

## HIV/AIDS epidemic in India: An economic perspective

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**Whilst the international community's focus has been on the region most devastated by HIV/AIDS, namely sub-Saharan Africa, India now appears on the brink of a significant AIDS epidemic. In thinking about the implications of HIV/AIDS, considerable attention was initially drawn to its clinical aspects. More recently, other dimensions of HIV, including economic, have been explored. The primary objective of this review is to elaborate on the major elements of the national and international economic research to data on HIV/AIDS, and to infer lessons from it, for India. It also examines the evidence on the aggregate and household-level economic impacts of HIV, the economic roots that drive its transmission and the methods economists use to assess the efficacy of alternative interventions to address HIV and AIDS. Available evidence suggests that whereas aggregate impacts may be limited, the adverse household-level economic implications of AIDS may be serious; public resources that are available for health are also likely to be put under strain. Paucity of economic research on HIV and AIDS relating to India is highlighted.**

When acquired immune deficiency syndrome (AIDS) was first recognized in early 1981, few would have predicted that it would escalate into a modern-day plague, with over 40 million individuals infected worldwide. Indeed, AIDS is an exceptional infectious disease, posing challenges in terms of immediate needs and long-term development. In 2003, almost five million people were newly infected with HIV, the highest annual incidence rate since the beginning of the epidemic. In the same year, almost three million individuals died of AIDS and over 20 million have died since the first cases of AIDS were identified in the early 1980s<sup>1</sup>.

Whilst the international community's focus has been on the region most devastated by HIV/AIDS, namely sub-Saharan Africa, India now appears on the brink of a significant epidemic. HIV has been detected in almost all of India's states and union territories. In seven Indian states, the prevalence of

HIV in women attending antenatal clinics exceeds 1 per cent, categorizing the epidemic as generalized. With an estimated 5.1 million individuals living with HIV in 2003, approximately 0.9 per cent of Indian adults are HIV positive, and in terms of absolute numbers, HIV prevalence in India corresponds to the second highest population worldwide<sup>2</sup>.

In thinking about the implications of HIV/AIDS, considerable attention has been drawn to its clinical and therapeutic aspects: the nature of the HIV virus, the mechanism through which it is transmitted across individuals, the creation of vaccines to prevent infection, and the development of drugs to manage opportunistic infections and conditions associated with HIV and AIDS. Yet, it is clear by now that the effects of HIV/AIDS are not limited to the realm of medicine. HIV has profoundly influenced legal, human rights and ethical frameworks, and there are raging debates regarding the twin strategies of prevention and

treatment within these contexts. Considerations of gender equality, family structure and demographic implications have also attracted attention in studying its consequences.

A large amount of attention has also been devoted to analysing the aggregate economic impacts of the worldwide HIV/AIDS epidemic. This is not surprising since HIV/AIDS affects individuals in prime-working age groups, is typically expensive to treat, and has affected massive numbers of people worldwide. However, the focus on the aggregate impacts of HIV/AIDS is only one of several lenses through which economists have viewed the impact of the epidemic. Firstly, researchers have also examined the impact of HIV at the micro-level, on specific sectors, individuals and families, on economic inequality and on poverty. Secondly, economists have highlighted elements of the process of modern economic development that are correlated with the spread of HIV, for example, rural-urban and international migration, urbanization, and increases in income. This focus on the “economic roots” of the epidemic, when enriched by the ways in which economists study individual behaviours at risk for HIV infection, has a potentially vital role in promoting our understanding of the spread of HIV, and in aiding policy makers to design policies that most efficiently limit its impact. Thirdly, economists have developed methods of evaluation, which have been widely used in the literature to assess the efficacy of alternative HIV/AIDS interventions available to policymakers.

The primary objective of this paper is to elaborate on the major elements of the national and international economic research to date on HIV/AIDS, and to infer lessons from it, for India. Where available and possible, we shall rely on Indian data and analyses that have been undertaken for India. However, the relative paucity of Indian economic literature on HIV/AIDS means that some of our analysis will have an international flavour.

### **Economic impacts of HIV/AIDS**

*Household-level impacts* : There is a large, albeit relatively recent, theoretical and micro-econometric literature that highlights the adverse impacts of ill

health and poor nutrition on individual labour force participation, on earnings and on asset holdings, and the like<sup>3</sup>. In its emphasis, this recent literature on the economic implications of ill health at the micro-level is a departure from the traditional treatment of health as an outcome of economic circumstances. The extension of this work to HIV/AIDS is natural given that HIV is almost invariably fatal, affects the economically most productive adults, and is expensive to treat.

Existing research indicates several ways in which households are likely to be economically affected by AIDS (Table I).

The most visible impact is on the financial expenses associated with medical treatment of individuals that are borne by the household(s) to whom the individuals belong. Annual treatment costs of AIDS were estimated to be more than two times the per-capita income in the mid-1990s in a study of nine Asian countries income that included India<sup>4</sup>. These early estimates did not include the costs of antiretroviral drugs (ARV), which can be expected to substantially escalate the economic burden on families and households. A recent study of patients visiting a non government provider in south India estimated the median annual costs of treatment for AIDS patients to be of the order of rupees six thousand over a six month reference period, with the treatment expenses for patients on antiretroviral drugs averaging rupees 18,150 over that same period<sup>5</sup>. Another study from Delhi<sup>6</sup>, although with a less scientifically designed sample, suggests similar estimates for expenditures on antiretroviral treatment – about rupees 30 thousand (About US \$650) for antiretroviral treatment over a one year period, plus another rupees 10 thousand annually for monitoring tests.

One can imagine that the domestic manufacture of many of the combinatorial ARV drugs in India has, for time being, reduced the economic burden of ARV treatment by keeping drug prices in check. However, this will only be a short-term reprieve once patent protections for new HIV/AIDS drugs come into effect within a few more years, and the virus develops widespread resistance to the current line of drugs. Indeed, one recent study<sup>7</sup> of the impact of extending

**Table I.** Economic impacts of HIV on the household

*The most direct impacts of HIV on the household take the form of :*

- Expenditures for medical treatment
- Income losses to household owing to morbidity and premature death of adult members

*These impacts are exacerbated by :*

- Stigma and discrimination associated with HIV/AIDS that leads to economic loss, inadequate community and extended family support and inadequate access to care
- Discrimination may also lead to disproportionate economic impacts on young women
- Regulations that make access to essential drugs more expensive

*Seriously affected households cope with these impacts by :*

- Drawing down on savings, selling assets, or by borrowing
- Reducing consumption of essential items, including food
- Withdrawing children from schools
- Reducing consumption of other essential health care
- Increasing the number of members joining the labour force to supplement declining incomes

These coping mechanisms have long run impacts on the economic well-being of households, by impacting upon human capital accumulation and financial asset positions.

Civil society and enhanced government support in the form of free antiretroviral treatment act to ameliorate these impacts. Access to health and life insurance, or publicly financed health facilities also help.

intellectual property rights protections to pharmaceuticals in India suggests that there will be substantial welfare losses to Indian consumers on account of pharmaceutical price increases.

A second immediate impact is on earnings and incomes of households with members with HIV/AIDS, since HIV/AIDS affects individuals in their most productive years when they are likely to be members of the labour force, or are in a position to provide support. The impacts can take the form of lost earnings when individuals get sick, or die prematurely due to AIDS. The study by Duraisamy *et al*<sup>5</sup> estimated that, on an average, 43 workdays were lost in a 6-month reference period per HIV-positive client of the NGO, translating into roughly rupees three thousand in lost income during that time. Another study of households affected by HIV in four Indian states<sup>8</sup> clearly points to growing economic hardships, while average monthly expenditure on food and treatment increased substantially in households affected by HIV/AIDS, incomes declined by as much as one-third. Further evidence on income losses can

be gleaned from studies of the economic impact of tuberculosis infection, often an opportunistic infection associated with HIV infection in India. One study of 304 tuberculosis patients<sup>9</sup> found that the average cost of treatment over the six-month period amounted to nearly rupees 2,000 and an additional rupees 4,000 of lost wages during that same period.

In fact, the actual earnings losses are typically much larger than the above studies suggest, given that they accumulate over several years when an individual dies, even under fairly conservative assumptions about working life spans<sup>10</sup>. In Sri Lanka and in India, lost lifetime earnings due to an AIDS death were estimated to be more than ten times the annual treatment costs of AIDS<sup>4</sup>. Moreover, incomes and earnings losses can also occur due to the loss of a job from stigma associated with HIV infection, even if the HIV-positive individual is not sick with opportunistic infections associated with HIV/AIDS. In these cases, the value of lost earnings is even greater, since the period over which the household does not have access to an individual's earnings is

potentially longer. The ILO study<sup>8</sup> above confirms that stigma and discrimination at the workplace complicate matters, with many people living with HIV/AIDS (PLWHA) not disclosing their status to employers for fear of losing their jobs.

Earnings losses and increased expenditures due to HIV among adult members of the household are reflected in a number of short - and long-term consequences for households. These include declines in household savings and asset holdings. Duraisamy *et al*<sup>5</sup> found that medical treatment expenditures constituted a significant economic burden on a sample of affected households in south India, with roughly 40-70 per cent of AIDS-related expenditures being financed by borrowing. A similar reliance on borrowing and declining assets among was observed in a sample of households affected by HIV/AIDS in the Sangli district of Maharashtra<sup>11</sup>. The finding that households with an adult AIDS death were more severely affected compared to households with an adult non-AIDS death is similar to results from studies in Thailand and sub-Saharan African countries<sup>12-14</sup>.

Few studies on the effectiveness of coping mechanisms exist in India, but one study<sup>15</sup> on adult deaths in India found that richer households were better able to cope with the adverse economic consequences of losing breadwinners, in terms of their asset position. In addition to consequences manifested in the form of declining household asset holdings, members of households affected by HIV/AIDS are likely to have lower long-run accumulations of human capital, whether measured in terms of achievements in education, or health. The ILO study for India<sup>8</sup> found that households have to compromise on their children's education, with nearly 38 per cent of respondents reporting being forced to withdraw children from school and sending them to work. Similarly Verma *et al*<sup>11</sup> found in Sangli that children among households that experienced an AIDS death were less likely to receive health care, and more likely to be withdrawn from school compared to households with a non-AIDS death or no death at all. Corroborating evidence is available from analyses of families experiencing tuberculosis, or deaths among adults in India. In 34 per cent of a sample of households with parental tuberculosis, parents could

not afford to buy books, or adequate food for their children; and in 20 per cent of the cases children had to be pulled out of school to take up income earning jobs<sup>16</sup>. Leclercq<sup>17</sup> using survey data for rural India from the National Council for Applied Economic Research found that the death of one or both parents, adversely affects the schooling of their children, and increases the likelihood of their working. These findings are similar to those for sub-Saharan Africa suggesting that AIDS deaths within households are likely to be associated with declines in nutrition and the loss of educational continuity among children, with the effects likely to be especially concentrated among rural households and the urban poor<sup>13,18,19</sup>.

To conclude, three other observations, starting with the observation on a lack of access to formal health and life insurance. In general, such insurance is not accessible to Indians with HIV/AIDS, due to the low coverage of private health insurance, and presumably, excludability clauses<sup>10</sup>. Thus, safety nets offered by the public sector (such as public insurance, or free care in public health facilities) are the sole formal mechanisms available to households, and the latter is hampered by the poor fiscal situation of government and by the predominance of informal sector employment. One of the few ways in which households can reduce the impact of AIDS is by using public sector health facilities that are often available at subsidized rates to the poor. Unfortunately in developing countries with limited resources, such as India, this option is not always available. It is well known that India's public health facilities are poorly funded and undermanned. There is also some evidence that public facilities may be disproportionately benefiting the rich<sup>21</sup>. In this setting, with health insurance coverage (social and private) accounting for no more than 15 per cent of the total population in India, and life insurance even more limited, most of the health and other household consumption expenditures are likely to come out of severely diminished household resources, with obvious implications for the current and future levels of nutritional and educational achievements.

The second point relates to an intra-household economic impact that underpins the adverse implications of HIV/AIDS for young women. Young

married women in India, who are at high risk of being infected by their husbands, are unfortunately also at high economic risk upon the identification of HIV status of their husbands, or upon the death of the latter. There is evidence of young married women being blamed for their husband's infection and ostracised as a result<sup>22,23</sup>. Moreover, when families in India do economically support members with HIV, such support tends to be discriminatory and in favour of male HIV-positive members<sup>23,24</sup>. The economic implications of HIV are also likely to be negative for another group of young women vulnerable to HIV infection, *i.e.* commercial sex workers. Sex workers infected with HIV, or those with symptoms of AIDS, are highly likely to lose even their sole source of economic sustenance as brothel owners abandon them and there is little hope of returning to their families, or counting on social safety nets.

Third, counterbalancing these serious economic threats to households and their female members, at least partially, is a vibrant civil society composed of an activist media and a large number of non governmental organizations involved in activities ranging from treatment, prevention, legal support, advocacy and the like. NGOs working in the field of HIV and AIDS registered with the National AIDS Control Organization (NACO) of India are several hundred in number<sup>2</sup>, and the voluntary nature of the registration process means that this list comprises only a subset of the full set of NGOs currently working on HIV and AIDS in India. By protecting the rights of people with HIV infection, by preventing new infections, and by advocating for treatment, their efforts can be expected to ameliorate the household level impacts of the epidemic in India, although no systematic assessment of their effectiveness currently exists.

*Sector-level impacts:* It is not obvious that a society or an economic sector in the aggregate will be affected by a severe health crisis in the same manner as individual households. Economic assets may get transferred from one household to another and previously unemployed members of the labour force may take over from members of society unable to work owing to sickness, or premature mortality. In societies with scarcity of food and educational

resources, one family's loss may yield a benefit to another, who may now be able to access them. Moreover, communities and industries may have mechanisms in place that can mitigate sustained household level impacts such as orphanages, public health systems, civil society institutions and extended family support. In the case of HIV/AIDS, given its magnitude, it is possible that community and government resources may be overwhelmed. In this circumstance aggregate sector - regional - and national-level impacts might emerge. This section presents a discussion of some of the international findings regarding the impacts of HIV among production units (*e.g.*, factories, farms and service providers such as hospitals) and at the sector level, and explores their implications for India.

One might naturally suspect the impacts of AIDS to be high in sectors where labour inputs constitute an important component of the production process, such as agriculture, labour-intensive industrial sectors, and the services sector (Table II). An early study for Rwanda estimated that the loss of a female adult member of an agricultural household could lead to a nearly 50 per cent decline in its farm labour inputs, and similar assessments have been made elsewhere in sub-Saharan Africa<sup>19,25</sup>. One observed consequence of the AIDS epidemic is a shift to less labour-intensive cash crops, a decline in the area cultivated, and less animal husbandry<sup>26</sup>. In Zimbabwe, household survey results suggest that AIDS-affected households experienced significant declines in production on average of 61 per cent in maize production, 47 per cent decline in cotton production, and 37 per cent decline in groundnut production<sup>27</sup>. Presumably HIV/AIDS can also enhance costs of replacing labour, increase insurance premiums, and funeral expenses for firms working in the agricultural sector, thereby affecting their profitability, and chances for economic survival. There is also some evidence of adverse effects on costs and productivity in agro-based industries at the level of individual firms, in sugar, tea and coffee estates<sup>19,28,29</sup>.

A key question is whether the findings for household production units and firms translate into sector level effects. The effects of HIV/AIDS on national or regional agricultural production levels,

**Table II.** Economic impacts of HIV on firms and sectors*A: At the Firm, or Production unit (e.g., hospitals, factories, farms):*

The most direct impacts of HIV on production units, whether in the agricultural sector, or the non-agricultural sector, take the form of

*Factors that primarily affect costs of production:*

- Expenditures for medical treatment of employees, or their dependents who have HIV; or increased insurance premiums, if such premiums are risk-rated
- Expenditures for funeral expenses of employees, or their dependents
- Productivity losses from increased absenteeism among employees on account of HIV- related morbidity and mortality
- Extra expenditures incurred by firms to replace workers who are either sick, or have died due to HIV/AIDS (training costs, search costs for new employees)
- Increased wages to attract scarce skilled workers

*Factors that primarily affect demand and revenues:*

- Reduced demand owing to fear of HIV infection (e.g., tourist operators)
- Reduced demand owing to deaths among young working-age adults
- Reduced demand owing to increased uncertainty in firm's ability to respond to orders
- Increased demand owing to rising numbers of people with HIV and AIDS (e.g., hospitals, pharmaceutical manufacturers, condom manufacturers)
- Stricter screening of applicants leads to rising premiums (health and life insurance companies)

*Factors that mitigate the impact on costs of firms/production units:*

- Existence of unemployed or underemployed workers who can readily replace workforce losses from AIDS-related morbidity and mortality
- Low HIV-prevalence among workers and prevention efforts
- Financial risk-bearing capacity of production units (large firms versus small trucking companies; government versus private sector)

*B. At the Sector-Level:*

Whether production unit-level effects translate into aggregate sector level effects depends on

- The scale of the HIV-epidemic
- The possibility of replacing workers at reasonable cost, whether by new workers, or new technology
- The possibility of land-sales across agricultural families, so that distributional impacts mitigate aggregate output impacts
- Excess infrastructure and resource capacity to handle increases in demand (e.g., health sector)

however, have not been well documented. A major reason could simply be the substitution of any lost production by increased agricultural production among households not affected by AIDS, a process facilitated by land transfers/sales from AIDS-affected families to such households, and excess labour force<sup>19</sup>. The only available sector level estimates are based on model-based simulations for South Africa<sup>30</sup>, which

report that value added in the agricultural sector in that country would be 17 per cent lower in 2010 under a projected AIDS scenario compared to a situation of no AIDS.

In the non-agricultural sector the evidence of the economic impact of HIV/AIDS is also somewhat mixed. Using data from a survey of nearly one

thousand firms in sub-Saharan Africa, Biggs and Shah<sup>31</sup> concluded that the impact of AIDS on staff turnover was minimal. They did find, however, that replacing professional staff was a major problem, with firms taking 24 wk to replace a deceased professional, compared to 2-3 wk for less skilled staff. Indeed, there is an example of a multinational in South Africa hiring three workers for each skilled position to ensure that replacements are on hand when trained workers die<sup>32</sup>. Studies in Zambian firms reported substantial increases in funeral related absenteeism, increased costs (and reduced profits), and increased expenses on account of *ex gratia* payments. In Zimbabwe, at one large firm with 11,500 employees with 30 per cent HIV-positive, the costs of health expenses associated with AIDS in 1996 amounted to roughly 20 per cent of the company's profits<sup>32</sup>. Another analysis, for the United States, estimated costs to a firm of hiring an HIV-infected person to range from US\$2,300 to US\$31,800 under four different scenarios<sup>33</sup>.

One non-agricultural sector that has received some attention in the context of the HIV/AIDS epidemic is transportation. Giraud<sup>34</sup> assessed that HIV/AIDS related costs to the trucking industry in Thailand would increase from an estimated US\$40,000 in 1991 to nearly US\$14.5 million by the year 2000. A study of the Uganda Railways<sup>32</sup> concluded that HIV/AIDS had substantially increased its labour turnover rate and that nearly 10 per cent of its employees had died of AIDS in recent years; another study reported an absenteeism rate of nearly 15 percent among employees of the National Railways of Zimbabwe, mainly on account of AIDS.<sup>32</sup> Finally, Arndt and Lewis<sup>30</sup> estimated that the transport sector in South Africa would have 20 per cent lower value added in 2001 under a projected scenario of the AIDS epidemic, relative to a no-AIDS scenario. Although few in number, these studies taken together suggest that the transport sector could be a major casualty of HIV/AIDS in the worst affected countries.

Aside from labour supply impacts, HIV/AIDS can affect firms by adversely affecting the customer base, since the group hardest hit by AIDS, young adults of working age, is also the major source of demand for goods and services. Given that caring for people with AIDS is expensive, we should expect that while the

health sector might see increased demand, most other sectors should experience spending redirected away from them. Effects on the customer base are not readily detected by individual firms because of the dissipation of spending implications across local and international economies. These effects are more likely to be transparent if there are dominant firms, or firms organized into business associations. Thus, the JD Group (South Africa's leading furniture retailer), which performed its own research on the potential impact of the epidemic on its markets and used a forecast of HIV-prevalence among its customers, found that changes in demography would reduce its customer base by 18 per cent by the year 2015<sup>32</sup>. Another way in which the customer base could be diminished is through the fear of being infected by HIV, for example, in the tourist industry, although it is not apparent how the average visitor will face an increased risk of infection unless he or she undertakes activities at high risk for HIV infection, such as unprotected sex or needle-sharing. To the extent that the proportion of such visitors in the overall flow of tourism is unlikely to be very large, it is difficult to imagine a large effect of HIV on tourist flows. The little empirical evidence that exists on the subject suggests that impacts of HIV on tourism inflows are likely to be insignificant<sup>35</sup>.

There are few studies on the sector level impact of HIV/AIDS in South Asia. However, it is difficult to imagine large sector level effects in agriculture and most labour-intensive industries in India in the near future, given that HIV prevalence among working-age adults are still quite low, at roughly 0.9 per cent of people in the age range 15-49 yr. Even these may not translate into output losses, given the large numbers of underemployed in India. It is also not obvious that an expanded HIV/AIDS epidemic will lead to substantial increases in distress sales of land, or losses of high skilled personnel, especially if the epidemic is more likely to be concentrated among the poorest and least skilled groups. However, one candidate sector for a negative effect of HIV/AIDS is transportation by road. It is well known that behaviour at high risk of HIV infection is common among Indian truck drivers and studies suggest that HIV prevalence in this group may range from 1.9 to 10.9 per cent<sup>36</sup>. Any impacts in terms of re-training

or other costs are likely to be magnified in their effect owing to the small average size of the trucking firm, or about 5 trucks per firm<sup>37</sup>. Balanced against this is the fact that there are large numbers of unemployed, who can potentially replace any driver/helper dying of AIDS. We suspect that ultimately, truck drivers and helpers, rather than trucking firms will bear the bulk of the adverse economic impact of AIDS, owing to the low degree of employment protection that currently exists for employees.

Also likely to be affected is the health sector. Available evidence on the subject is mostly from sub-Saharan Africa and suggests that in countries with HIV prevalence exceeding 5 per cent, there is a significant burden of AIDS patients on medical facilities, ranging from 20-70 per cent of bed occupancy in major hospitals<sup>19</sup>. Studies from the sub-Saharan region also suggest large obligations on public health spending accountable to HIV, in some cases exceeding 10 per cent of the total health budget<sup>19,38</sup>. In Thailand, the one country in Asia with a significant record of public spending on HIV/AIDS, more than 5 per cent of all public sector health spending in the mid-1990s was on HIV/AIDS<sup>38</sup>. In the absence of insurance mechanisms, or if public services are of poor quality, increased spending on HIV/AIDS will take the form of out-of-pocket expenses by households, as confirmed by studies from Cote d'Ivoire, Rwanda and Tanzania<sup>38</sup>. The large expected increases in health spending related to HIV/AIDS suggest an expansion, rather than a contraction, of the health sector. It is instructive to note in this connection, the conclusions of Arndt and Lewis<sup>30</sup> whose simulation results suggest that the health sector in South Africa would not suffer as much as the other sectors on account of HIV/AIDS over the period 2001-2010.

Relative to the situation in sub-Saharan Africa, public expenditures directed to HIV/AIDS in India are much lower at the moment, at roughly 1.5 per cent of public health spending, much of it financed by international organizations<sup>2</sup>. The effect of HIV/AIDS on bed occupancy in public hospitals could still be severe in the short-run, given that excess bed capacity (supply of inpatient days less demand) appears to be extremely limited at present in these countries. An expanded HIV/AIDS epidemic could also pose future

problems for the health sector by constraining supply and increasing the cost of medical personnel providing services to people with HIV. A study in Sri Lanka<sup>35</sup> suggests that medical personnel may need added payments to compensate for increased risk of HIV infection in health care settings with high HIV prevalence rates; and there is evidence of discriminatory behaviour in Indian hospital settings<sup>23</sup>. In addition, if the Indian government continues on its current path of providing ARV treatment to increasing numbers of people with AIDS, one can expect not only increased public health expenditures, but also increased pressures on its limited infrastructure and personnel capacity in the health sector as the HIV epidemic expands in the future. These effects will likely be exacerbated by the fact that most states in India are currently undergoing a severe fiscal crisis, and their finances can be overwhelmed in the short run by even small increases in expenditures directed towards ARV treatment and HIV/AIDS activities. Even some of the poorer states, such as Uttar Pradesh and Bihar where HIV prevalence rates have been low so far, may not be able to escape this outcome not just because they supply large numbers of migrant labour who tend to be at increased risk of HIV infection, but also because their fiscal situation is especially dire<sup>39,40</sup>.

The influence of HIV/AIDS on the private health insurance sector may not be as significant as on public spending, given that insurance companies can screen out HIV-positive individuals from the pool of insurable individuals. However, it is possible that treatment costs for opportunistic infections are passed on to third-party payers without disclosure of an individual's HIV status. One Zimbabwean insurance company estimated that 45 per cent of its health insurance claims in 1995-96 were AIDS-related<sup>32</sup>. With private voluntary health insurance in India still in its infancy it is difficult to say what the future impact of AIDS on this sector might be. Potential future sector-level responses that may reduce the impact of HIV/AIDS may include added screening to enforce exclusions for HIV/AIDS, or greater participation of insurers in prevention messages and in offering incentives to corporate and other large clients to promote prevention messages in return for more attractive insurance packages, as in Thailand<sup>41</sup>.

*State and national Effects: Output and output per capita:* With limited evidence of sector level impacts one may suspect that evidence on national-level impacts of HIV/AIDS is even weaker. In fact, there is a significant literature focusing on the aggregate impacts of health on growth of real gross domestic product (GDP) per capita and real GDP, or their levels, that sheds light on the way HIV can influence overall economic performance of nations, through its impact on the quantity and quality of the labour force and the stock of physical capital<sup>42,43</sup>. Some of the literature has also emphasized “indirect” ways in which health can influence economic outcomes through influencing human and physical capital formation, with Bloom and Williamson<sup>44</sup> demonstrating the long-term effect of health improvements associated with the process of demographic transition. Their work focuses on the declines in child and infant mortality followed by declines in fertility characteristic of the demographic transition. Taken together, these lead to an initial bulge in the age distribution of the population in the very young age groups. Initially, this process leads to an increase in dependency ratios, with the situation reversing when members of the age group belonging to the “bulge” reach the working ages. In this latter phase, there is the potential of contributing to increased production and savings, a possibility that Bloom and Williamson refer to as the “demographic gift.”

The large size of the AIDS epidemic and its impact on the more productive members of the labour force suggests a large negative effect on growth in national income (and national income per capita) in the context of the existing economic literature. Moreover, taken in conjunction with the work of Bloom and Williamson discussed above, this implies a third way in which economic growth can be adversely affected – a “reverse demographic gift” as a result of the deaths and morbidity among people in prime working ages owing to AIDS. There are other channels through which HIV/AIDS could have negative consequences for economic growth as well. These could include a decline in savings rates owing to increased medical treatment costs associated with HIV/AIDS. Savings rates could also decline if people expect to live for a fewer number of years owing to HIV/AIDS, and so feel less need for saving to meet their old age

consumption needs, or to add to their skills. The future stock of educational capital could also be affected if children whose parents die prematurely due to AIDS face economic barriers in efforts to continue their education. Very little work on the influence of HIV on technological progress exists at present, except mainly through its impact on biomedical research.

Counteracting some of these negative influences is the possibility that community responses and support mechanisms could have immediate and long-term consequences by sharing the economic and psychosocial burden of HIV/AIDS. In a purely technical sense, it is not obvious that declines in the rate of growth of real income would emerge in settings with substantial levels of unemployment. In the final calculus of course, these are issues that are best settled empirically (Table III).

Recent work on the aggregate economic impact of AIDS falls into mainly two groups. The first group of studies relying on simulation models constructed for a number of sub-Saharan African countries concluded that the AIDS epidemic would have significant adverse effects on the levels and rates of growth of national income, and national income per capita. Examples include Arndt and Lewis<sup>45</sup> who concluded that over the period 2000-2010 the annual rate of growth of real GDP in South Africa under their projected AIDS scenario would be substantially lower in comparison to a no-AIDS scenario, with the difference ranging from 1 to 2.6 percentage points. In similar vein, analyses for Tanzania and Malawi<sup>46,47</sup> concluded that AIDS would depress their annual rates of growth of real GDP per capita by an average of 0.25 percentage points over the period 1991-2010. Not all of the simulation studies however, conclude that AIDS would reduce both GDP and GDP per capita. MacFarlan and Sgherri<sup>48</sup> examined the macroeconomic impact of AIDS in Botswana for the period 1996-2021 and concluded that overall GDP under projected AIDS scenarios would be substantially smaller in 2021 relative to a no-AIDS scenario. However, HIV/AIDS also reduces population substantially in their model, so that real income per capita could grow at a rate faster than in a no-AIDS scenario, or slower, depending on the specific scenario.

**Table III.** Impacts on output or output per capita at the state and national levels

The overall national/state output depends on the quality and quantity of its employed workers (numbers, health and skill levels), the size of physical capital (machinery, infrastructure such as roads and electricity), and the level of technological sophistication with which inputs are used.

How HIV affects output levels and their growth over time, thus depends on its impacts on

*Human capital:*

Impact on the quantity of employed workers

Impact on the *quality* of employed workers (especially their education and health status) – impacting household accumulation of health and education, and government resources to fund health and education services

*Physical capital:*

Impact on household savings – owing to increased medical expenditures

Impacts on savings of the government - owing to increased spending on treatment and prevention related to HIV/AIDS – reduces budgets for road construction and maintenance and other infrastructure services

Impacts on savings of firms-owing to increased labor costs and impacts on revenues – reduces ability to reinvest in new physical capital

Impacts on foreign direct investment and physical capital brought by it (whether foreign investors are scared off by a workforce with high rates of HIV infection)

*Technological prowess:*

Impact of transmission of knowledge over time, and capacity to absorb technological developments owing to declines in human capital

Impact of new technology brought in by foreign direct investment

Impact on R & D of domestic firms and the government

*The Impact on national/state output per capita (output/population) depends on:*

The relative impacts of HIV on output and population

Whether these impacts show up in nation statistics depends on the scale of the HIV epidemic. Moreover, some (but not all) of these impacts may be mitigated by the existence of substantial numbers of unemployed, or underemployed. There will then be a distributional consequence – as resources move away from households and individuals with HIV/AIDS, to those who replace them in the workplace

Simulation studies do not always predict negative economic consequences of AIDS. Young<sup>49</sup> argues that in South Africa, the beneficial effect of HIV's restraint on population offsets the negative consequences of human capital losses of AIDS and implicitly bestows the South African economy with extra resources, which may be utilised for the care of the infected as well as improvement of the well being of the population at large. Thus he concludes that the AIDS epidemic is unlikely to be an economic disaster. Young's view has been contested by Bell *et al*<sup>50</sup>, who contend that in the absence of combating

measures, HIV would lead to widespread economic collapse, because not only will AIDS destroy existing human capital, but by killing mostly young adults it also weakens the mechanism through which knowledge and abilities are transmitted from one generation to the next. Presumably, this would also affect the rate at which the society is able to achieve technological progress, or to absorb it effectively from other societies. The consequences of this, according to their model, are progressively cumulative, and so will become apparent only after several generations. In their forecasts for South Africa, if nothing is done

to combat the epidemic, a complete economic collapse will occur within three generations<sup>50</sup>.

In contrast to the studies that rely on simulations conducted under various assumptions of the time profile and size of the HIV/AIDS epidemic, an alternative approach is to statistically estimate the link between HIV/AIDS and national economic performance. The main value of using an empirical approach is its ability to take into account not only of influences of AIDS in simulation models of the type discussed above, but also other factors (such as community responses to AIDS) not readily captured by the latter. Bloom and Mahal<sup>20</sup> used this approach to measure the nature and strength of statistical associations between the prevalence of AIDS and the rate of growth of real GDP per capita, using cross-country data for 51 countries. They found that the AIDS epidemic had a statistically insignificant effect on the growth of real GDP per capita.

There are factors that can potentially confound the results found in Bloom and Mahal's analysis<sup>20</sup>, in particular the possibility that their study was undertaken at a time when HIV prevalence rates were still too low to have a detectable economic effect at the national level, and that it relied on cross-sectional, as against longitudinal data. Recent empirical work<sup>42,43</sup> using panel data techniques offers more robust methods that could potentially be modified to serve as a means to understand the links between HIV and economic growth. These new analyses which point to strong causal linkages running from life expectancy to growth of GDP and GDP per capita provide strong support to the claim that AIDS will negatively influence national economic performance via its impact on life expectancy.

Existing empirical analyses do not predict huge adverse aggregate economic impacts for India in the near future. Even the most pessimistic scenarios project HIV prevalence rates among Indian adults to be no more than 5 per cent by the year 2025. These projected prevalence rates are considerably smaller than say, South Africa and Botswana, whose economic consequences have attracted much attention from economists. This conclusion is only slightly modified if we instead focus on individual

states rather than India in the aggregate. Current HIV prevalence among women attending antenatal clinics, often used as an indicator of HIV prevalence among adults, is less than 1.5 per cent in even the most severely affected Indian states (Mizoram, Karnataka, Maharashtra and Andhra Pradesh), and trends over the last 10 yr suggest slow rates of increase over time in adult HIV prevalence<sup>2</sup>. But data from a recent behavioural surveillance survey suggests that some states have relatively high rates of sexual activity outside of their marriage: Andhra Pradesh, Madhya Pradesh, Maharashtra, Gujarat, Bihar, Uttar Pradesh and in the Northeast<sup>51</sup>. If these behavioural patterns translate into high rates of HIV infection in the future, this set of states may face a relatively greater longer-term risk of the economic impacts of AIDS, compared to other states.

*National impacts: poverty and economic inequality:* To the extent HIV/AIDS is associated with declines in the rate of growth of per capita income, all else being the same, it will also increase the proportion of people living in poverty. Cross-country evidence suggests that poverty rates, defined as the proportion of population living below US\$1 per day, and the magnitude of economic inequality, are positively correlated with HIV prevalence<sup>52</sup>. Going beyond these simple associations to the causal impact of HIV on poverty (or inequality) has not been empirically demonstrated so far, at least with national level data.

The previous findings notwithstanding, there is fairly good micro-evidence in recent years to support the assertion that the poor and the less educated are at greater risk for HIV infection than other groups. A study from Uganda, for example, shows that the better educated are likely to be hit hardest during the early stages of the epidemic, but that the infection rates are now falling most quickly among those with better education<sup>52</sup>. Poverty also forces people to make sub-optimal choices that put them at risk for HIV infection. Small-scale studies from sub-Saharan African countries, Haiti, Sri Lanka and Brazil show how poor women can be forced into sex work, into providing sexual favours in return for money, and to be less able to insist on condom use<sup>4,35,52</sup>. Thus the end-consequence is likely to be a situation where the

poor disproportionately bear the economic consequences of AIDS, thereby contributing both to increased poverty as well as worsening economic inequality.

With the less well off in India, especially sex workers, truck drivers and unskilled migrant workers at high risk for HIV infection, it seems inevitable that HIV will contribute to increased poverty and inequality in India. Less well articulated, but no less noteworthy, is the negative impact of AIDS on the pre-existing low relative economic position of women, whether in the form of a loss of family support, or foregone income from sex work, in the case of commercial sex workers. Whether these effects become evident in national level statistics is less obvious, and depends crucially on the future scale of the HIV epidemic.

### **The economic roots of the AIDS epidemic**

The contribution of economics to the understanding of AIDS epidemic is not limited to quantifying its impact in monetary terms. Economics also provides a powerful way of examining the pattern of the epidemic's spread. The central assumption is that HIV is not spread randomly, as is the case for example with influenza, but rather that HIV is most often transmitted as a consequence of purposeful behaviour that has a strong economic foundation. Below we present a few examples that have attracted the attention of economists.

Firstly, economic deprivation and HIV/AIDS incidence are linked. Consider for example, the supply side of the sex industry where extreme poverty often leads women and young girls to join the sex industry, a high risk for HIV infection. Studies of female sex workers in Sri Lanka indicate that "survival" is a major reason for their entry into the sex trade, or for parents selling their children into sex work<sup>35,53</sup>. Analyses for Uttar Pradesh and Sangli district in Maharashtra reach similar conclusions<sup>54,55</sup>. Economic circumstances also influence condom use. The Sri Lanka study showed that sex workers at the lower end of the market, such as streetwalkers, were less likely to use condoms with their clients because of the relatively high degree of competition that they faced for their services,

relative to higher-end sex workers<sup>35</sup>. Of course, not all women enter the trade for "survival". The pure economic gains from entry into the sex trade are also relevant, especially if alternative economic opportunities are not as attractive. For instance, a study of Bangkok massage parlors in 1980 indicated that the average earnings of masseuses exceeded by nearly 1,700 per cent possible salaries in occupations elsewhere<sup>56</sup>.

Secondly, the demand side of the sex industry is driven obviously by the fact that clients can financially afford the services of sex workers. Thus mobile populations, such as migrant labourers, truck drivers, merchant seaman, the armed forces, and possibly tourists, who often have considerable amounts of cash to spend, are especially likely to demand commercially available sex, or engage in multiple-partner sex<sup>4</sup>. This connection is strengthened by the fact that the behaviour of migrants is not easily subject to monitoring by their families and communities, and because they may be lonely due to separation from their families. Thai long-haul truck drivers have routinely sought alcohol and sex at truck stops<sup>4</sup>. In India, HIV infection rates in samples of some truckers have ranged from 1.9 to 10.9 per cent, much higher than the national average for adults, and suggest similar risk factors at work<sup>36</sup>. There is also evidence that overseas migrant workers, members of the armed forces, and domestic migrants may all be at high risk for HIV infection in India<sup>41,57,58</sup>.

Even if engaging in multiple partner or commercial sex, it is not apparent that the sex has to be at high risk for HIV infection, that is, without condoms. Previously, we highlighted the role of market competition in influencing sex worker insistence on condom use by their clients<sup>35</sup>. Analyses of household data from several Asian, African and Latin American countries shows a strong correlation between wealth and education, the knowledge that condoms prevent AIDS, where condoms can be obtained, and the use of condoms. Recent research in Cambodia<sup>43</sup>, the country with the most advanced epidemic in Asia, demonstrates that poorest members of society have much less knowledge of how AIDS is transmitted and prevented, are more likely to have sex at a younger age, and use condoms less frequently. A study in

Brazil showed that three-quarters of people newly diagnosed with HIV in the early 1980s had a university or secondary education, but by the early 1990s this share had fallen to one-third<sup>52</sup>. Table IV summarizes the role of economic factors in heightened risk of HIV infection in the commercial sex industry.

Basu *et al*<sup>15</sup> in their examination of the impact of adult death on households in India found considerable socioeconomic variation in AIDS awareness among individuals. Specifically, indicators such as income, asset holdings, quality of housing, occupation and the level of educational achievement were all strongly and positively associated with awareness of HIV/AIDS. A study of 365 individuals who visited the STD clinic and outpatient department of a hospital in Vellore<sup>59</sup> in the late 1980s indicated that economic status and literacy were positively associated with awareness of HIV/AIDS. Condom use among Indian sex workers has been founded to be negatively linked to the price of a sexual act, and positively associated with the level of education, suggesting the key role that economic returns and education play in implementation of HIV prevention policies<sup>60</sup>.

Economic inequality is also likely to influence HIV transmission. Earlier we focused on how extreme poverty influences entry into the sex trade. Economic

inequality might also matter if it leads to demanders of sex work to be able to financially compensate other less well off individuals, even if not in abject poverty, to have unprotected sex<sup>61</sup>. Rural-urban economic differences play a role in migration, a standard feature in most models of economic development, and in turn can facilitate HIV transmission. In many cases the economic inequality reflects an underlying social inequality – lower status of women relative to men, for example, which is manifested in their lower educational status relative to men, fewer remunerative opportunities and assets, and in access to health. The low status of women in India and their literacy levels have obvious implications for women’s ability to protect themselves against the risk of HIV infection. Finally, economic and educational status has also been associated with other forms of high-risk behaviour. For instance Basu *et al*<sup>15</sup> also found that the use of disposable needles for injections associated with health care in the sampled households increased with socio-economic status.

*Purposive behavior and its implications:* By clarifying the underpinnings of behaviours at risk for HIV infection, economic analysis has also contributed to understanding the complexity of the mechanisms associated with the transmission of HIV. In particular, the hallmark of economists’ approach is to explain

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**Table IV.** Economic roots of the AIDS epidemic : The case of the commercial sex industry

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*Economic factors that increase the supply of unsafe commercial sex:*

- Poor parents sell children to sex-traffickers, who sell them to brothels
- Poor women join sex industry for “survival,” with fewer economic opportunities elsewhere
- Condom usage low among lower-end sex workers owing to competition in the commercial sex market
- Condom-usage low among child sex workers who are effectively “owned” by brothel madams who seek to recoup their investment quickly
- Women lack information and knowledge about risks of unsafe sexual activity, a correlate of their low socio-economic position

*Economic factors that increase the demand for unsafe commercial sex:*

- Migrant workers move to cities in search of jobs, leaving families behind
  - Professions involve considerable mobility and long time periods away from families (truck drivers, armed forces, merchantmen)
  - Incomes from work enable individuals to afford commercially available sex
  - Lack of information and education among lower strata workers means greater reliance on unsafe sex
-

individual and organizational behaviour on an assessment of potential benefits, relative to its costs for the individual (organization). This framework for explaining behavior has been extensively used by economists and turns out to be extremely useful in providing policy insights. We provide three examples to illustrate these points.

The first example relates to HIV transmission via the sharing of needles among injecting drug users. To reduce the rate of HIV transmission, some policymakers have suggested banning opium cultivation to constrain its supply. From an economist's perspective, however, this might actually promote raise the price of opium/heroin, which in turn might lead individuals who are habitual smokers of drugs to switch to injecting, a more efficacious mechanism of obtaining a "high." The illegality of drug possession also means that drug users might prefer to stay underground, and so are unable to obtain ready access to prevention messages associated with HIV. Finally, when either drug or paraphernalia possession is illegal, it would be beneficial for injecting drug users to share injecting equipment and not have everyone carry their own equipment, as a means to reduce the risk of being suspected of carrying drugs. The net result might be a promotion of HIV transmission, a result opposite to the intended policy objective.

The above reasoning does not, of course, imply that government ought to promote opium production as a way to drive prices down and encourage smoking in place of injection. However, such economic reasoning does help explain calls for decriminalizing the sale, possession and use of drugs and needles voiced in North America and Europe and for the promotion of needle exchange programmes.

As a second example, consider a policy of isolating or imprisoning HIV-positive commercial sex workers. At first sight, this policy might seem a sensible way to curb HIV transmission, because it prevents HIV infected sex workers from selling sex. However, such a policy fails on two counts. It fails to influence the demand side of the market for commercial sex, and fails even to address the deeper economic roots of the supply of commercial sex workers. Under the economic conditions that currently prevail in India,

the continuing demand for commercial sex will be satisfied by a newly migrating group of women who will supply sex commercially, not because they are social deviants but because they lack better economic opportunities. Economic models of migration can be used to show that the likelihood of frequent arrests of commercial sex workers, and their consequent withdrawal, will enhance the work opportunities for newer participants to the industry. Moreover, the incarceration of sex workers in rehabilitation homes and prisons is also likely to result in the industry remaining "underground", an approach that could potentially result in these women not being able to access health messages. Without information about HIV and the power to negotiate the use of condoms, they too will become infected and then infect others. Estebanez *et al*<sup>62</sup>. lend further support to this conclusion by noting the failure of methods focusing on isolation and imprisonment in order to control syphilis in the early twentieth century.

The third example has to do with commercial donation of blood for transfusion purposes. This example is particularly relevant for India, where commercial donation of blood has been banned since 1997 and yet, as late as 2003, only 50 per cent of blood donated in India was obtained from voluntary donors<sup>63</sup>. Commercially donated blood is deemed to be at greater risk of being contaminated with HIV, since the donors are likely to be the poor who, in turn, are more likely to be at risk for infection from HIV. Presumably the ban has not worked because alternative economic opportunities do not exist for thousands of young people who commercially donate blood. India has increasingly adopted efforts to promote voluntarily (unpaid) donated blood - the appropriate policy under the circumstances for at least two reasons. Firstly, it increases share of blood donated by people less likely to be at risk for HIV infection, given that the general population has a lower rate of infection than of commercial donors. Secondly, by enhancing supply of blood for a demand that can reasonably be taken to be medically determined, voluntary blood donation puts a downward pressure on the price of paid blood, thereby reducing the attractiveness of supplying blood on commercial terms. This strategy still does not address the issue of lack of economic alternatives for paid

donors, but it is a policy superior to one focused exclusively on banning commercial blood, which would simply raise the price of blood and increase economic hardships to the poor.

The three examples are not meant to suggest that economic reasoning provides a complete explanation of individual decisions about drug consumption, the supply and demand for sex, and the quality of donated blood. These do, however, illustrate one of the hallmarks of economists' approach to policymaking: the need to understand the mechanism that is generating undesirable outcomes as a prelude to effective policy design and implementation. These also highlight the fact that many practical policies for HIV prevention may conflict with other social goals and policies. For instance, decriminalizing the use and possession of drugs and needles may promote drug use; promoting information about sex and condoms may enhance promiscuity; and policies promoting the use of condoms in brothels may undermine the legal status of prostitution.

### **Economic evaluation of HIV/AIDS policies and concluding remarks**

In thinking about appropriate policy interventions, it becomes clear that good economic reasoning encourages policymaking directed at underlying problems, not merely superficial symptoms. This means taking account not only of the beneficial consequences of an intervention, but also its unexpected consequences, including any adverse effects.

Supplementing these insights, economists also offer a set of tools that are often extremely useful for policymaking. The tools of cost-benefit and cost-effectiveness analyses, that compare the benefits of a policy to its opportunity costs, are standard methods utilized by economists to evaluate alternative policy options. Cost-effectiveness analysis typically compares an outcome indicator such as lives saved, or disability adjusted life years averted that is not measured in monetary units, with costs that are measured in monetary units. This method ranks alternative programmes in terms of their economic efficiency in achieving a particular non-monetary

outcome. Examples include studies demonstrating the potentially high cost-effectiveness ratio of programmes such as needle exchange programmes, STD prevention and HIV prevention information provision<sup>64,65</sup>.

Cost-effectiveness analyses for health interventions (including HIV/AIDS) are not always useful for policymakers when the choice is between alternative policies, some of which are being planned in non health sectors, or across health activities whose outcomes are not directly comparable. An example is when a decision is being made regarding whether to allocate funds to HIV prevention, for hospital construction, or for bridge construction. In these circumstances, cost-benefit analysis is typically the method of choice since in this method both benefits and costs are measured in monetary units. Several studies that use cost-benefit analyses exist. A striking example of such an analysis for the region was a series of studies in Sri Lanka, which showed that preventing HIV transmission via the screening of blood used for transfusion, and the use of disposable, instead of reusable injecting equipment in hospital settings can yield benefits that are much greater relative to costs<sup>35</sup>.

An alternative formulation of cost-benefit analysis that yields a rate of return to the monetary investment in the policy is also useful, and is referred to as the internal rate of return (IRR) method. By examining the rates of return on alternative policy programmes, a policy maker can adopt a simple rule to choose projects: first, the policy with the highest IRR, then the one with the second-highest IRR and so on, until the budget is exhausted. Recent research provides an example of the application of IRR methodology to evaluating HIV prevention efforts in Thailand. Under conservative estimates of the impact of prevention campaigns on changes in behaviour, the IRR on Thailand's prevention programmes was estimated to be between 12 and 55 per cent. To the extent that some of the behaviour change that took place in Thailand would have taken place irrespective of any intervention owing to individual preventive action, these rates of return may be upper bounds to the true returns on HIV prevention. On the other hand, if such private preventive reactions were relatively slow to

occur, the revised rate of return that takes account of such behaviour change would not be very different.

The methods of economic evaluation discussed above can be used to address other crucial policy questions, including whether antiretroviral treatment is cost-effective, and how treatment interventions compare with prevention programmes. As one example, a recent report by the World Bank assessed the cost-effectiveness of three alternative anti-retroviral treatment strategies in India, finding that the cost per life saved ranged from \$146-\$280 in present value terms. However, it is quite clear that these returns pale in significance to the returns yielded by prevention strategies, including promoting the use of condoms <sup>6</sup>.

One can also inquire, using these methods, whether there are greater returns from intervening earlier rather than later, in the HIV/AIDS epidemic, and the nature of optimal strategies involved. Few analyses of this type have been conducted this far in India, although one can suppose that prevention strategies are more likely to be cost-effective and best introduced early in the epidemic. A blood screening programme is an obvious candidate, particularly at low initial rates of HIV infection. Less immediately clear are the implications for a programme such as HIV/AIDS information provision, or condom promotion. This is because such an intervention may not influence behaviour at risk for HIV infection if people perceive the risks to be small, as is likely to be the case during the very early stages of the HIV/AIDS epidemic. This may suggest introducing the policy a little later. On the other hand, in (relatively) high prevalence settings, people are much more likely to be aware of and may curtail risky behaviour even in the absence of policy intervention, and so reduce the additional gains brought about by policy change. This may call for publicly supported prevention programmes to be introduced early. The net effect on the optimal timing of policy will depend on the relative strengths of these two effects, as well as concerns of financial affordability, and whether people have freedom of action. This last is not guaranteed for many women, an obvious case being of brothel sex workers who may be forced to have unprotected sex with their partners.

The tools of economic evaluation discussed here are just that – they help us in assessing interventions, but they do not free researchers and policymakers from the need to clarify the underlying mechanism driving the epidemic. For instance, perfectly sensible programmes such as condom distribution and information provision on safe sex practices may turn out to be cost-ineffective if women's inability to influence condom use by their sexual partners, quite commonly the case in India, is not simultaneously addressed by the intervention. Analogously, if people with HIV are discriminated against, or harassed by the police, it would be difficult to introduce them to cost-effective counselling and education programmes that lead them to practice low risk behaviour, or access services to improve their health.

Clearly, economics can contribute usefully to thinking about and measuring the potential impacts of the HIV/AIDS epidemic in India and in the development of optimal strategies to address it. Although at the present time, such research is sorely lacking in India, we believe that a few salient points do emerge from the literature discussed in this paper. First, it is unlikely that effects on output due to AIDS at the all India, or even at the state level, will be large in the next 15-20 yr. Second, there may be sector level effects, particularly in the health sector in the form of growing use of health services and increased public spending on health. Perhaps most importantly, AIDS will substantially lower the well being of affected households and their members. Female members of households and households belonging to the poor and less educated groups appear to be at especially high risk of bearing the economic burden of AIDS. Policies aimed at ameliorating, or preventing these effects are likely to be among the most cost-effective.

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