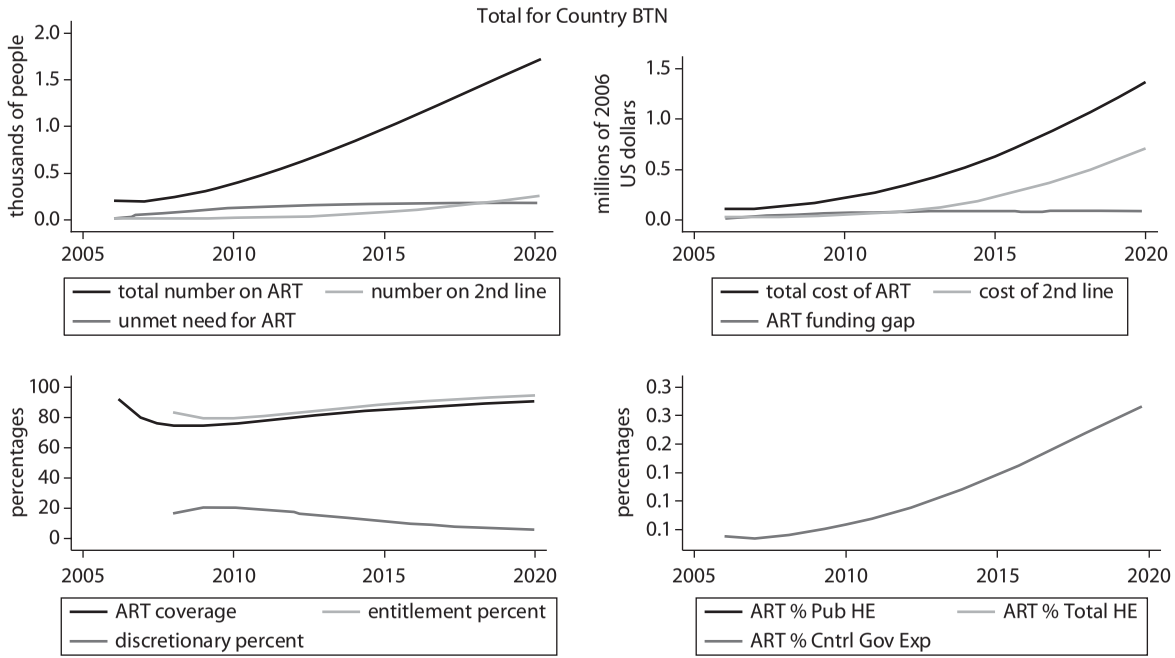
Annex 5.1 Projected Fiscal Burden of AIDS Treatment in Four South Asian Countries



adjusting at 95.0 % of unmet need each year

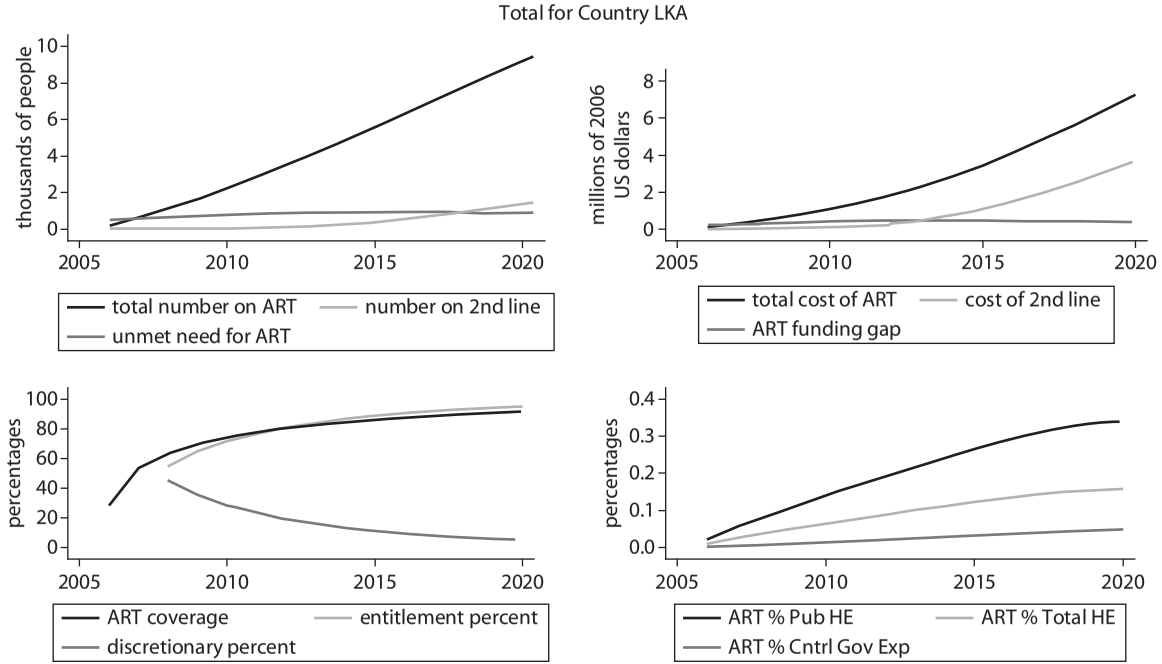
adrate1 = .13, adrate2 = .04, bdrate = .01, Erate = .11, ndrate = .3, incdwn = .95

Annex 5.1 Projected Fiscal Burden of AIDS Treatment in Four South Asian Countries *(continued)*



adjusting at 95.0 % of unmet need each year

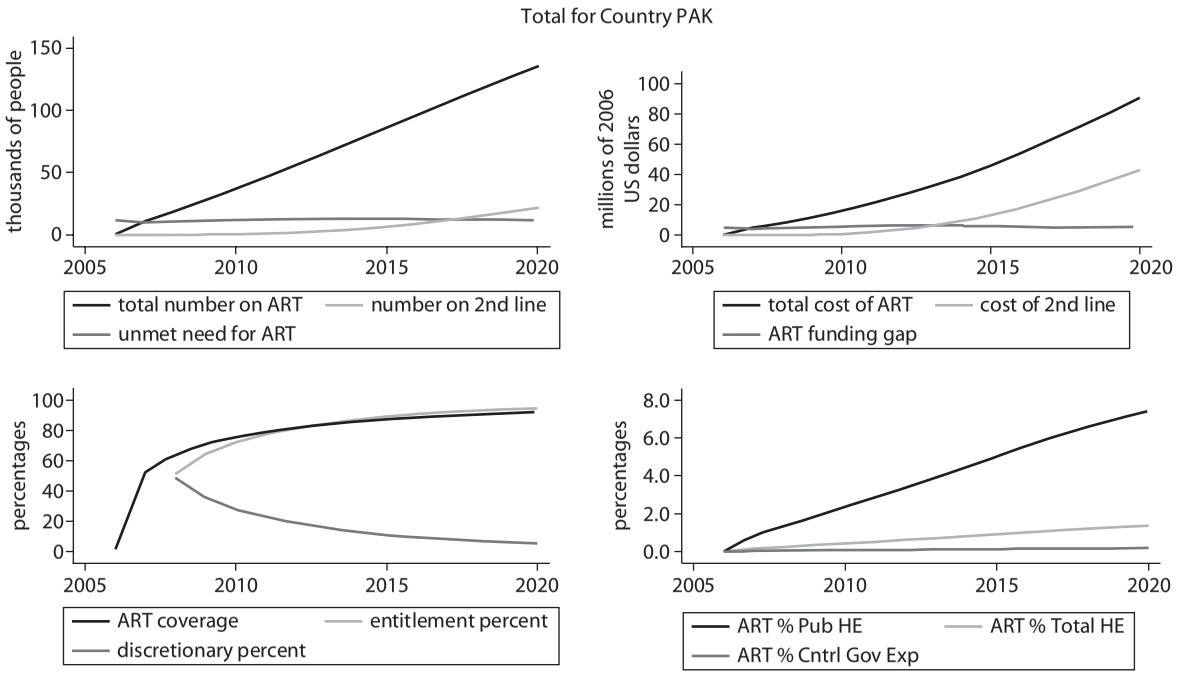
adrate1 = .13, adrate2 = .04, bdrate = .01, Erate = .11, ndrate = .3, incdwn = .95



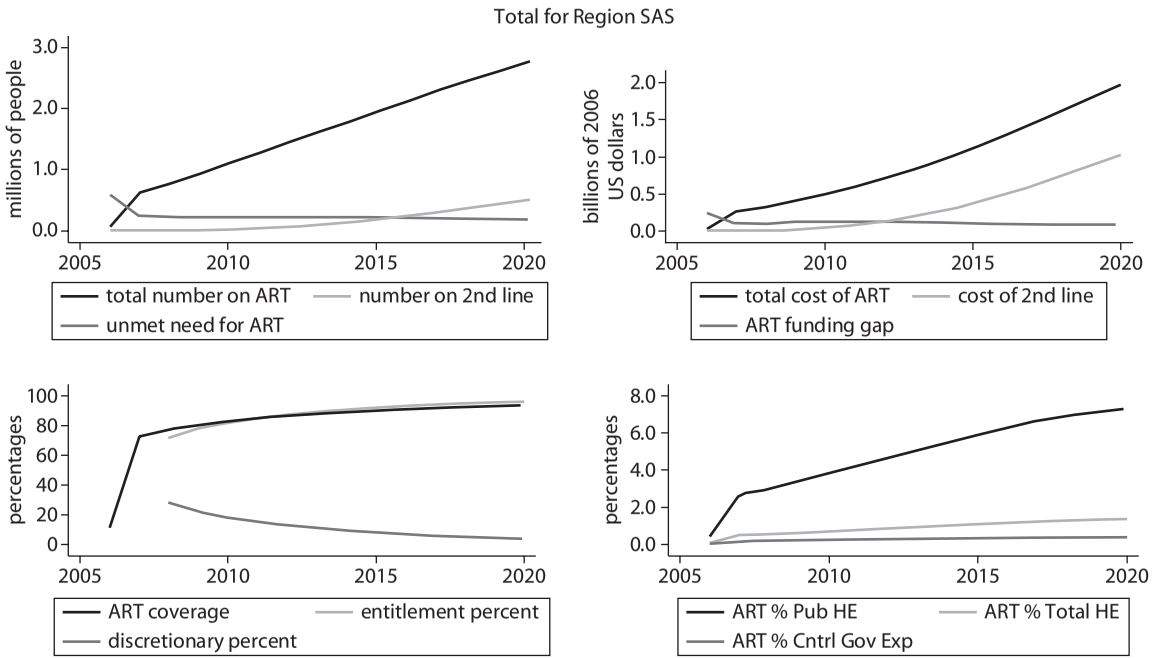
adjusting at 95.0 % of unmet need each year

adrate1 = .13, adrate2 = .04, bdrate = .01, Erate = .11, ndrate = .3, incdwn = .95

Annex 5.1 Projected Fiscal Burden of AIDS Treatment in Four South Asian Countries *(continued)*



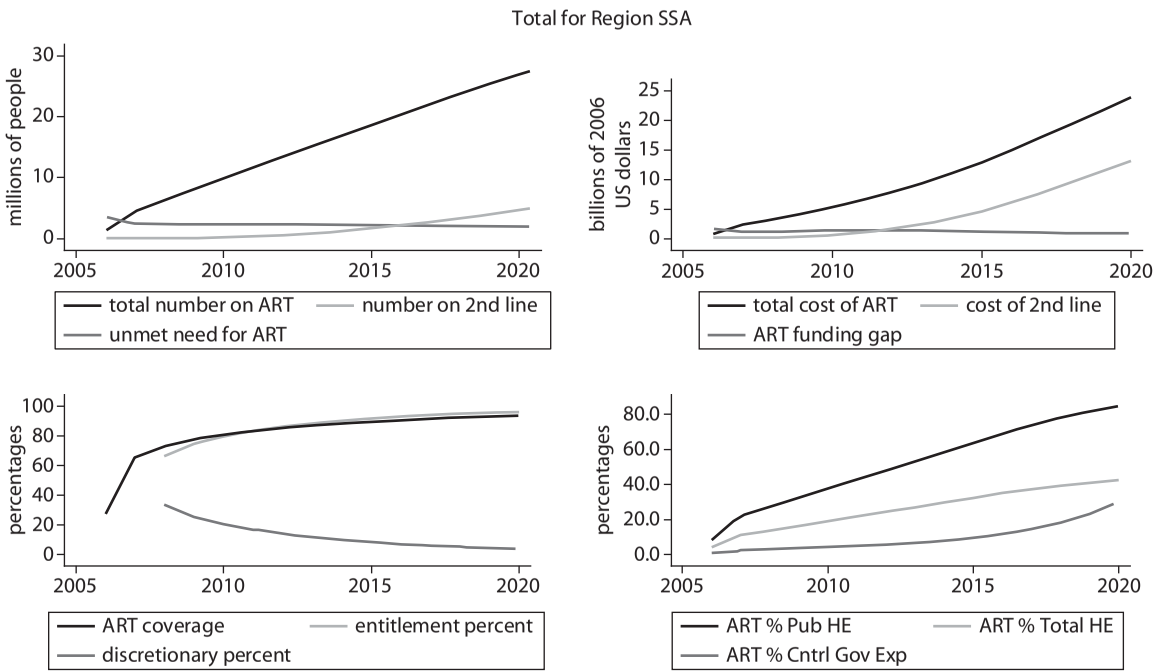
Annex 5.2 Projected Fiscal Burden of AIDS Treatment for South Asia & Sub-Saharan Africa



adjusting at 95.0 % of unmet need each year

adrate1 = .13, adrate2 = .04, bdrate = .01, Erate = .11, ndrate = .3, incdwn = .95

Annex 5.2 Projected Fiscal Burden of AIDS Treatment for South Asia & Sub-Saharan Africa *(continued)*



adrate1 = .13, adrate2 = .04, bdrate = .01, Erate = .11, ndrate = .3, incdwn = .95

Annex 5.3. Model for Projecting Future AIDS Treatment Costs[10]

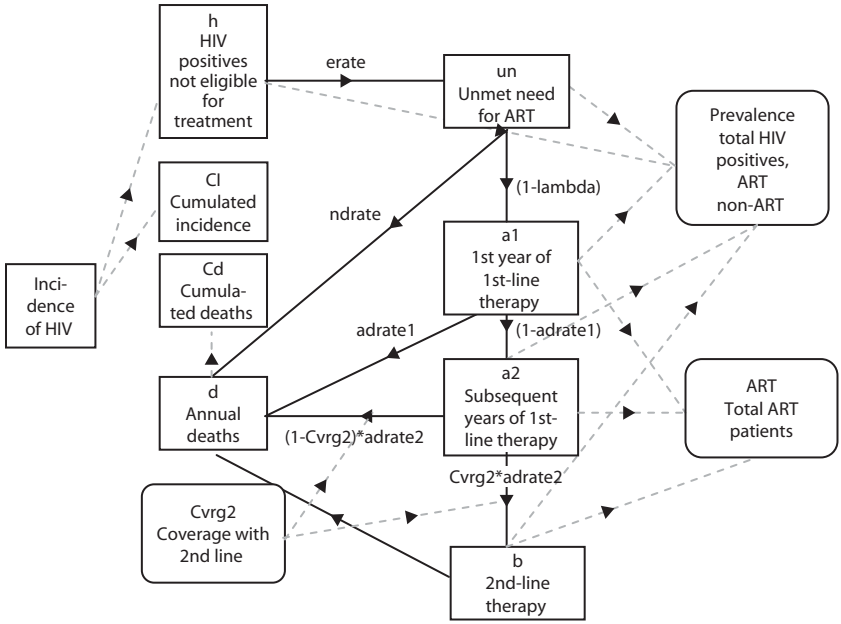
Projections of future treatment costs were made using a simple difference equation model based on those used in previous modeling studies of AIDS treatment in India (Over et al. 2004) and Thailand (Over et al. 2006). The prototype model was developed using Modelmaker from ModelKinetix (http://www.modelkinetix.com/) and then ported to STATA. The STATA code is available from the author on request.

The following figure provides a flow diagram of the model's difference equations as implemented by the STATA program *aidsproj.ado*. The dark lines with arrowheads indicate flows from a source to a sink. Parameter names close to those arrowheads are defined below the figure. Most of them are annual rates of flow expressed as proportions of the source population that move towards the sink in a single year. However, the parameter "Cvrg2" represents the proportion of patients needing second-line therapy who gain access to it in a given year. The runs of the model reported here assume that coverage with second-line therapy starts at 5 percent of those needing it in 2006 and levels off at 95 percent of those needing it in 2016.

Parameters of the *aidsproj* projection model

Proportion of HIV+ newly eligible for ART	erate	0.11
ART death rate during first year on 1st line	adrate1	0.13
ART failure rate during subsequent years on 1st line	adrate2	0.04
ART death rate of AIDS patients on 2nd line	bdrate	0.01
Non-ART death rate of AIDS patients	ndrate	0.3
Starting coverage rate for 2nd-line ART[11]	strtcov2	0.05
Target coverage rate for 2nd-line ART	trgtcov2	0.95
2nd-line ART to reach target in year	trgtyr	2016
Scale up of 1st-line modeled as constant proportion (1 - lambda) of unmet need, where lambda is constant across all countries and equal to:		
Historical scale-up	lambda =	0.82
Rapid scale-up	lambda =	0.05
Annual cost per patient of first-line drugs[12]		US$227
Annual cost per patient of second-line drugs		US$2,681
Annual cost per patient of clinic time		US$278

Annex 5.3 Flow Diagram for *Aidsproj* Model Predicting the Future Growth of AIDS Treatment Cost



Annex 5.4 Projected Annual Cost of Treating AIDS Patients in Six South Asian Countries by Uptake and Prevention Scenarios

	1st Line	*2nd Line*	*Total Cost*		*1st Line*	*2nd Line*	*Total Cost*
Costs of AIDS treatment at historical uptake with effective prevention (90% reduction in incidence each year)				*Costs of AIDS treatment at historical uptake with moderate prevention (5% reduction in incidence each year)*			
2006	26,991	7,673	34,664	2006	26,991	7,673	34,664
2007	40,188	8,071	48,259	2007	40,188	8,071	48,259
2008	52,467	9,102	61,569	2008	52,467	9,102	61,569
2009	64,405	11,313	75,718	2009	64,405	11,313	75,718
2010	75,425	15,087	90,512	2010	76,001	15,087	91,088
2011	85,236	20,780	106,016	2011	87,218	20,780	107,998
2012	93,718	28,679	122,397	2012	98,019	28,734	126,753
2013	100,865	38,979	139,844	2013	108,363	39,270	147,633
2014	106,732	51,806	158,538	2014	118,206	52,677	170,883
2015	111,410	67,205	178,615	2015	127,511	69,213	196,724
2016	115,008	85,176	200,184	2016	136,255	89,109	225,364

Annex 5.4 Projected Annual Cost of Treating AIDS Patients in Six South Asian Countries by Uptake and Prevention Scenarios (2006 U.S. dollars) (continued)

	1st Line	*2nd Line*	*Total Cost*		*1st Line*	*2nd Line*	*Total Cost*
Costs of AIDS treatment at historical uptake with effective prevention (90% reduction in incidence each year)				*Costs of AIDS treatment at historical uptake with moderate prevention (5% reduction in incidence each year)*			
2017	117,630	103,798	221,428	2017	144,420	110,451	254,871
2018	119,396	122,889	242,285	2018	151,987	133,122	285,109
2019	120,401	142,267	262,668	2019	158,953	157,014	315,967
2020	120,747	161,774	282,521	2020	165,319	182,005	347,324
			Least costly				
Total	1,350,619	874,599	2,225,218	Total	1,556,303	933,621	2,489,924
Costs of AIDS treatment at rapid uptake with effective prevention (90% reduction in incidence each year)				*Costs of AIDS treatment at rapid uptake with moderate prevention (5% reduction in incidence each year)*			
2006	26,991	7,673	34,664	2006	26,991	7,673	34,664
2007	258,193	8,071	266,264	2007	258,193	8,071	266,264
2008	319,797	9,102	328,899	2008	319,797	9,102	328,899
2009	388,257	23,025	411,282	2009	388,257	23,025	411,282
2010	445,754	46,425	492,179	2010	455,046	46,425	501,471
2011	492,955	81,134	574,089	2011	519,393	81,134	600,527
2012	531,116	128,198	659,314	2012	580,896	129,118	710,014
2013	561,384	188,133	749,517	2013	639,259	192,155	831,414
2014	584,774	261,115	845,889	2014	694,262	271,843	966,105
2015	602,187	347,036	949,223	2015	745,756	369,568	1,115,324
2016	614,414	445,581	1,059,995	2016	793,646	486,518	1,280,164
2017	622,159	546,294	1,168,453	2017	837,891	611,374	1,449,265
2018	626,036	648,227	1,274,263	2018	878,483	743,426	1,621,909
2019	626,595	750,576	1,377,171	2019	915,451	881,967	1,797,418
2020	624,316	852,648	1,476,964	2020	948,854	1,026,292	1,975,146
							Most costly
Total	7,324,928	4,343,238	11,668,166	Total	9,002,175	4,887,691	13,889,866

Source: Author's calculations based on assumptions in annex 5.

Notes

1. Owing to data constraints, the analysis presented in this chapter focuses on Bangladesh, Bhutan, India, Nepal, Pakistan, and Sri Lanka, and excludes Afghanistan and the Maldives.
2. Figures 5.4 and 5.5 share the assumption that the "incidence rate" of new cases declines at a modest 5 percent each year from its historical level. This assumption is also embodied in the two right-hand tables in annex 4.

3. The greatest uncertainty in these projections is with regards to the annual cost of second-line therapy. While the costs of clinic time and of first-line therapy are unlikely to change much, second-line therapy could either decline or increase in average cost. Second-line prices might decline due to negotiated price reductions and/or exercise of Trade Related Aspects of Intellectual Property Rights provisions, which allow a country to issue a "compulsory license" for domestic manufacture of a pharmaceutical product under certain conditions. But there will be upward pressure on second-line costs from the advent of newer medications, the increasing complexity of care for patients who fail first-line treatment, the usual increase in costs with increasing scale, and the globalization of the Indian pharmaceutical industry. Since the outcome of these conflicting trends is not clear, the projections presented here assume that unit costs remain constant for both first- and second-line medications.
4. Thanks to an anonymous reviewer for supplying the 2004 figures for this table. The data are advertised on the Web site of the statistical office at http://mospi.nic.in/mospi_nsso_data.htm.
5. To a different degree in each country, the cost of both AIDS and non-AIDS care is currently underwritten by donors. For example, according to India's NACO, the government of India covers 60 percent of NACO's budget out of either direct budget support or a credit from the World Bank. The remaining 40 percent of NACO's expenditures was funded by grants from DFID, the Global Fund to Fight AIDS, Tuberculosis and Malaria, and USAID. (http://www.nacoonline.org/About_NACO/Funds_and_Expenditures/)
6. The situation is a bit more complex than presented in the text. Since people have insurance and precautionary saving, some out-of-pocket payments are prefinanced and therefore should not be seen as immiserating. This prefinanced proportion of the out-of-pocket payment should instead be subtracted from both gross and net consumption. In figure 5.8, this would have the effect of shifting an individual "paint drip" to the left and also making it shorter. If the slope of the cumulative expenditure curve is sufficiently flat (i.e., less than 45 degrees), such a shift could move an individual who appears to be immiserated by health care expenditures to a position from which health expenditure no longer Pushes him or her below the poverty line. See Van Doorslaer, Wagstaff, and co-authors for in-depth discussion (Van Doorslaer et al. 2007; Van Doorslaer, Wagstaff, and Rutten 1993; Wagstaff 2002; Wagstaff, Van Doorslaer, and Paci 1989).
7. The incorporation of blood tests into the Demographic and Health Surveys financed by USAID has permitted such analysis for the first time in a dozen or so countries, none of which is in Asia. http://www.measuredhs.com/topics/biomarkets/start.cfm

8. High-quality AIDS treatment will not only maximize adherence, and thus patient survival, but will also minimize transmission in the community through outreach programs. Potential mechanisms to achieve this goal are discussed in Over and others (2006) and Over and others (2007).
9. A reviewer points out that the government of India has recently committed to increasing health expenditure from its present 1 percent of GDP to 2 percent to 3 percent of GDP by 2012. This paper shows that expansion of AIDS treatment could potentially absorb all of such an increase.
10. See the Spectrum projection model for an alternative approach: http://www.futuresinstitute.org/.
11. The model embodies the assumption that, for those people who fail first-line ART, access to second-line ART expands along a logistic curve from about 5 percent of all patients needing it now to 95 percent of all patients needing it in 2016.
12. Drug costs are assumed to vary across countries with the 2006 GDP per capita of the country according to the patterns observed by WHO in that year, and then to remain constant (in constant dollars) in any given country over time. While the costs of drugs may be reduced as markets for antiretroviral drugs become more contestable, the unit costs of achieving high ART uptake and strong adherence may increase at the same rate, leaving average costs per patient unchanged.

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CHAPTER 6

Recurrent Costs of India's Free ART Program

Indrani Gupta, Mayur Trivedi, and Subodh Kandamuthan

In April 2004, the government of India announced the Free Antiretroviral Treatment (ART) Program, which brought first-line antiretroviral (ARV) drugs within the reach of a much larger pool of ARV-eligible individuals. However, the full costs of providing treatment, the share of costs across entities involved directly or indirectly in the program, and the possible financial implications of a more scaled-up program were not much discussed or analyzed in the country, leaving open many questions regarding the cost of the program and the implications of scaling up access to treatment. The present study attempts to fill this gap by carrying out a financial analysis of the recurrent costs of the ART program of the government of India, with a view to understanding the per-client cost of provision of ART by the government, the share of various components of the program in total cost, the distribution of costs across the different bearers of such costs, the resource implications of scaling up, and the long-run sustainability of the program.

Introduction

The availability of antiretroviral drugs at reduced cost and the example of large-scale antiretroviral treatment programs in countries like Brazil have

spurred many other developing countries to start their own ARV treatment programs, including India, which launched its Free ART Program in April 2004, with the objective of expanding access to antiretroviral treatment, initially in high-prevalence states, and with the plan to subsequently expand to other states.

This chapter discusses the financial implications of scaling up the Free ART Program, and of expanding it on an all-India basis. Most of the analysis focuses on estimating unit cost data, which are critical for estimating the resource needs, and for any analysis of cost-effectiveness and impact evaluation. Comprehensive estimates of the costs of treatment with ARV, in sufficient breadth and detail to allow for such a scaling-up exercise, were not available so far, either in the public or in the private sector.

The only study of the costs of ARV treatment in India is a recent one by Bhat and Saha (2006), which uses an incremental cost approach to calculate per-client cost of providing ART for a site in Gujarat, and arrives at a figure of Rs. 668 per month. However, these calculations are based only on the direct provision of ART and do not take into account other shared costs incurred by the different departments of the hospital. To that extent, this figure underestimates the per-client cost, although it provides a very useful benchmark for which to compare our results.

From the perspective of the government, however, it is crucial to obtain estimates of such overhead costs, to understand the total recurrent costs at present, to know how the burden is distributed among different entities, and to understand the feasibility of sustaining the program over the years. In particular, it is important to understand the extent to which core government funds are being spent to sustain the program, as a significant part of the costs of running the program is being borne by the (government-funded) hospitals that are actually treating the patients. In order to fully understand the financial costs of India's Free ART Program, and to effectively plan and implement the program, it is important to understand the actual financial distribution of the costs. Understanding the full costs is also necessary to assess the feasibility and sustainability of an ARV treatment program.

Another objective of the costing exercise is to understand the component of total cost that is borne by individuals. This is important not only from a financial perspective, but also in terms of the potential impacts of HIV and AIDS on the household level. As will be shown below, the "free" program does not imply that the entire ARV treatment is free; individuals bear a significant burden of accessing ART, which needs to be analyzed to understand whether such costs impose a barrier to the available treatment.

The present study thus attempts a full financial analysis of the recurrent costs of the ART program of the government of India, with a view to understand the following:

- The per-client cost of provision of ART by the government
- The share of various components of the program in total cost
- The distribution of costs across the different bearers of such costs
- The resource implications of scaling up and the long-run sustainability of the program.

The study was completed in consultation with the National AIDS Control Organisation (NACO)[1], which also helped in selection of the study sites. In addition, in each of the sites, the hospital staff and the concerned State AIDS Prevention and Control Societies (SACS) offices were actively involved in facilitating the research and data collection.

The chapter is organized along the following lines: At the outset, we provide some background on India's Free ART Program. The analysis then proceeds broadly in three main steps. First, we discuss the methodology and the process of data collection, and present information on the various sites where the study has been conducted. Second, we outline the key assumptions and parameters underlying our unit cost estimates, and present our estimates of unit costs of treatment and of out-of-pocket expenditures associated with care and treatment. Third, we provide estimates of the aggregate costs of India's Free ART Program, and discuss how these would change as the number of patients increases or as the prices of key components of treatment change. Finally, a discussion of findings highlights some of the key results of our study, and a concluding section discusses how these findings may help guide policy makers and stakeholders in planning and implementing India's Free ART Program.

India's Free ART Program

While the exact number of infected individuals in the country is subject to debate, NACO estimates indicate that currently there are approximately 5.2 million people living with HIV and AIDS in India (NACO 2006). In response to the epidemic, NACO is implementing a comprehensive program comprising targeted interventions for groups at high risk, preventive interventions for the general community, low-cost AIDS care, institutional strengthening, and intersectoral collaboration.

Until 2003, access to ART in India was quite limited; it was estimated that out of 750,000 ART-eligible individuals in need of treatment, only 13,000, or 2 percent of the total, were receiving ART by the end of 2003. At that time, ART was delivered mainly through the private sector. Although ARVs were also provided in the public sector through various government institutions like the Central Government Health Scheme (CGHS), Employees State Insurance Corporation (ESIC), the Armed Forces Medical Services, and the railways, these arrangements were not systematic or by design, and were in place mainly as part of medical benefit schemes in these government organizations. Clearly, there was only very limited access to ARVs in the country till 2003, with most of the individuals requiring ART accessing private providers, who were more likely offering "unstructured" ART (Over et al. 2004). The health financing situation in the country continued to present a somewhat bleak scenario, with total health expenditure at about 5.2 percent of GDP, of which only 1 percent was from the government sector (World Bank 2001). Many studies corroborated the fact that the major part of health expenditure in India was on curative care, and it was financed mostly out of pocket (Ministry of Health and Family Welfare (MoHFW) 2005). Given the high level of sustained financing required for ART, as well as the limited access to drugs, it was clear that ART was neither affordable nor available to a vast majority of infected individuals, who were already reeling under significant out-of-pocket expenditure for other health issues. Most important, with ART being offered by the unregulated private sector, where adherence and monitoring were serious issues, the situation was ripe for an intervention like the subsequent government program.

Thus, with domestic and international pressures to respond to the increasing treatment need—and despite concerns raised around the ability of the health system to handle a complex therapy like ART—the government, on the eve of World AIDS Day 2003, announced its program of free distribution of ARVs in selected states. In June 2004, the Global Fund on AIDS, TB, and Malaria (GFATM) awarded a financial grant of US$165 million to provide ART in the public sector and through public-private partnerships to 100,000 people living with AIDS over a five-year period (see http://www.nacoonline.org/directory_arv.htm).

As announced by the then-health minister, the actual plan aimed at not only providing free antiretroviral treatment to 100,000 people living with HIV and AIDS by the end of 2005, but to provide treatment to an additional 15 percent to 20 percent of AIDS cases each year thereafter, for a period of five years. The rollout started in April 2004, and covered

three groups: women covered under the Prevention of Parents To Child Transmission (PPTCT) program, children below 15 years of age, and AIDS patients who seek treatment in public sector hospitals. The program was started in the six high-prevalence states of Tamil Nadu, Andhra Pradesh, Maharashtra, Karnataka, Manipur, and Nagaland, and in the capital city of Delhi. Recent reports indicated that NACO was aiming to expand the ARV rollout to 100 centers—with at least one site in each state—by the end of 2005.[2]

The program was put in place in government hospitals and medical colleges, without much interaction with the state health departments. Since it was being run as a central program, the state health departments were not actively taken on board for planning purposes, though the funding for the hospitals came from these departments. Instead, the SACS, which were running the prevention and control program in the states, were made the focal points of the treatment program. The national guideline for implementation of ART was formulated and distributed across the ART centers. Attempts were made to strengthen the health system through capacity-building measures for treating physicians, and each ART site was given some startup financial help.

According to NACO, currently there are about 39,000 patients on ART, of whom more than 76 percent access ART from NACO-supported ART centers. In addition, as table 6.1 shows, there are other sites where ART is offered for free, with the major ones being in the NGO sector (about 10 percent). The private sector covers about 6 percent of ART patients currently on treatment in India. In all, there are currently 54 NACO-supported ART sites all over the country, with 39 in high-prevalence states with

Table 6.1 Clients Receiving ART in India's Free ART Program (as of March 2006)[3]

Sites	*Number of sites*	*Number of clients*	*Proportion (Percent)*
NACO-supported ART centers-GFATM states	39	23,773	61.1
NACO-supported ART centers-Non-GFATM states	15	5,973	15.3
State-supported ART centers	9	766	2.0
NGO-supported ART centers	2	3,699	9.5
Intersectoral partners	4	2,327	6.0
Private partners	2	2,399	6.2
Total	71	38,937	100

Source: NACO 2006.

GFATM-supported programs (Tamil Nadu, Maharashtra, Andhra Pradesh, Karnataka, Manipur, Nagaland, and Delhi). Another 15 sites are in medium- to low-prevalence states that are not being funded through the GFATM grant.

Methodology and Data Collection

The unit cost of any intervention is measured as the total cost divided by the output measure. It is an average figure and indicates the cost needed per intervention. An economic cost analysis involves a broader evaluation of resources used, regardless of who actually pays for those resources. Calculation of unit economic costs includes financial costs, and values all resources that go into the program, at costs that reflect their true value in alternative uses.

To arrive at unit costs, it is necessary to first identify the components of the program, and then to cost each of these components in its entirety. Different approaches have been adopted for arriving at the functional components of an ART program, but we broadly distinguish the following components:

- ARV drugs
- OI treatment
- Diagnostic tests
- Outpatient department (OPD) service
- Inpatient department (IPD) service

Ideally, a full costing exercise should include both recurrent and capital costs, as well as fixed recurrent costs that are applicable every few years, like costs of training and maintenance. However, in this analysis, the capital costs have not been considered for three main reasons.

First, from the scaling-up perspective, the recurrent costs are more useful to policy makers, and equipment purchase—which in resource-poor settings often means a CD4 machine—can be treated as a separate item, whenever relevant. Second, the relevant capital costs for the ART center seemed to be a small component of total capital costs in the sample hospitals, so excluding these from calculations was unlikely to bias the unit costs estimates too much. Finally, and in view of the earlier points made, it did not seem worthwhile to pursue a tracking of capital costs in these hospitals, since the data on dates of purchase of machines and their lifespan were very difficult to obtain.

A key component of our costing exercise involves estimating shared costs, that is, costs of inputs that are not obviously part of the ART program, but indirectly are important for the program to run. In India, the program is being run in government hospitals, and a significant part of the ART program costs is being borne by the hospitals themselves, which is included in our analysis.

Regarding the costs incurred at the outpatient and inpatient departments, in addition to drugs and other costs, these would include human resources. Physicians' time (and that of other health care personnel) to look at patients, treat opportunistic infections (OI), or run the diagnostic tests are, in principle, already counted under these headings. However, if these individuals are spending additional time on the ART program, the value of additional time would need to be attributed to the program.

The analysis calculates mainly financial costs, rather than economic costs, using shadow prices. In the absence of capital costs, the relevance of shadow prices in the ART program comes mostly from the value of personnel in the program; however, since the perspective is programmatic, rather than societal (except for the component of costs incurred by an individual), only costs accruing to the government have been considered. It is recognized that physicians trained in the ART centers have high opportunity costs in the private sector, but if the government wants to scale up the program, it would have to hire the physicians at rates that are determined within the public sector pay scale, which does not allow for additional incentives.

Box 6.1

Studies of the Costs of National Antiretroviral Treatment Programs

At the macro level, cost studies can help track and assess the impact of funds and provide information for estimation of future resource requirements. There have been studies done on costing of ART programs with a view to informing policy on scaling up. The first country to offer a public program with ARV was Brazil, which triggered a spate of studies on cost and cost-effectiveness of ART (see, for example, Bastos et al. 2001). While pointing out the cost-effectiveness of ART, these studies also documented issues of program management and implementation. The more recent studies have taken as given the cost-effectiveness of giving ART, but have focused more on scaling up and their financial implications.

(continued)

Box 6.1 *(Continued)*

A review of several costing studies on South Africa (see Boulle et al. 2003) indicate that anticipated coverage remains the key uncertainty in cost estimates, and emphasize service capacity and readiness—rather than resources—as critical issues in scaling up. More recent costing studies look at resource requirements. For example, a study based on Nigeria (Kombe and others 2004) estimates the total cost of ARV in the public sector in Nigeria, and includes costs of voluntary counseling and testing, treatment of opportunistic infections, and other resource requirements of implementing the national program. They find that drugs comprise the largest single component (50 percent) of the total cost of the program, followed by monitoring tests and labor costs. Significantly, the study also finds that a large proportion of the treatment costs are borne by the patients for both tests and drugs. A similar study done for Zambia (Kombe et al. 2003) brings out the need for caution in scaling up based on estimates of per-unit cost of the government program, and from the perspective of sustainability.

A recent study from Thailand (Supakankunti 2004) evaluates the economic costs associated with the national program and analyzes the costs borne by patients and their productivity changes. In 2006, a national report for policy advice prepared by the World Bank (The Economics of Effective AIDS Treatment: Evaluating Policy Options for Thailand) evaluates the costs of various policy options by estimating the average costs of ART per patient by modes of service delivery, types of drug regimens, and stages of disease. The report concludes with the finding that under its primary set of assumptions, the Thai program to treat AIDS patients has the potential to save millions of lives, although the program is less cost-effective than a similar program with first-line therapy.

Extensive studies on ART costing in the context of South Asian countries are relatively rare, with the most recent one conducted in Gujarat using an incremental cost approach to calculate per-client cost of providing ART (Bhat and Saha 2006).

Cost analysis is a powerful tool, and programs can use the data generated to develop realistic budgets, calculate the efficient use of resources, and understand the demands of scale-up or replication (Guinness 2004). The interest in, and relevance of, costing also prompted a few attempts at coming up with a standardized costing tool; for example, the Cape Town Antiretroviral Costing model developed by Boulle et al. (2004) was aimed at researchers and planners for estimating the cost of ART programs using a series of simple worksheets.

Source: Authors.

Since the NACO program created an ART center at each site, and funded most of it, for estimating the **cost associated with the ART clinic,** this exercise entailed a straightforward collation of costs, mainly cost data from the SACS offices. Mostly, these were costs borne by NACO, but wherever any other staff was putting in full-time work, their time and salary were included as well. Attributing **costs at the level of the hospitals** is a more complicated exercise, involving the following steps:

- Identifying the major departments that were involved in treating ART patients. Most often the departments involved in the ART included medicine, skin/STD, and gynecology[4]
- Collecting total IPD and OPD data from these departments, as well as numbers of ART patients being sent to the various departments
- Collecting information on time allocation (for ART) of physicians and other health personnel of these core departments
- Identifying the major diagnostic departments involved in running tests for ART patients (microbiology, radiology, pathology, and biochemistry)
- Collecting details from each site on the various mandatory tests done for ART patients and frequency of such tests
- Eliciting from these diagnostic departments volume data on tests, so that allocations due to the ART program could be done
- Collecting departments' annual expenditure data for each of the core and diagnostic departments identified as being directly or indirectly involved in the ART program
- Allocating costs to each of the departments based on volume data
- Collecting volume data from voluntary counseling and testing clinics, which is taken to be the most unambiguous measure of increase in patient load, to see trends over time
- Collecting expenditures incurred by NACO/SACS on drugs purchased, training, and CD4 test kits and reagents.

Additionally, we collected data on the human resource costs incurred on the level of NACO and SACS that can be attributed to the ART clinic program by collecting data on the time allocation of the relevant staff.

Once all the cost components were in, the total cost for each of the sites was calculated and the unit costs arrived at by a simple division of total costs by the number of clients being treated at the end of the study period. An alternative definition of volume, defined by "total client months on

therapy" at the end of study period, was also calculated and used as another denominator, as will be explained below.

An important component of the total cost of the ART program is expenditures incurred by the patients themselves in accessing ART from the sites. A total of 264 interviews were conducted, spread over all the ART sites, with a focused questionnaire that attempted to elicit the amounts individuals had to spend out of pocket to access the free ART at the sites, such as the costs of ART drugs, OI drugs, tests, transport, lodging, lost wages, and food. Some clients received support from various NGOs while they were on the government ART program; for lack of data availability, the costs of this support are not being considered in this analysis.

The study was completed in two phases. The first phase was an exploratory phase, where the initially selected sites were visited to understand the feasibility of the research. Based upon the analysis and findings of the first phase, the final list of sites was drawn up, methodology was finalized, and activities were mapped out for the next nine months of the project.

The following seven sites were selected for the study based on Phase I of the study, and in consultation with NACO:

- Government Hospital of Thoracic Medicine (GHTM), Tambaram, Chennai, Tamil Nadu
- Regional Institute of Medical Sciences (RIMS), Imphal, Manipur
- BJ Medical College, Ahmedabad, Gujarat
- Lok Nayak Jai Prakash (LNJP) Hospital, New Delhi
- Dr. Ram Manohar Lohia (RML) Hospital, New Delhi
- Government Medical College and Hospital, Trivandrum, Kerala
- Government Medical College and Hospital, Thrissur, Kerala.

Since the aim was to understand the cost of the Free ART Program, two sites that were initially not supported by NACO, but were also offering free treatment (supported by the state government) were included as well: these are the two Kerala sites at Trivandrum Medical College and Thrissur Medical College. The Trivandrum Medical College became a NACO-supported site in May 2005, and the Thrissur site was inducted into the NACO program in November 2005. This also allowed some analysis of the differences between a state-run program and a NACO-supported program. Over the two phases, several field trips, meetings, and discussions were held with a variety of individuals in the hospitals, SACS, and NACO, including the medical superintendents (MS) at hospitals, treating physicians, pharmacists,

counselors, administrative officers, accounts officials, and others who were thought to be key informants for the research. The two main types of information—volume of patients seen and expenditure—primarily were collected from the medical records departments, the accounts section, and occasionally from the medical departments.

Overview of the Selected Sites

Most of the hospitals selected were multispecialty hospitals with medical colleges attached to them (table 6.2). Only GHTM, Tambaram, does not have a medical college, but is one of the oldest TB hospitals in India, which in recent years has also become one of the leading hospitals for

Table 6.2 Overview of the Selected Sites

Site city	*Year of establishment*	*Type of hospital*	*Specialty*	*Total OP 2005*	*Total IP 2005*
GHTM Chennai	1928	Super specialty	Well known for tuberculosis and HIV treatment; oldest NACO site	319,971	24,588
Medical College Trivandrum	1951	Medical college attached. Multi/super specialty	Kerala's oldest medical college; ART site started as state govt. initiative. Now converted into NACO site	453,691	65,754
Government Medical College Thrissur	1981	Medical college attached. Multi/super specialty	Kerala government started the ART site. Now a NACO site	118,913	21,616
BJ Medical College Ahmedabad	1953	Medical college attached. Multi/super specialty	Only ART site in Gujarat	638,017	66,670
RMLH Delhi	1930	Multi/super specialty	Funded by central government	1,157,653	48,937
LNJPH Delhi	1930	Medical college attached. Multi/super specialty	One of first NACO ART sites	1,062,768	67,960
RIMS Imphal	1972	Medical college attached. Multi/super specialty	Funded by central government through North East Council	237,297	27,588

Source: Authors.

treatment of HIV and AIDS. In terms of ownership, all the hospitals are under the respective state health departments, except the RIMS at Imphal, which is run by the Ministry of Development of North Eastern Region (DONER), and RML in Delhi, which is under the central health department. Most of these hospitals were established fairly early (two were pre-independence), and therefore have a long history of existence as well as repute. In terms of ordinary patient load, table 6.2 indicates that the volume of inpatient and outpatient load was significant in all the hospitals, with LNJP and BJ Medical College, Ahmedabad, topping the list for outpatients and inpatients, respectively. All the hospitals except GHTM, Tambaram, are capable of treatment of all opportunistic illnesses. GHTM, Tambaram—apart from treating TB cases—has a strong referral system with other local hospitals.

Table 6.3 gives details of when the ART program started in each site, and the study period. The duration of the reference periods across sites ranges from 12 months to 24 months. The reasons for this variation in the study period have to do mainly with data availability and the ease of access of up-to-date information in the limited time available for the study. While most of our analysis is based on these reference periods, we also discuss the differences in costs over a two-year period in one section, based on the data from those sites for which more than one year's data was available.

Recent trends in the number of clients seeking voluntary counseling and testing (VCT) in the selected sites (figure 6.1) suggest that the demand for such services increased over the observation period (early 2004 through

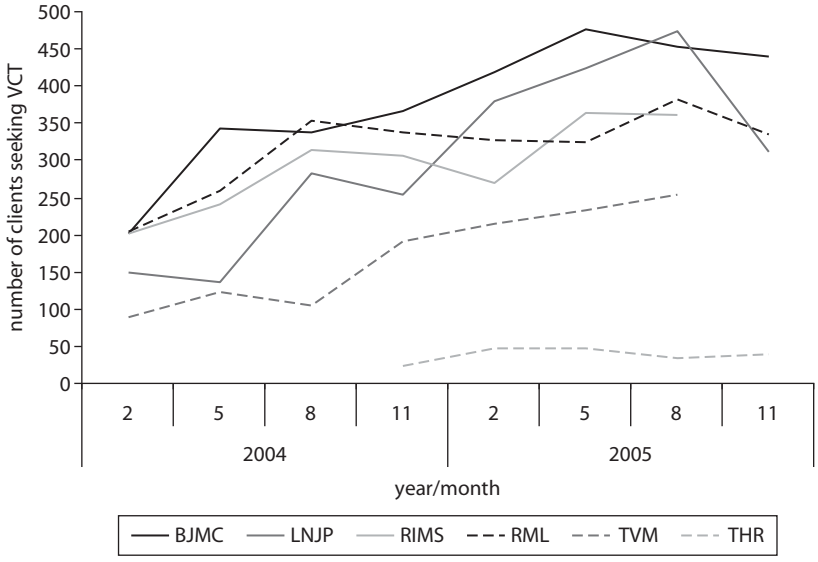
Table 6.3 Reference Period for Study

Site	*City*	*ART started*	*NACO site started*	*Study period*	*Study period in months*
GHTM	Chennai	1994	Apr. '04	April 2004–March 2006	24
TMC	Trivandrum	March 2004	May '05	April 2005–March 2006	12
BJMC	Ahmedabad	April 2005	Apr. '05	April 2005–March 2006	12
THR	Thrissur	November 2004	Dec. '05	Nov. 2005–Oct. 2005	12
LNJP	Delhi	April 2004	Apr. '04	April 2004–March 2006	24
RIMS	Imphal	1995	Apr '04	April 2004–July 2005	16
RML	Delhi	April 2004	Apr '04	April 2004–March 2006	24

Source: Authors.

Note: The ART program started in TMC November 2004, but became functional in the department of medicine only in March 2005.

Figure 6.1 Trend in Pretest Counseling at VCTC



Source: NACO-MIS.

late 2005). This could reflect an increase in HIV prevalence or the number of clients requiring treatment, or an increase in HIV awareness.

Before elaborating more on the actual functioning of the sites, brief mention must be made on the initial assistance given by NACO to start the program in the selected sites. At the time of setting up the sites, NACO had promised to sanction funds for two medical officers (one senior and one junior), one data entry operator (DEO), one counselor, one lab technician, and one recordkeeper/computer operator. In addition, a contingency grant of Rs. 100,000 was to be provided during the first year of the program, including the cost of a dedicated computer along with a printer and Internet. From the second year onward, a contingency grant of Rs. 50,000 was also to be given to each ART unit, according to the draft version of the National Guidelines for Implementation of Antiretroviral Therapy of August 2004.

We found that the study sites differed significantly from one another in terms of personnel, procurement of drugs for ART and OI, issues around treatment of opportunistic illnesses, and data management. Below, some of these issues and concerns are listed without mention of specific sites; it must be noted that not all the sites had similar problems.

- Initial funding for opening the site not always forthcoming.
- Dedicated physicians not in place (sites managed by drawing on the services of other doctors and postgraduate students).
- Counselors not appointed, and drawn from VCTC or telecounseling services.
- Smooth supply of drugs not always forthcoming.
- No clear guideline for drug dispensing at the sites; practices differed across sites.
- Pharmacist of the hospital overstretched and no allowance for designated ART pharmacist. Long waiting list for CD4 count investigation.
- Reagent supply for CD4 count investigation not always smooth.
- Lack of separate infrastructure for the ART site within hospital.
- Guidelines for initiating ART not always agreed to by physicians.
- Poor data management due to absence of DEO:/recordkeeper or lack of computerization.

Over the following year, many of these issues were ironed out, but some management concerns continue to plague the program. While costing the program in its entirety is important, the management and implementation issues are closely linked to costing: often some of the operational issues could be solved with careful planning around procurement, personnel, and infrastructure, all of which can be translated into funding implications. The financial feasibility question is therefore linked closely with the question on the extent of "structured"-ness of the government ART program. An earlier World Bank study (World Bank 2004) had described "structured" ART to mean treatment with the following features:

- Standardized, competency-based training of physicians in ART management
- Prescription of a standard triple-drug regimen
- Support from a multidisciplinary team that includes a counselor and a nutritionist
- Regular clinical and lab-based monitoring of the patient's treatment status
- Counseling to prevent transmission
- Prophylaxis for opportunistic illnesses when indicated
- Diagnosis and treatment of opportunistic illnesses.

Our study indicates that not all of these characteristics might be present in all of the sites. In particular, the first three points apparently were not

always fully satisfied. None of the sites had a dedicated nutritionist who was helping the patients on ARV. As for prevention, counseling—while available—generally focused on the ART itself rather than prevention; the main task of the counselors was to explain the drugs and how often to take them. Other operational and management issues included the lack of a dedicated doctor specialized in ART, the lack of availability of specific drugs for prolonged periods, or the inability to recruit a data management person (which also hampered monitoring of the program to some extent).

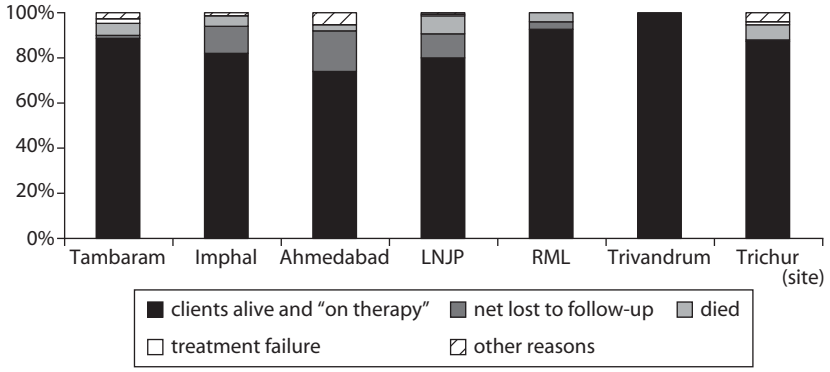
Another major finding of the team, not specific to the ART program, regards the general data management in the hospitals, especially bookkeeping and accounting. Only one of the hospitals had a breakdown of expenditures by department, which meant that the exercise on cost apportionment was almost impossible. Lack of proper data implies that many additional assumptions have to be made about how the total annual expenditure of the hospital should be divided among different departments, which renders the costing exercise somewhat tedious as well as imprecise.

Key Assumptions and Parameters

One of the most important, and conceptually most challenging, variables that went into the cost calculations is the number of patients receiving ART, that is, the choice of an appropriate denominator for our unit-cost calculations. The number of patients receiving treatment at any point in time is an imprecise measure, as it does not include patients who have died, experienced treatment failure, dropped out, or entered or re-entered a program later during the study period. (Also, in a setting where the number of people receiving treatment is increasing, the number of patients who have initiated treatment during the study period, or received treatment at the end of that time, may be far greater than the average number of people receiving treatment during that period.) Thus, matching the cost data (which would relate to costs incurred over a longer period) and the number of people on treatment is not a trivial exercise. Figure 6.2 illustrates this point—of patients who initiated treatment during the study period, between 10 percent and 20 percent had dropped out for various reasons in five of the seven sites by the end of the study period.

Table 6.4 presents alternative ways of looking at the number of people receiving ART. The first column presents the number of people who ever started treatment (initiated treatment during the study period), the next

Figure 6.2 Adherence and Reasons for Drop-out across Study Sites



Source: Authors' compilation of monthly ART reports from study sites.

Table 6.4 Volume on ART – Alternative Definitions

Site	*Number of clients ever started*	*Number of clients at the end of study period*	*Number of clients who have been on therapy for entire study period*	*Equivalent client months*	*Ratio of client months to clients ever started*
Tambaram	2,941	2,606	1,083	25,989	8.8
Imphal	276	226	228	3,642	13.2
Ahmedabad	1,635	1,210	819	9,824	6.0
LNJP	651	523	288	6,901	10.6
RML	1,302	1,205	555	13,317	10.2
Trivandrum	498	498	350	4,200	8.43
Thrissur	353	308	196	2,348	6.7

Source: Generated by authors.

one indicates the number at the end of the study period, and the third column indicates those who have been on therapy for the entire study period. The last column, which is the ratio of client months to those ever starting treatment gives an idea of the ability of the program to retain people. Given the staggered entry of clients into the program, and attrition due to various reasons, the number of people receiving treatment at any point in time is a very imprecise indicator of the scale of a treatment program. For this reason, our preferred measure of people receiving treatment is "the number of client months on treatment," which gives a much more accurate picture of the utilization of the various sites over the study period.[5]

Another important methodological concern is to what extent to attribute the volume of CD4 tests to the ART program. It is a matter of debate whether the entire CD4 testing in the reference period should be attributed to the ART program, because CD4 tests were routinely performed in many of the sites even before the ART program was put in place. One could therefore take the costs of only those CD4 tests applied to people receiving ART. However, this would give an underestimate of the cost of the ART programs because a CD4 test is essentially a screening device done prior to putting people on ART. The other option is to look at the trend in CD4 tests for those centers that had been doing CD4 testing prior to the start of ART, project the trend for the reference period, compare that with the actual CD4 tests done, and take the difference as the volume attributable to the ART program.

However, this approach was not easy to adopt. First, only three sites had CD4 testing facilities well before the start of the respective ART programs. Second, in one of these sites, RIMS, the numbers frequently bounced around, mainly due to self-rationing by the hospital, owing to the unavailability of drugs, as well as overuse of the machine. Tambaram had a profile very different from that of other general hospitals—TB and HIV were the two major diseases it was dealing with, and the CD4 numbers were understandably much higher than elsewhere. Finally, the CD4 numbers from RML, if projected (without ART), seemed similar to the ones with the ART program.

The issue of additionality of CD4 tests was, therefore, difficult to resolve. In our calculations, we have taken the current CD4 test numbers for calculating the additional test load, at the risk of slight overestimation of the respective costs. From the point of view of setting up a new site with a CD4 machine, there is no easy way to separate the spontaneous demand for CD4 from demand that is being generated in anticipation of the ARV treatment; thus, using the current numbers in the calculations may be a reasonable approximation. Regarding the workload for the microbiologist that can be attributed to the ART program, this seemed to be around 25 percent to 30 percent of working time on average.

Below, we discuss assumptions, findings, and data sources for the most important components of the costs of the ART program. Additional assumptions underlying cost estimates are provided in annex 6.1, and any site-specific assumptions are listed in annex 6.2.

- **Human resources to support the ART center.** Our research shows that many physicians at the hospitals are giving time to the ART centers, in

addition to the ones hired specifically for the program. While the proportion of time spent on treating HIV patients by each practicing physician, and the number of physicians contributing to the program, varied from site to site—from one to about six physicians—(Tambaram)[6] in a general hospital, in no site was the ART center being run only by the ART doctor. In some sites, additional health care personnel like nurses were also involved. Most of the extra effort was coming from personnel from the medicine department, followed by the microbiology department.

- **Human resources at the ART center.** The NACO ART program envisaged that the following personnel would be required for running each site: two medical officers, one DEO, one counselor, one laboratory technician, and one recordkeeper/computer operator. Three out of seven sites did not have two medical officers when they were started, and counselors were sometimes initially taken from the VCT center. The rest of the personnel were appointed as scheduled in most of the sites; in a few sites the appointments were made late and essentially the hospital staffs were running the ART program for a long time. The costs of ART center personnel were straightforward to calculate and could be attributed entirely to NACO or the hospital.

- **ARV drugs.** The supply of ARV drugs presents a mixed scenario. While NACO was supposed to supply the drugs, the state-initiated programs were buying the drugs on their own through the SACS or relevant state departments. Even after these sites became NACO sites, the drugs continued to be supplied by the state government, at least for a while. Additionally, there were also instances of NACO-sponsored sites where local-level purchases were made by SACS to fill the demand gaps. The cost of these drugs was obtained from a variety of sources: ART monthly reports compiled at the sites (and submitted to the respective SACS) gave figures on consumption of the various drugs, which were then used in conjunction with unit prices (obtained from NACO, SACS, or other relevant state agencies[7]) to arrive at the total cost of drugs consumed. The weighted average of unit cost was calculated when there was more than one supplier, such as, both NACO and SACS.

- **CD4 kits and reagents.** Costs of CD4 tests were calculated based on prices of CD test kits and reagents, as explained in appendix table 6.1.

- **OI & prophylactic drugs.** The common prophylactic drug used was Septran; the costs of this and other common OI drugs were estimated using consumption figures.

- **Hospital department support to ART program.** Six departments, including four diagnostic departments—radiology, microbiology, pathology, and biochemistry—and medicine and skin departments were included in the cost calculations. Departmental costs were the most difficult to obtain, and could be obtained only for one hospital, RIMS, Imphal. Unfortunately, none of the general hospitals keep accounts separately for each department. Thus, the proportions on departmental breakdown of total recurrent costs from RIMS were used for the other hospitals to arrive at departmental costs for these six departments. For medicine and skin, total volume of inpatient admissions was taken as the denominator, and the admission of ART patients as a numerator. Capital costs, such as purchases of equipment, were left out of the calculations of the total costs.

- **Miscellaneous.** This involves refreshments, office charges like printing and stationery by SACS, and other petty expenses, obtained from the SACS office.

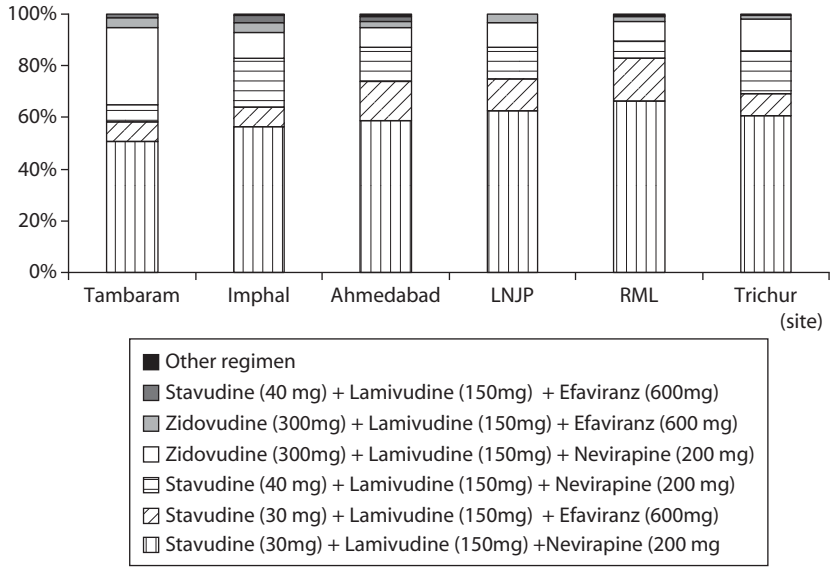
- **Contingency grant.** NACO grants Rs. 50,000 each year for operating expenses.

- **Training cost.** These include the training of an ART team consisting of 10 people[8] per site. NACO is responsible for arranging and funding all training in NACO sites. State programs like those in Kerala followed a slightly different pattern of training. Delhi SACS also arranged some training for counselors, which has been included under training costs. For RIMS and Tambaram, which are themselves training sites, there were no training expenses.

- **Establishment grant.** Additionally, NACO granted Rs. 50,000 in the first year, for example, for the purchase of a computer and printer. In one site, RIMS, there were expenses for building renovation, which were borne by the state SACS.

Before turning to the analysis, it is important to present the different drug regimens in some detail, since drugs and drug prices pay a central role

Figure 6.3 Distribution of ART Clients across Drug Regimens



Source: Monthly ART reports of study sites.

in the costing exercise. Figure 6.3 shows the various combinations used across the sites, reflecting that the government program is providing only the first-line drug regimen.[9] Apart from Tambaram, Chennai—where a significant proportion of clients are on Zidovudine combinations, and Imphal—where a number of clients are on Efaviranz due to the presence of Hepatitis B coinfection, most of the other sites are mainly using the combination of Stavudine (30 mg), Lamivudine (150 mg), and Nevirapine (200 mg). Clearly, the total cost of drugs across sites would depend on what combinations are being used, and in what proportions.

Costs of the ART Program

Table 6.5 presents per-client costs across the different items for all the sites based on client months on ART, and also provides costs obtained using the number of patients receiving ART at the end of the study period as the denominator. We first find that the monthly unit costs vary substantially across the sites. For "cost per client (a)," the unit costs range from about Rs. 970 per month to about Rs. 1,850. The last column of the table gives the average per-client cost, which comes to about Rs. 817, leaving out training

Table 6.5 Per-Client Cost across Sites and Items

								Average	
Sites	*Tambaram*	*Imphal*	*Ahmedabad*	*LNJP*	*RML*	*Trivandrum*	*Thrissur*	*(Rupees)*	*(Percent of total)*
Based on "client months on ART"									
Volume on ART	1,083	228	819	288	555	350	196		
Human resources (ART center)	153	253	71	337	147	85	95	163	12.7
Human resources (others)	84	163	63	137	81	90	68	98	7.6
ARV drugs	548	637	441	588	440	829	786	610	47.4
CD4 kits and reagents	225	478	309	179	220	422	0	262	20.4
OI drugs	11	136	11	8	7	9	12	28	2.2
Hospital department support	120	94	56	45	58	25	32	62	4.8
Miscellaneous	2	0	0	5	3	0	0	1	0.1
Contingency grant	2	8	0	0	4	0	0	2	0.2
Cost per client (a)	1,145	1,770	951	1,300	959	1,461	992	1,225	95.2
Training costs	0	0	10	30	16	24	215	42	3.3
Establishment grant	2	78	10	0	4	45	0	20	1.6
Cost per client (b)	1,147	1,847	971	1,330	979	1,530	1,208	1,287	100.0
Based on number of patients receiving ART by the end of the study period									
Volume on ART	2,606	226	1,210	522	1,205	498	308		
Human resources (ART center)	64	254	48	186	68	60	60	106	12.3

(continued)

Table 6.5 Per-Client Cost across Sites and Items *(continued)*

								Average	
Sites	*Tambaram*	*Imphal*	*Ahmedabad*	*LNJP*	*RML*	*Trivandrum*	*Thrissur*	*(Rupees)*	*(Percent of total)*
Based on "client months on ART"									
Human resources (others)	35	164	42	76	37	63	43	66	7.7
ARV drugs	228	642	299	324	203	583	500	397	46.2
CD4 kits and reagents	93	482	209	99	101	297	0	183	21.3
OI drugs	5	137	7	4	3	6	7	24	2.8
Hospital department support	50	95	38	25	27	17	20	39	4.5
Miscellaneous	1	0	0	3	1	0	0	1	0.1
Contingency grant	1	8	0	0	2	0	0	2	0.2
Cost per client (a)	476	1,782	644	716	442	1,026	630	817	95.0
Training costs	0	0	7	17	7	17	137	30	3.5
Establishment grant	1	78	6	0	2	32	0	17	2.0
Cost per client (b)	477	1,861	657	733	451	1,075	767	860	100.0

Source: Authors' estimates.

and establishment grants; including these gives a per-client cost of Rs. 860. Table 6.5 also shows the share of each of the items in total costs, obtained from the last column on average unit costs.[10] Drugs comprise 47 percent of the total costs.[11] Costs of CD4 kits and reagents comprise about 25 percent, followed by human resources at the ART center. If we take all human resources, the proportion comes to about 21 percent.

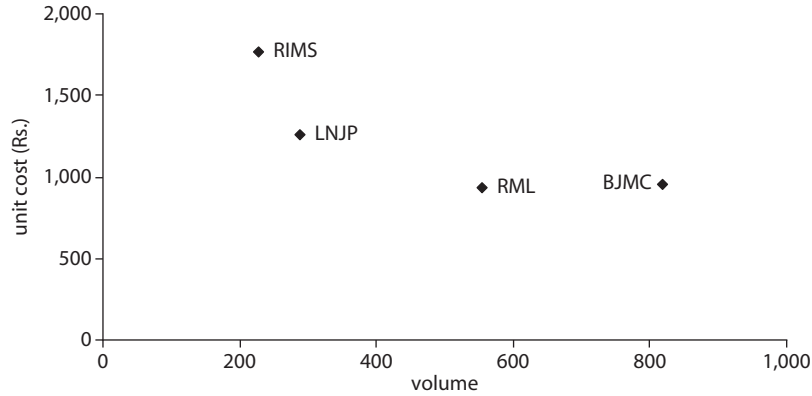
Table 6.5 also allows for a comparison of the structures of costs across sites. Consistently, the major cost driver remains the cost of drugs. Moreover, we note that whenever the sites could not take advantage of the bulk purchase done by NACO, the drug costs were high, as was the case with the Kerala sites and Manipur. Next in importance is cost of CD4 tests, which depend on both the volume (which makes it lower) and the number of mandated tests, which is hospital specific (Thrissur is an exception because it did not have a CD4 machine). As for human resources, the larger the hospital, the smaller is the burden on human resources; thus for instance, Ahmedabad, RML, and Trivandrum have a very low share of costs contributed by human resources.

Table 6.5 also provides the cost estimates obtained by using the number of clients receiving ART at the end of the study period as the denominator. This approach returns much lower cost estimates (and a higher variance across estimates), illustrating the pitfalls associated with using the number of clients at any point in time as a denominator (rather than indicators that measure the provision of ART across the study period), and being aware of the possibility of underestimating costs if only the total clients on therapy is taken as the denominator (which is easily available from the forms filled out by the sites and sent to NACO, and therefore may be used more frequently by researchers and other users).

A key issue for estimating or projecting the costs of an ART program is the extent to which unit costs change as the number of patients receiving treatment increases, in other words, the question whether there are economies of scale. Plotting the unit costs against the volume on ART across the NACO sites only (leaving out Thrissur, Trivandrum, and Tambaram because it is a specialized hospital), we find that there is some (negative) correlation between unit costs and the number of patients receiving treatment, suggesting the presence of economies of scale (figure 6.4).[12]

Unit costs may also change over time. This is an issue that we can explore to some extent because the study period extends over two years for some of the sites. Differences in unit costs over time may occur owing to start-up costs, or because the number of patients increases after the initial year. Table 6.6 presents the costs per client for

Figure 6.4 Unit Costs and Number of Patients



Source: Author's calculation.

Table 6.6 Annual Costs across Selected Sites, by Year (in Rs per year)

Sites	*LNJP Year 1*	*LNJP Year 2*	*RML Year 1*	*RML Year 2*
Client months	149	426	217	920
Human resources (ART)	556	261	315	103
Human resources (Others)	289	84	223	45
ARV drugs	607	521	490	373
CD kits and reagents	230	173	267	202
OI drugs	13	6	10	4
Hospital department support	81	58	105	48
Miscellaneous	19	0	13	3
Contingency grant	0	0	0	5
Total recurrent costs	1,795	1,103	1,423	783

Source: Authors' estimates.

RML and LNJP for each of the two years for which data were available from these hospitals.[13]

For both hospitals, the number of patients receiving treatment increased markedly, while unit costs were much lower in the second year. This was due to two reasons. First, the prices of ARV drugs were significantly lower in the second year, which may reflect the fact that prices of ARV drugs have been falling over the study period, rather than scale effects in procurement. Second, the key factor behind the decline in unit costs is the fact that human resource costs increased at a much slower rate than the

number of patients receiving treatment (accounting for 72 percent (at LNJP) and 61 percent (at RML) of the decline in unit costs). This is an important finding for the purpose of a scaling-up exercise, as the second-year estimates would be more representative for this purpose.

While the analysis was underway, the prices of ARV drugs had already come down substantially, and NACO was able to procure these drugs at a much reduced rate. It is easy to see that further reductions in the prices of ARV drugs and CD4 tests kits could significantly reduce the unit costs of the program. Table 6.7 illustrates this point—a reduction in the prices of ARV drugs and CD4 test kits of 50 percent would bring down the costs per client of the program by about 23 percent. The effects of such reductions on future cost projections will be discussed later in the chapter.

From the perspective of scaling up, and in addition to the overall costs of the ART program, it is important to know to which entities these costs are allocated. Table 6.8 shows the distribution of total costs across various agencies (SACS, NACO, the hospital, and the state government). While the expenditure incurred by the hospitals is also ultimately borne by the state government (Department of Health), functionally these are different entities, and the costs incurred are therefore presented separately. In fact, the funds of the various SACS come from NACO as well, but since the ART program is a separate subprogram of NACO, the analysis separates expenditures of SACS from NACO.

Table 6.8 presents the allocation of total recurrent costs (excluding the fixed costs of training and establishment,[14] showing that slightly less than half of the total cost of running the program is borne by NACO; the

Table 6.7 Estimated Unit Costs with Reduced Prices of ARV Drugs and CD4 Test Kits

Site	*No change in prices*	*Prices of ARV drugs down by 50%*	*Prices of ARV drugs and CD4 kits down by 50%*
Tambaram	1,145	871	759
Imphal	1,770	1,451	1,212
Ahmedabad	951	731	576
LNJP	1,300	1,006	916
RML	959	739	629
Trivandrum	1,461	1,046	835
Thrissur	992	599	599
All sites	1,225	920	789
Average	1,264	974	821

Source: Authors' estimates.
Note: The average excludes Thrissur, since it did not have costs of CD4 tests.

Table 6.8 Distribution of Costs across Sites
(Percent)

Sites	*SACS*	*NACO*	*Hospital*	*Other*
(Actual distribution of costs)				
Tambaram	22	51	22	6
Imphal	38	49	13	
Ahmedabad	47	41	12	
LNJP	24	48	28	
RML	31	49	20	
Average across selected NACO sites*	35	47	18	
(Distribution of costs if CD4 kits and ARV drugs purchased through NACO)				
Tambaram	2	71	22	6
Imphal	9	78	13	
Ahmedabad	2	87	12	
LNJP	3	70	28	
RML	2	78	20	
Average across selected NACO sites*	4	78	18	

Source: Authors.
* Imphal, Ahmedabad, RML, and LNJP.

SACS are also spending a significant amount of funds from other sources to run the ART program, mostly on the CD4 kits and reagents. Finally, the hospitals themselves bear some of the burden (mainly through departmental support and personnel), though they do not receive any additional funding for running the program. A new development is the proposal of NACO to centralize the purchase of CD4 kits and ARV drugs. Centralized procurement of CD4 and ARV drugs by NACO would not only shift the burden of costs away from hospitals (NACO would bear about 78 percent of the total program cost), it might also lead to lower aggregate costs, if distributional costs are not too high.

Out-of-pocket Expenditure

From a macroeconomic or general welfare perspective, an important aspect of the costs of the ART program is the amount of out-of-pocket spending by individuals when they access ART. To analyze this, we obtained a sample of 264 individuals from the seven sites by interviewing patients coming back for their monthly refill of ARV drugs.[15] Out of the sample of 264 individuals, 68 percent were males, and the average age of respondents was 36. About 74 percent of the respondents were

currently married, and 18 percent were single. The rest comprised widows, divorcees, and so forth. More than half of the individuals in the sample were currently working.

It is important to note that about 26 percent of the respondents were non-naïve, or had accessed ARV before joining the free program. The most common reason cited for discontinuing treatment was financial difficulties, which indicates that the free program is a welcome step for many. At the same time, the fairly high percentage of non-naïve patients has implications for both subsequent adherence as well as spread of resistance strains, and is an important factor to be kept in mind when scaling up.

On average, respondents had participated in the Free ART program for at least 12 months. The questionnaire asked in detail about different type of expenditures incurred while accessing ART. Table 6.9 indicates the percentage of individuals who spent non-zero amounts on any of the items, and the average monthly expenditure on these items. On average, individuals were spending Rs. 911 per month to access the free ART. Food and nutrition expenses (23 percent) comprised the largest share of access costs,[16] followed by transport (17 percent), and tests (13 percent for initial testing and monitoring). While this amount does not seem a large sum, a regular monthly expenditure of about Rs. 1,000 would mean a significant burden of treatment for poorer socioeconomic categories. The average out-of pocket spending is almost equal to unit cost of provision of therapy, suggesting that the actual cost of accessing ART is double that of the cost of provision. Interestingly, the distribution

Table 6.9 Out-of-pocket Expenditure to Access ART

Item	*Non-zero responses (Percent)*	*Average expenditure (Rupees per month)*	*(Percent of total)*
ARV	12	27	3.0
OI drugs	52	108	11.9
Vitamins	41	54	5.9
Food and nutrition	56	212	23.3
Initial test	61	96	10.5
Monitoring test	21	18	2.0
Hospital stay	35	88	9.7
Transport	96	158	17.3
Wage loss	39	83	9.1
Lodging	4	18	2.0
Other	63	50	5.5
Total expenditure		911	100.0

Source: Authors' survey.

across sites of total out-of-pocket expenditure seems bimodal, with four sites showing expenditures above Rs. 1,000 per month, and the remaining showing expenditures between Rs. 650 and Rs. 850.

The importance of nutrition in ART is now slowly gaining recognition,[17] and there is some evidence to suggest that the efficacy of treatment in a well-nourished person is better than in an undernourished one. Presumably, the doctors prescribing the medicines, as well as the counselors, are advising the patients about the kinds of food they should be eating. While most of the patients who access ART in these clinics are from less well-to-do backgrounds, the messages are clearly getting across, since a large percentage of them are found to be taking additional nutrition while on ART. As for transport cost, the importance of this in the context of health-seeking behavior is now well documented. Thus, it is not surprising that transport constitutes a significant part of the total out-of-pocket expense. Also, our findings are comparable to other studies, which have found that tests can impose a significant burden on individuals and they are less willing to pay for tests than for drugs (Gupta and others 2004). Finally, if economic burden is a reason for nonadherence for some clients, our results suggest that there is some justification in trying to find alternative sources of financing for some of the major items, like food, tests, and transport; this may ensure higher adherence and a better treatment outcome.

Projected Costs of India's Free ART Program

One of the potential uses of our unit cost estimates is to inform an analysis of the financial implications of a potential scaling up of India's Free ART program. Table 6.10 gives an example of a financial planning exercise, based on NACO's aim to put 100,000 people on ART by the end of the 2007 financial year, and thereafter an additional 15 percent to 20 percent for the next five years (NACO ART Guideline 2004). While such projections do not address the issue of deaths directly, they do so indirectly, by using the total number of people receiving treatment as the basis for calculations, which is net of attrition due to death, nonadherence, and treatment failure. It is important to point out that the calculations are based on recurrent costs, and do not include the costs of new CD4 machines or other fixed costs, which would have to be calculated separately.

The unit cost underlying the estimates reported in table 6.10 is based on the one reported in table 6.8. Also, we assume that NACO is going to bear the costs of CD4 test kits and ARV drugs. Thus, starting with a

Table 6.10 Projections of Costs of ART Programs

Year	Projected number of patients	Annual cost		Costs (in rupee millions) incurred at		
		Rupee millions	US$ millions	SACS	NACO	Hospital
At current unit cost of Rs. 1,264						
2007	100,000	1,517.3	35.3	37.8	1,226.3	253.3
2008	110,000	1,669.1	38.8	41.6	1,348.9	278.6
2009	121,000	1,836.0	42.7	45.7	1,483.8	306.5
2010	133,100	2,019.6	47.0	50.3	1,632.2	337.1
2011	146,410	2,221.5	51.7	55.3	1,795.4	370.8
Total		9,263.5	215.4	230.8	7,486.4	1,546.3
(percent of total)		100		2.5	80.8	16.7
At reduced unit cost of Rs. 974 (owing to lower prices of antiretroviral drugs)						
2007	100,000	1,168.9	27.2	37.7	877.9	253.3
2008	110,000	1,285.8	29.9	41.5	965.7	278.7
2009	121,000	1,414.4	32.9	45.6	1,062.2	306.6
2010	133,100	1,555.8	36.2	50.2	1,168.4	337.2
2011	146,410	1,711.4	39.8	55.2	1,285.3	370.9
Total		7,136.5	166.0	230.3	5,359.5	1,546.7
(percent of total)		100		3.2	75.1	21.7
At reduced unit cost of Rs. 821 (owing to lower prices of antiretroviral drugs and CD4 tests)						
2007	100,000	985.6	22.9	37.7	694.5	253.3
2008	110,000	1,084.1	25.2	41.5	764.0	278.7
2009	121,000	1,192.5	27.7	45.6	840.3	306.6
2010	133,100	1,311.8	30.5	50.2	924.4	337.2
2011	146,410	1,443.0	33.6	55.2	1,016.8	370.9
Total		6,017.0	139.9	230.3	4,240.0	1,546.7
(percent of total)		100		3.8	70.5	25.7

Source: Authors' estimates and projections.

unit cost of Rs. 1,264 per month (which translates into about US$350 per year), we find that the total cost of the program over the next five years would be US$215 million, out of which NACO's share would be 81 percent. One important determinant of the future cost of providing ART are developments in the prices of ARV drugs. Table 6.10 therefore also reports cost projections for alternative scenarios—one in which the prices of ARV drugs are reduced by 50 percent from 2007 onward, and one in which the price of CD4 test kits is also reduced by 50 percent. Under these scenarios, the total cost of the program over the five years

under consideration would be reduced from US$215 million to US$166 million. As the costs of ARV drugs and CD4 test kits are assumed to accrue to NACO in our projections, its share in the overall costs declines as the respective prices decline, from 81 percent without price changes, to 71 percent in the scenario with falling prices of both ARV drugs and CD4 kits.

One interesting point to note is that whichever entity bears a larger share of the fixed costs of the program (in this case personnel costs borne by hospitals) will increasingly bear a larger share of the total costs, with decreasing prices of the "consumables" (ARV drugs and CD4 kits). This also explains why, over the three scenarios (baseline, reduced costs of drugs, and reduced costs of drugs and kits), SACS show a slight decline in the total costs, whereas the hospitals experience a slight increase.

Discussion of Findings

Some key results are summarized in box 6.2. However, before discussing the implications of our findings, some limitations of the research need to be mentioned. The first regards sample size. Owing to budget and time constraints, only seven samples were included in the study. The samples differed based on parameters like initiation date of the ART program, who started it (NACO/state), the type of hospital, the number of people receiving ART, and location (high-prevalence states vs. other states). This has led to some loss of generality in the results. However, we found that the general hospitals had more or less similar structures of operation, and unit costs appeared to converge in the second year of operation; the fact that our findings were quite similar across hospitals thus suggests that the sample size limitation may not have hampered the analysis too much.

The second main limitation regards the availability of cost and other data from hospitals. Only one hospital was able to provide cost data disaggregated by department, which was an important constraint for this research. Moreover, data regarding the number of patients receiving ART and the provision of drugs and tests were not computerized in some hospitals, and collection of data from hard copies was both tedious and fraught with potential copying mistakes. The data limitations extended the process of data collection and revisions by a few months, and squeezed the analysis time. Many innovative ways of cross-checking the data collected had to be undertaken and the team had to "revisit" (literally and through many phone calls) the sites many times to get more accurate information.

Box 6.2

Summary of Key Findings

(1) The average per-month, per-client recurrent cost of the ART program is Rs. 1,264, or about US$30; thus, the annual per-client cost is Rs. 15,168, or US$353.
(2) Our data point at the presence of economies of scale in provision of ART—the total costs are proportionately lower for NACO centers with a higher number of clients (across center and as centers expand over the study period).
(3) The bulk of the costs come from drugs (46%), followed by CD4 test costs (24%) and human resources (22%).
(4) On average, NACO bears 47% of the costs of providing ART in the participating sites, with SACS accounting for 35% and hospitals for 18%.
(5) A reduction in the prices of ARV drugs and CD4 test kits by half would reduce the per-client cost of treatment by 23%.
(6) Centralizing drugs and CD4 test kit purchases will shift the burden (of a lower total cost amount) mostly to NACO, and its cost share will increase to 78%.
(7) The expenditure incurred by the clients themselves while accessing ART is about Rs. 900 (US$21) per month.
(8) Thus, the societal cost of ART comes to around between Rs. 2,164 per month or Rs. 25,968 annually (US$604).

Source: Author.

We estimate the annual unit cost of ART provision at about US$353 without taking into account the costs borne by the individuals. This works out to be US$1 a day; if one adds about US$0.7 per day based on the individual costs, the cost per day comes to around US$1.70. An earlier World Bank study (Over and others 2004) estimated the cost per year for structured ART in India at US$600 (not including the individual costs). The difference is mainly due to a difference of about six years between the two reference periods, during which time the cost of ARVs have fallen substantially. Including individual costs in a similar study in Thailand (Supakankunti 2004), suggests a monthly cost per client US$78 per month, or US$2.50 per day, which is somewhat higher than the figure estimated in this study. Thus, in an absolute sense, the cost of provision in India does not appear to be very high; however, given the increasing number of individuals who will need to be put on therapy and kept on it, it translates into substantial financial commitment for the government.

A crucial variable for estimating annual costs will of course be the number of people initiating and receiving ART. The evidence indicates that there is a continuous demand for ART; there are sites that are unable to put everyone on it, and have created waiting lists. A related issue is the relation between demand and quality—the quality of the government program determines to what extent individuals would want to join it, and how many of them would prefer private providers, despite the cost difference. Again, the evidence gathered from the sites and from the experts consulted seems to indicate that the quality of the program has been quite good, with significantly high levels of adherence at all the sites. This has ensured a moderately high level of demand for the government program. Thus, if the quality is maintained at this level in years to come, there may be a switch away from the private to the public sector, which will only help keep up the demand.

How do our estimates of costs compare with the health budget of the country? The question of affordability was also raised by the World Bank study referred to earlier, which indicated that the cost of the most ambitious of the ART programs (to support all those below the poverty line) would be about 70 percent of central health expenditure (Over and others 2004). However, since then, prices of ARV drugs have come down significantly. Also, there have been substantial increases in the allocation to the Ministry of Health and Family Welfare, and restructuring of the programs, so that it is no longer meaningful to talk only about health expenditure. The revised health and family welfare budget for 2005–06 amounted to about US$2,250 million. Our estimates of cost of the ART program for 2007 (without any changes in costs of ARV and test kits), comes to about US$35 million, which is around 1.5 percent of the total health and family welfare budget. A 50 percent reduction in both the prices of drugs and kits reduces the amount to about 1 percent of the health and family welfare budget. The comparison with the earlier World Bank study and the different cost estimates within this study indicate that there are substantial savings to the program costs through reductions in prices of drugs and kits. As for NACO's own resources (excluding GFATM funds), the budget estimate for 2006–07 is US$148 million (MOHFW 2006); using the lower estimates of the ART program, the total ART cost for 2007 would be US$23 million, which is about 16 percent of NACO's core resources. If we assume that only 70 percent of the total cost would be covered by NACO, about 11 percent of total core resources of NACO would be required for the ART program for 2007.

The exercise above provided an illustration of the possible implications of a scaled-up program. Clearly, the question of financial sustainability is critical, and Financial Sustainability Planning, an exercise advocated and practiced in the case of immunization by the Global Alliance for Vaccines and Immunization (GAVI) could be usefully applied in the present context, too. While most of the cost would have to be borne by NACO, the sites may need additional help and funds so that their current services for other departments are not hampered. Additionally, if adherence of the program is seen as the most critical component of the public program, then individuals may need additional assistance, especially in light of the role of nutritional supplements to ensure that the ART works optimally.

Currently, NACO's ART program is being supported by GFATM. However, the sustainability of this funding and the possibility of other donors to support a scaled-up program are issues that NACO will need to focus on immediately. Additionally, if NACO plans on adding second-line drugs to the program, this would have significant financial implications for the program.

Careful planning, identifying ways to bring down costs without sacrificing quality, and negotiations with donors are strategies that need to be worked on simultaneously in the immediate future to ensure that the ART program remains sustainable.

Outlook

There are numerous ways this work can be utilized and extended. The first step involves active dissemination of the results to show the potential of such costing studies to NACO and the state governments that are running state-level ART programs, and also to give them some preliminary estimates of costs that they may find useful in their planning activities. It is also important to demonstrate the usefulness of such cost estimates in a financial sustainability planning exercise that not only charts out costs over the years, but also records the sources of secure and probable funding. This will allow NACO to negotiate with future donors on the basis of more solid data The results of this study may also be useful to other parts of the government, like the Ministry of Health and Family Welfare and the Planning Commission, to enable them to mainstream HIV and AIDS treatment programs into national planning activities.

This study also establishes a baseline of unit costs and can be used for cost-effectiveness analysis, for example, of a second-line ART program. It can also be used to understand the implications of (and interactions between) treatment success and adherence, which are bound to have cost implications. For example, our data from six sites show a positive, though weak, correlation between duration of exposure to treatment and total dropouts. Such a correlation can be expected for any disease; however, there are many causes of dropouts in the case of ART, and comprehensive research can be carried out to understand all the determinants of dropouts and treatment success in conjunction with a costing study, to evaluate the effectiveness of the program.

Finally, the results of this study could also be useful to the many other stakeholders involved in the study, in particular the hospitals and SACS. This will enable them to plan resource allocation and negotiate with NACO/state governments with better information. It may hopefully also serve as an advocacy tool for greater efficiency and transparency in data management, so that they can continue to be important partners in research endeavors that have important implications about their own work, as well as national policies.

Annex 6.1 Additional Assumptions Underlying Cost Estimates

Clients on ART	Available from monthly reports ART centers prepare and send to respective SACS
Human resources (NACO)	Estimated proportion of time spent by the NACO staff on the ART program was arrived at based on discussions. Actual proportion of time. See annex 6.2.
Human resources (SACS)	Estimated proportion of time spent by the SACS staff on the ART program was arrived at based on discussions. Actual proportion of time. See annex 6.2.
Human resources (ART Clinic)	NACO ART guideline specifies the details of staff to be appointed at the ART clinic. It was verified at respective sites, and actual "in-place" staff were taken into account. Additionally, details of dedicated ART clinic staff—other than NACO sponsored—were taken into account.
Human resources (Hospital staff)	In addition to the ART clinic staff, hospital physicians, especially from the medicine and microbiology departments, were actively involved in the ART program. The medicine department physicians' time was apportioned to the ART program based on discussions around their perceptions about involvement in the program at respective sites. For the microbiology department, 25% of the time of one faculty was accounted for based on various discussion at all the sites.

Annex 6.1 Additional Assumptions Underlying Cost Estimates *(continued)*

ARV drug consumption	Available from monthly reports that ART centers prepare and send to respective SACS.
ARV crug expenditure	ARV drugs supply and consumption figures are available from monthly reports. The unit prices of different drug molecules for the years 2004-05 and 2005-06 were obtained from NACO. Since the drug prices during two years and volumes of drug supplied to different sites were different, a site-specific weighted average unit cost was calculated. Finally, the total consumption figures were multiplied with the weighted average unit prices to get the total expenditure on ARV. In the case of state-level purchasing of ARVs, a ratio of NACO and state supply was calculated, and accordingly, the expenditure—based on two different unit costs—was calculated.
CD4 kits/reagents expenditure	Unit cost of CD4 test kit was collected from respective SACS. The unit cost of sheath fluid was calculated based on Delhi SACS data and applied to all other sites. Total expenditure was calculated based on unit cost and total consumption.
CD4 test volume	Monthly data on CD4 testing, control, and failed tests were available from microbiology labs. The sum of these yielded total consumption of CD4 tests. A container of 20 liters of sheath fluid was assumed to be required for 150 CD4 tests.
Prophylaxis: Septran (Cotrimoxazole) consumption	All centers provide Co-trimoxazole—one tablet a day—to all clients having a CD4 count less than 200 cells till it improved beyond 200 cells. Only Imphal could provide actual consumption data for the study period. The CD4 count profile of ART clients was only available from Ahmedabad and thus, this proportion (73% of clients would take Septran for six months and 11% for a year) was applied to sites where actual/estimated proportion was not available.
OI drug consumption	Only RIMS and Trichur could give data on actual consumption of OI drugs. For other centers, consumption of OI drugs had to be calculated based on the profile of OI infections among clients and prescribed dosage, which was available only for Ahmedabad; the proportion of clients with major OIs was calculated for Ahmedabad and used for other sites.
OI drug expenditure	The unit price of OI drugs was available for Manipur, Trivandrum, Trichur, and Tambaram. The figures obtained from the rate list of the Directorate of Medical Education, Kerala, for the unit price of OI drugs were used for those sites where relevant data was unavailable. Total expenditure was calculated based on unit cost and total consumption.
Hospital volume patients	Departmental OP and IP figures available from Medical Records Department (MRD) for calendar year 2004 and 2005.
Hospital volume laboratories	Laboratory volume figures (of tests) were available from MRD for calendar year 2004 and 2005.

(continued)

Annex 6.1 Additional Assumptions Underlying Cost Estimates *(continued)*

ART clients volume laboratories	All clients who were on therapy had to undergo a list of tests at different laboratories. The volume of these tests was available from monthly reports. Additionally, it was assumed that the same number of clients would go in for repeat testing at stipulated time intervals. This volume was calculated based on "net clients on therapy," i.e., total clients on therapy minus estimated dropouts. List of compulsory tests is given in annex 6.3 .		
Hospital department support	Mainly two clinical departments (medicine and dermatology) and four diagnostic departments (pathology, biochemistry, radiology, and microbiology) were actively involved in the ART program. Only Manipur could provide departmental expenditure details. No sites could provide rate lists of various procedures being done at these laboratories. Thus, the proportion from Manipur was used to calculate departmental costs from total hospital costs, and the rate list of Manipur was used to calculate the ART lab coefficient. However, the list of compulsory tests was site specific. The cost apportionment for these departments was done as discussed below.		
	Proportion of A dept. cost (%)	Pa	From Manipur data
	ART proportion coefficient_IP(%)	Xai	ART inpatients/Total inpatients
	ART lab coefficient (%)	Xlab	Rate of ART tests/Rate of total tests
	ART proportion coefficient_lab (%)	Xal	# of ART pts tests/total pt tests
	Cost of A department (Ca) =		[Total hospital costs * Pa]
	ART cost of A department_ inpatient =		[Ca * Xai]
	ART cost of A department_lab =		[Ca * Xlab * Xal]
	The methodology is different for Tambaram, which is given in detail in the annex on specific-site assumptions.		

Source: Authors.

Annex 6.2 Site-specific Details and Assumptions

Government Hospital of Thoracic Medicine (GHTM), Tambaram, Chennai, Tamil Nadu	
Prophylaxis—Septran (Co-trimoxazole) consumption	CD4 count profile of ART clients could not be made available. However, discussion with Tamil Nadu SACS (TNSACS) staff indicated a proportion of 85% for six months and 15% for a year.
OI drug consumption	GHTM dispenses many OI drugs; however, actual consumption of OI drugs or profile of OI infection was not available. The proportion of clients that may have major OI was calculated based on various discussions. The estimated consumption was calculated based on dosage and estimated clients that may have different OI infections.

Annex 6.2 Site-specific Details and Assumptions *(continued)*

Hospital volume patients	The departmental patient load was available for the years 2004, 2005, and up to March 2006. The volume was apportioned for the study period from April 2004 to March 2006 accordingly.
Hospital volume laboratories	The monthly patient load for various tests and procedures for all the labs was available for the study period. The number of haemograms was taken as a proxy for the pathology lab and liver function tests as a proxy for the biochemistry lab.
ART clients volume laboratories—details of repeat test frequency	Following tests are being repeated at every three months: haemogram, liver function, urinary creatinin, blood sugar, x-ray.
CD4 test volume	CD4 test volume data available monthly from the labs at Tambaram hospital.
Human resources (SACS)	The project director, deputy director, ART consultant, and finance controller at TNSACS contributed to the ART program. The salaries of the deputy director and ART consultant were provided by WHO.
Human resources (ART)	In addition to the NACO-sanctioned staff at the ART clinic, seven medical officers are working at the ART clinic—three of whom are sponsored by WHO, two by SACS, and one each by the Clinton Foundation and the hospital itself. The hospital also sponsors two dedicated nurses and a pharmacist for the ART clinic. One additional counselor is sponsored by the Thai foundation.
Human resources (hospital staff)	Ten hospital physicians contribute to the ART program. The exact proportion of their time dedicated to the ART program was collected from the Medical Superintendent (MS) of the hospital. Additionally, 5% of a pathologist's time was allocated to the ART program.
ARV drug expenditure	TNSACS has supplied Efaviranz 200 mg and also 11% of total Efaviranz 600 mg consumed during the study period.
CD4 kits/reagents expenditure	The cost of a CD4 kit was different for the two years.
OI drug expenditure	Estimated consumption of major OI drugs was multiplied with unit prices at which Tambaram hospital purchased them to get the total OI expenditure. All expense on OI drugs is borne by the hospital itself and no grant in this regard is available from SACS.
Hospital expenditure	Expenditure data for financial year 2005/06 was available only up to February; it was extrapolated for the financial year 2005–06.
Hospital department support	Tambaram hospital is mainly an HIV and TB center with no demarcated clinical departments unlike a medical college-affiliated general hospital. The total bed count is 896, and there are 31 wards, with eight especially for HIV patients, including ART. The diagnostics include a central laboratory, which performs all pathology-, biochemistry-, and microbiology-related tests, and a radiology section, which performs imaging diagnosis; being a TB center, radiology is an important cost center. Thus, the proportion from RIMS is inappropriate here. A separate system was worked out.

(continued)

Annex 6.2 Site-specific Details and Assumptions *(continued)*

	The estimated costs of rehabilitation center—which is an exclusive setup with 120 beds—were calculated based on bed proportion, and deducted from the total expenditure. Since department-level expenditure was not available, unit costs of different diagnostic units was worked out based on RML hospital's volume and expenditure estimates. The remaining expenditure was divided across IP and OP in equal proportion given than OP setup is a significant one. The IP expenditure, which was assumed to have relevance to the ART program, was then divided across HIV and non-HIV ward expenditure based on the number of wards. ART patient coefficient, ART lab coefficient, and departmental support expenditure were calculated like other sites, as discussed the methodology section.
Regional Institute of Medical Sciences (RIMS), Imphal, Manipur RIMS, Imphal	
Hospital volume patients	The patient load for July to August for the years 2003–04 and 2004–05 was used to apportion the total hospital volume for the study period.
Hospital volume laboratories	Volume of various tests was available from annual reports. Volume of haemogram was taken as a proxy of volume of the pathology lab; liver function for biochemistry and HbAsg test was taken as a proxy for the microbiology lab. Total x-ray volume was used as a volume of the radiology department. July to August figures for the years 2003–04 and 2004–05 was used to apportion the total hospital volume for the study period.
ART clients volume laboratories	There are no mandatory repeat tests, but according to the treating physician, nearly 50% of patients need to undergo repeat test as mentioned below: haemogram, liver function test.
Human resources (SACS)	Delhi SACS estimates of proportion of time in the program were applied. However, actual salary was available from the Manipur SACS.
Human resources (hospital staff)	One professor, one associate professor, and three assistant professors give on an average 6% of their time to the ART clinic. A store officer looks after entire logistics around ARV and OI medicines and gives 30% of his time to ART program.
ARV drug expenditure.	MSACS supplied around 51% of the total Efavirenz 600 mg.
Hospital expenditure	Expenditure data for financial year 2004/05 and 2005/06 was available. Appropriate apportionment was done for April 2004 to July 2005.
BJ Medical College (BJMC), Ahmedabad, Gujarat	
Hospital volume patients	The patient load for December 2004 to November 2005 was used as a proxy of financial year 2005–06.
Hospital volume laboratories	Actual load of different laboratories was available from MRD. The patient load for December 2004 to November 2005 was used as a proxy of financial year 2005–06.
ART clients volume laboratories	Following tests are repeated every six months: haemogram, liver function. X-ray is repeated every nine months.

Annex 6.2 Site-specific Details and Assumptions *(continued)*

Human resources (NACO)	An average time apportioned to Ahmedabad was calculated based on the number of sites operating at the end of the year, i.e., 54 sites for 2005–06.
Human resources (SACS)	Actual proportion of time of SACS staff was estimated based on discussions with the additional project director.
Human resources (hospital staff)	All ART clients need to first visit department of medicine, and only those who have been screened are referred to the clinic. Thus, the involvement of the medicine department is significant. Six professors, three associate professors, and one assistant professor from the department of medicine contributed 9%, 7%, and 4% of their time, respectively, to the ART clinic.
ARV drug expenditure	Gujarat SACS has supplied a significant proportion of all the medicines—except Zidovudine combinations—account for almost 28% of the cost of total ARV consumption.
OI drug expenditure	As the unit cost of OI drugs was not available, the costs from Tambaram hospital were used to arrive at estimated total expenditure on OI drugs.
Hospital expenditure	College expenditure was available for the financial year 2005–06 and hospital expenditure was available only till December 2005; this was extrapolated for the financial year.
Lok Nayak Jai Prakash (LNJP) Hospital, New Delhi	
Prophylaxis—Septran (Co-trimoxazole) onsumption	CD4 count profile of ART clients was not available. Septran consumption was calculated based on the CD4 count profile of clients of Ahmedabad site.
OI drug consumption	LNJP dispenses many OI drugs; however, actual consumption of OI drugs or profile of OI infection was not available. The proportion of clients that may have major OI was calculated based on the Ahmedabad client profile. The estimated consumption was calculated based on dosage and estimated clients who may have different OI infections.
Hospital volume patients	Departmental OP volume and total IP figures were made available from MRD for April 2004 to November 2005; projections were made till March 2006 using the "moving average forecasting" technique. IP to OP ratio was calculated for four sites viz. Ahmedabad, RML, Trichur, and Imphal. This ratio was then applied to departmental OP figure of LNJP to arrive at departmental IP figures.
Hospital volume laboratories	Similarly, precise laboratory volumes were not available. Laboratory-to-OP ratio was calculated for the above-mentioned four sites, and applied to LNJP figures to arrive at laboratory volumes.
ART clients volume laboratories	Following tests are done every six months: Haemogram, x-ray, liver function, kidney function.
CD4 test volume	Monthly data on CD4 testing, control, and failed tests available from microbiology lab till December 2005. Projections were made till March 2006 using "moving average forecasting" technique.

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Annex 6.2 Site-specific Details and Assumptions *(continued)*

Human resources (NACO)	An average time apportioned to LNJP was calculated based on the number of sites operating at the end of the year, i.e., 25 sites for 2004–05 and 54 for 2005–06.
Human resources (SACS)	Actual proportion of time of SACS staff was estimated based on discussions with relevant Delhi SACS staff. An average time per site was calculated based on the number of sites operating at the end of the year, i.e., two sites for 2004–05 and seven for 2005–06.
Human resources (ART clinic)	NACO-specified staff was in place by the end of the study period, but the calculation was done based on actual joining of the ART clinic. Hospital-sponsored staff includes two nurses, a nursing orderly, and a pharmacist.
Human resources (hospital staff)	Four physicians of different levels of seniority spent 10% of their time on the ART clinic. Since actual salaries of these staff were not available, average salary of RML physicians was taken as a proxy measure.
ARV drug expenditure	Delhi SACS has supplied Efaviranz 200 mg and also 67% of total Efaviranz 600 mg consumed during the study period.
OI drug expenditure	As the unit cost of OI drugs was not available, the cost from Tambaram hospital was used to arrive at estimated total expenditure on OI drugs.
Ram Manohar Lohia (RML) Hospital, New Delhi	
Prophylaxis—Septran (Co-trimoxazole) onsumption	CD4 count profile of ART clients was not available. Septran consumption was calculated based on the CD4 count profile of clients of Ahmedabad site. In RML until August 2005 the patients were given Septran for 30 days, and after August 2005 for 15 days.
OI drug consumption	Hospital does not supply any OI drugs and patients have to purchase their own.
Hospital volume patients	The patient load for calendar year 2004 and 2005 assumed to be same for study year April 2004 to March 2005 and April 2005 to March 2006, respectively.
Hospital volume laboratories	The patient load for calendar year 2004 and 2005 assumed to be same for study year April 2004 to March 2005 and April 2005 to March 2006, respectively.
ART clients volume laboratories	Haemogram is repeated every three months. Liver function test and x-ray are repeated every six months.
Human resources (NACO)	An average time apportioned to RML was calculated based on the number of sites operating at the end of the year, i.e., 25 sites for 2004–05 and 54 for 2005–06.
Human resources (SACS)	Actual proportion of time of SACS staff was estimated based on discussions with relevant DSCAS staff. An average time apportioned per site was calculated based on the number of sites operating at the end of the year, i.e., two sites for 2004-05 and seven for 2005-06.
Human resources (ART clinic)	NACO-sanctioned ART lab technician for CD4 machine was not filled till October 2004. Thus, hospital lab technician was taken into account for seven months. Two nurses are sponsored by hospital and have been working at the ART clinic during study period.

Annex 6.2 Site-specific Details and Assumptions *(continued)*

Human resources (hospital staff)	Five professors of the medicine department give 10% of their total time to ART clinic.
ARV drug expenditure	Delhi SACS has supplied Efaviranz 200 mg and 50% of total Efaviranz 600 mg consumed during the study period.
OI drug expenditure	No OI consumption.
Government Medical College and Hospital (GMC), Trivandrum, Kerala	
Prophylaxis—Septran (Co-trimoxazole) consumption	CD4 count profile of ART clients could not be made available. Septran consumption calculated based on the CD4 count profile of clients of Ahmedabad site for the period April 2005 to March 2006.
OI drug consumption	The profile of OI consumption is based on the estimates of Ahmedabad. Consumption of Doxycyclin tablets was calculated based on consumption pattern of RIMS.
Hospital volume patients	The patient load for calendar year 2005 used for the study period from April 2005 to March 2006.
Hospital volume laboratories	The patient load for the calendar year 2005 was used for the study period from April 2005 to March 2006 for all the laboratories. The total number of haemograms was used as proxy for the total tests at the pathology lab and number of liver function tests for the biochemistry lab. Since no compulsory tests were conducted at the microbiology lab, it was not taken into calculation for departmental support.
ART clients volume laboratories	Haemogram is repeated every three months, while liver function test and test for lipid profile are done every six months.
CD4 test volume	The only CD4 machine in the state of Kerala is placed at the skin department of the Trivandrum Medical College. The annual CD4 count figures for 2004 and 2005, and total during January to March 2006, were available. Monthly volume was not available and thus it was difficult to arrive at precise estimate of CD4 tests during the study period. During 2004, CD4 count was being done an average of 53 tests per month, which increased to 130 tests per month in 2005. This growth can be attributed to the ART program. Thus, it was assumed that during January to March 2005, CD4 tests were done at the average monthly rate of 53 tests and volume of April to December 2005 was calculated accordingly by subtracting 160 tests from the annual figure.
Human resources (NACO)	Trivandrum became a NACO site in May 2005, and the proportion of time NACO staff spent during 11 months of the study period was used in the study. However, since there was no drug supply from NACO during the study period, the procurement consultant's time was not taken into account.
Human resources (SACS)	Actual proportion of time of SACS staff was estimated based on discussions with relevant Dehli SCAS staff. An average time apportioned per site was calculated based on the number of sites operating at the end of the study period, i.e., five sites in Kerala.

(continued)

Annex 6.2 Site-specific Details and Assumptions *(continued)*

Human resources (ART)	From May 2005 (the beginning of the program) until November 2005, postgraduate students of the medical college were running the ART clinic on a rotation. NACO-sanctioned ART medical officer was in place from November 2005. The lab technician and recordkeeper were provided in January 2006. A dedicated laboratory technician was working on CD4 tests during April to November 2005. A SACS appointed counselor worked in the ART clinic from April 2005.
Human resources (hospital staff)	The head of the Department of Medicine spent about 50% of his time on the ART program. Two professors from the infectious diseases unit and medicine department respectively gave 15% and 1% of their time to ART clinic. An associate professor of dermatology who was in charge of CD4 testing gave about 25% of his time on ART program.
ARV drug expenditure	Started as a state-level initiative, drugs were procured by the Directorate of Medical Education purchased through the Central Purchase Committee of the state government. It became NACO-sponsored site in May 2005, but the drugs consumed during the study period were from the state-level procurement.
OI expenditure	The unit costs of relevant OI drugs were used from the rate list of the Central Purchase Committee of the government to calculate the total OI expenditure.
Hospital expenditure	The expenditure data for the period April 2005 to December 2005 was available, which was then extrapolated to get the data for the entire financial year. The actual expense on salaries for the college staff was not available. The proportion of budget provision for salaries to actual expenditure for Trichur was used for Trivandrum to estimate the expenditure for Trivandrum from its budget provision for 2005–06.
Government Medical College and Hospital (GMC), Thrissur, Kerala	
Septran (Co-trimoxazole) consumption	CD4 count profile of ART clients was not available. Septran consumption calculated based on the CD4 count profile of clients of Ahmedabad site for the period November 2004 to October 2005.
Hospital volume patients	The patient load for calendar year 2004 and 2005 was apportioned for the period from November 2004 to October 2005.
Hospital volume laboratories	The patient load for the period November 2004 to October 2005 was collected from the registers for all the labs. The number of haemograms was taken as proxy for the pathology lab and number of liver function tests was taken as proxy for the biochemistry lab.
ART clients volume laboratories	Following tests are done every six months: haemogram, x-ray, liver function.
CD4 test volume	CD4 machine is not available at Trichur. ART patients either go to Trivandrum or private labs for CD4 testing.
Human resources (NACO)	Trichur was not a NACO-sponsored site during the study period, so NACO staff time was not taken into account.

Annex 6.2 Site-specific Details and Assumptions *(continued)*

Human resources (SACS)	Actual proportion of time of SACS staff was estimated based on discussions with relevant Kerala SACS staff. An average time apportioned per site was calculated based on the number of sites operating at the end of the study period, i.e., five sites in Kerala.
Human resources (ART clinic)	A SACS appointed medical officer and a counselor were in place at the ART clinic during the study period.
Human resources (hospital staff)	Two faculty members, from the departments of dermatology and neurology, give 36% and 10% of their time to the ART clinic, respectively.
ARV drug expenditure	Being a state-level initiative, drugs were procured by the Directorate of Medical Education purchased through the Central Purchase Committee of the state government.
CD4 kits/reagents expenditure	Not applicable.
OI drug expenditure	The unit costs of relevant OI drugs were used from the rate list of the Central Purchase Committee of the government to calculate the total OI expenditure.
Hospital expenditure	Expenditure statements of the Directorate of Medical Education and Directorate of Health Services accounts were available for the financial year 2005–06. The salary figures for 2005–06 for the hospital is based on the revised estimate of fiscal year 2004–05. Additionally, Hospital Development Committee (HDC) expenses were also taken into account.

Source: Authors.

Annex 6.3 List of Compulsory Tests

Site	*Pathology*	*Biochemistry*	*Microbiology*	*Radiology*
Tambaram	Haemogram	Liver function test, urea, creatinin, blood sugar		X-ray
Imphal	Haemogram	Liver function test, lipid profile, kidney function test	Hepatitis B Hepatitis C	X-ray Ultrasound
Ahmedabad	Haemogram	Liver function test, lipid profile, kidney function test	Hepatitis B Hepatitis C	X-ray Ultrasound
LNJP, New Delhi	Haemogram Urine	Liver function test, lipid profile, kidney function test	VDRI, Hepatitis B Hepatitis C	X-ray Ultrasound
RML, New Delhi	Haemogram Urine	Liver function test, lipid profile	VDRI, Hepatitis B Hepatitis C	X-ray
Trivandrum	Haemogram	Liver function test, lipid profile		
Trichur	Haemogram	Liver function test		X-ray

Annex 6.4 Time Allocation of NACO Staff to ART Clinic Program in Selected Hospitals

	Joint Director (ART & Surveillance)		*ART Consultant*		*Director (CD4)*		*Procurement Consultant*	
Site	*Time allocated (Percent)*	*Duration in months*	*Time allocated (Percent)*	*Duration in months*	*Time allocated (Percent)*	*Duration in months*	*Time allocated (Percent)*	*Duration in months*
GHTM	0.73	24	2.93	15	0.29	24	1.17	24
RIMS	1.00	16	4.00	7	0.40	16	1.60	16
BJMC	0.46	12	1.85	12	0.19	12	0.74	12
LNJP	0.73	24	2.93	15	0.29	24	1.17	24
RML	0.73	24	2.93	15	0.29	24	1.17	24
TVM	0.46	11	1.85	11	0.19	11		

Annex 6.5 Time Allocation of SACS Staff to Selected ART Clinic Programs

Staff	*Time allocated (Percent)*	*Staff*	*Time allocated (Percent)*
GHTM, Tambaram		*BJMC, Ahmedabad*	
ART consultant	15	Monitoring and evaluation officer	5
Finance controller	2	Project director	1
Project director	6	Store officer	25
Deputy director	10	T.C.O	5
Senior technical officer - Deputy director	6	*RML and LNJP*	
Finance officer	5	Accountant	3.93
RIMS, Imphal		D (C&S)	20
Project director	5	APD	3.57
Store officer	5	Procurement officer	3.57
APD	10	*TVM and Thrissur*	
Deputy director	10	Accountant	0.2
Finance controller	2.5	Administrative assistant	2
Finance officer	2.5	APD	0.2
		Deputy director	2
		Project director	0.2

Source: Authors' calculations.

Notes

1. NACO is the government nodal agency in charge of formulating, coordinating, and implementing policies and response on HIV and AIDS in India, including through state-level agencies called State AIDS Prevention and Control Societies (SACS).
2. Answer of the Minister of State in the Health Ministry to Lok Sabha: Unstarred question no. 454 has been answered on 27th July 2005.

3. These numbers pertain to the situation existing a year ago. Currently, as per NACO figures for May 2007, there are about 80,000 individuals in the country on ART. In all, there are currently 117 NACO-supported ART sites all over the country, with 68 of these being in high-prevalence states with GFATM-supported programs catering to some three-fourths of the total clients on ART.
4. We do not include the large outpatient departments of the general hospitals, as the ART patient loads were a very small part of the total OPD load.
5. One potential pitfall with this approach occurs when a substantial share of costs relates to overhead, and average costs would therefore decline strongly with the number of people receiving treatment (i.e., there are economies of scale). As the bulk of costs, presented below, can be attributed to the costs of treatment, rather than overhead, we do not differentiate between treatment costs and overhead in this exercise.
6. Tambaram hospital is mainly a TB hospital, catering to a large number of HIV-positive patients. Therefore, the number of physicians involved in the ART program is much higher.
7. For the Kerala sites, the Directorate of Medical Education, Department of Health and Family Welfare, purchased the drugs. Even now, after these sites have become NACO sites, the drugs are not being supplied by NACO.
8. This consists of one physician, one surgeon, one gynecologist, one pediatrician, one community medicine specialist, one microbiologist, one psychiatrist, one TB specialist, one STD specialist, and one staff nurse.
9. The distribution across drug regimens was not available from Trivandrum.
10. Thrissur has been left out of this because it did not have a CD4 machine, and including it would have yielded inaccurate shares.
11. This is lower than the share of ARV in the Thai national program, which was estimated at 60 percent (Supakankunti et al. 2003).
12. BJMC, Ahmedabad, may be an outlier because it purchased a large quantity of drugs on its own.
13. Data over two years were also available for Tambaram; as it is a specialty hospital, it is not included in this table.
14. Since Trivandrum and Thrissur were initially state programs, the respective cost shares are not comparable with the other sites; the two sites are therefore reported, but excluded from the analysis of cost shares. Tambaram (as a specialty hospital) is also not used for calculating averages across NACO sites.
15. The distribution of the sample was as follows: Chennai (45), RIMS (28), LNJP (45), RML (41), Ahmedabad (45), Trivandrum (26), and Thrissur (34). The samples have been taken keeping in view the client load across sites. Since the respondents had to be interviewed at the ART clinic, the sampling

was purposive, but the interviews were spread over several days (although there did not seem to be any particular pattern to the type of individuals attending the clinic on any particular day).

16. The question on food was worded carefully, and the interviewers were also trained to ask the question so that routine food intakes were not included. The emphasis was on whether the client has been advised by anyone to eat additional nutritious food like eggs, meat, milk, and fruits.
17. A survey of recent publications on this issue is maintained by the UN Standing Committee on Nutrition, and is available online (as of June 2007) at http://www.unsystem.org/scn/Publications/AnnualMeeting/hiv_reference/SCN_HIV_articles/ARV_and_nutrition_interactions.htm.

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