

## CHAPTER 2

# Responding to HIV in Afghanistan

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### Introduction

Following almost three decades of war, Afghanistan is one of the poorest countries in the world. GDP per capita is estimated at about US\$360 for 2007 (IMF 2007a). Life expectancy at birth is only 44.5 years (UNDP 2008), and maternal and child mortality are among the highest in the world. The literacy rate in the general population is very low (36 percent), especially for women (13 percent) (World Bank 2007).

There are very limited data available on the state of HIV and AIDS in Afghanistan. The number of known cases of HIV infections has been relatively low so far. However, there is a risk of an escalation in HIV prevalence owing to a high and increasing number of injecting drug users in the country. The experience from other countries across Asia suggests the potential for rapid spread of HIV within the drug-injecting population and onward transmission of the virus (Friedman and Des Jarlais 1991; Riehmman 1998; Monitoring of the AIDS Pandemic (MAP) 2005; Ohiri 2006). At the same time, opium production in Afghanistan reached record levels in 2007 (IMF 2007b).

Keeping HIV prevalence low is one of the development objectives in Afghanistan. An increase in HIV and AIDS also has the potential to complicate progress in the attainment of other key development objectives.

A recent mapping of groups at high risk for HIV—IDUs and sex workers in three cities of Afghanistan (Chase 2008)—sheds some light on vulnerable groups at high risk in urban Afghanistan. The large numbers of returning refugees contribute to the spread of the epidemic, as many of them started injecting drugs while abroad. At the same time, lack of comprehensive harm reduction to prevent the spread of HIV and limited health system capacities imply that adequate prevention, care, or treatment are not available to many. The low social status of many affected by HIV and AIDS and the stigma associated with both risky behaviors and HIV and AIDS add to the challenges.

Against this background, control of HIV infections is a development priority in Afghanistan. While the level of HIV prevalence arguably remains low, the available evidence suggests that high vulnerability and risk are present and may contribute to an escalation of new HIV infections in Afghanistan. On the other hand, timely intervention activities proven to be cost-effective in a variety of settings may forestall or prevent such an occurrence. The first national HIV prevention project was launched in 2007, with a focus on targeted prevention programs, surveillance, strengthening management capacity and advocacy, and communications.

Section 2 discusses the state of the HIV epidemic in Afghanistan, summarizing the available data, discussing the social and economic context, and analyzing factors affecting the risk of transmission of HIV. Section 3 reviews the evidence on the effectiveness and cost-effectiveness of HIV preventions, with emphasis on interventions targeted at injecting drug users. Section 4 attempts an economic analysis of an HIV prevention program for Afghanistan and provides some measures of the economic effects of such a program. Section 5 summarizes the findings.

## **The State of the Epidemic in Afghanistan**

An effective disease control strategy must respond to the nature and scope of the relevant disease patterns. We start out by summarizing the limited information available on the state of the epidemic in Afghanistan. Next, we discuss the social and economic context of the epidemic, including the country's history of conflict, which has resulted in destitution and a large number of refugees. The remainder of the section focuses on the role of injecting drug use and its implications for HIV transmission.

### ***Stage and Scope of the Epidemic***

The number of recorded AIDS cases in Afghanistan is low at present. The Ministry of Public Health reported a total of 69 cases of HIV infection in Afghanistan in late January 2007, based on data from the Kabul blood bank and an HIV seroprevalence survey of injecting drug users in Kabul. A few months later (August 2007), the government reported 245 cases of HIV infection in Afghanistan (Saif-ur-Rehman et al. 2007). These data, however, likely substantially understate the actual number of people living with HIV in Afghanistan. UNAIDS (2006b) put HIV prevalence in Afghanistan at 1,000 people, with an “upper-range” estimate of up to 2,000 people, most of whom are male, and recent estimates have doubled.

Almost all the known cases of HIV infection in Afghanistan today are due to injecting drug use (IDU). A study of 464 injecting drug users in Kabul showed an HIV prevalence rate of above 3 percent, and highlighted the extremely high risk of the spread of the disease among injecting drug users and their partners, and to the general population (Todd et al. 2007).

While prevalence in the general population seems to be negligible, evidence shows that under a combination of unfavorable conditions<sup>1</sup> HIV prevalence in vulnerable groups can increase dramatically within short periods (see Claeson and Wilson, this volume). These conditions include the existence of multifaceted high-risk behavior, low education and social status, as well as weak health systems, severe public resource constraints, limited social responsibility, and lack of information, health education/promotion, and social marketing. According to a global review, in some of the 80 countries where HIV infections have been reported among IDUs, HIV has spread extremely rapidly within this group, with increases in seroprevalence of 20 to 40 percentage points within a single year (Friedman and Des Jarlais 1991). More generally, while HIV infections at present appear to be concentrated among IDUs, there is often intersection between IDU and sex work. HIV transmission among IDUs often serves as the entry point for HIV to spread to other vulnerable groups and the general population (Jha et al. 2001).

Given the initial stage of the epidemic in Afghanistan and the paucity of information, it is natural to also look to Afghanistan’s neighbors as potential examples of future development. Central and South Asia are experiencing a rapid increase in HIV cases, with injecting drug use and the commercial sex trade as the major sources of HIV transmission

(UNAIDS 2006a). Iran has the highest rate of heroin addiction in the world: 20 percent of Iranians ages 15 to 60 are engaged in drug abuse, and between 9 percent and 16 percent of these inject drugs. In Tehran, 23 percent of IDUs are HIV positive; just one year earlier this prevalence stood at 15 percent (Zamani et al. 2005).

### **Context**

Future transmission patterns of HIV in Afghanistan depend on the economic and social context and behavioral factors that determine risk profiles and transmission probabilities. Afghanistan is a conflict country, devastated by protracted armed conflicts since 1978. As a consequence, many factors associated with an increased risk of HIV transmission are present, including poverty, displacement of a population with high HIV prevalence to areas of lower prevalence, and sexual abuse or use of sex as a survival commodity.<sup>2</sup> The low levels of education, literacy, and health education contribute to the continuation of risky behaviors, particularly among IDUs. Illiteracy presents a severe barrier to HIV awareness and prevention. The literacy rate in the general population is very low (36 percent) and lower still among women (13 percent), with little popular awareness of HIV and AIDS and the protective effects of condom use (World Bank 2008). Women in Afghanistan experience one of the lowest social positions in the world. Denied access to education and jobs, and often not allowed to leave their homes without a male relative, they lack access to information on how to protect themselves (World Bank 2007).

The war has resulted in over 1 million widows, 1.6 million orphans, 0.5 million internally displaced people (DP), and 4 million Afghan refugees who returned from neighboring Pakistan and Iran (World Bank 2008). Today, still, about 4 million Afghans live in these countries, which have rapidly growing IDU-driven HIV epidemics of their own. Spillover of the epidemics from these countries raises grave concerns.

During the recent decades of conflict, up to 8 million Afghans fled to neighboring countries. Some Afghans began using and injecting heroin during their difficult years as refugees. In Quetta, a town in Pakistan bordering Afghanistan, for example, an HIV prevalence of 24 percent has been reported in a cluster of injecting drug users. These data have increased the fear of an epidemic in Afghanistan, since an estimated 4 million Afghans have returned home in the past few years.

The Iranian experience may be particularly relevant for the future of the epidemic in Afghanistan. HIV and AIDS is closely associated with

injecting drug use in both countries, and a 2005 United Nations Office on Drugs and Crime (UNODC) report found that at least 50 percent of IDUs in Afghanistan reported to have started in Iran.

Iran has an estimated 200,000 injecting drug users (Razzaghi et al. 2006). Recent data indicate that 67.3 percent of HIV-positive cases and 85 percent of AIDS cases have a history of injecting drug use (Ministry of Health and Medical Education (MOHME) 2003). Furthermore, the HIV and AIDS epidemic in Iran appears to be accelerating rapidly. Between 2003 and 2005, the estimated population of those with HIV in Iran has increased from 37,000 to 66,000, the latter corresponding to 0.2 percent of the adult population (UNAIDS/WHO 2006).

Poverty in Afghanistan is both deep and broad, and can lead to increased risk of HIV infection. Impoverished, socially marginalized, and disempowered populations face access barriers to even basic care and information. There is an acute shortage of health facilities and trained staff, particularly female staff, in most rural areas. Of the facilities that exist, most are ill-equipped and unable to treat opportunistic infections or prevent mother-to-child transmission (MTCT) of HIV. Unsafe blood transfusion adds to the risk of HIV spreading to the general population, with only 30 percent of transfused blood being tested for HIV. People engaged in high-risk behaviors often have limited access to health care (World Bank 2007). At the same time, because it is located in the Golden Crescent, one of the major drug-producing areas and trafficking routes globally, access to drugs in Afghanistan is easy (Saifurrehman 2007; Ohiri 2006; World Bank 2007). Production of opium in Afghanistan reached record levels in 2007, with the estimated amount produced reaching 8,200 metric tons, an increase from the previous year of 34 percent, and amounting to 93 percent of the world's supply. The 2006 opium crop was estimated to have provided US\$3.1 billion to Afghanistan, representing 32 percent of the entire national economy. Whereas almost all of the opium and heroin produced in the country was previously exported, 2 percent of the output is now believed to be consumed locally (UNODC 2007). Since production is now believed to exceed worldwide demand by a vast margin, large quantities are probably being stockpiled.

### ***Behavior and Transmission Risk***

As in many other traditional and deeply religious countries, estimation of the scale of the spread of HIV associated with IDUs, sex workers (SW), or men who have sex with men (MSM) is difficult in Afghanistan.

Local opinion varies as to the importance of these factors. Ex-inmates report that a substantial amount of drug injection occurs in Afghan prisons, a situation also reported in many other countries. Vulnerable groups potentially at risk of HIV infection include long-distance truck drivers and their helpers and the many abandoned children. Only 30 percent of transfused blood or blood products is currently tested for HIV (UNAIDS 2006b), which will be of increasing concern as HIV prevalence rises. There is much re-use of injecting equipment and other medical equipment in the formal and informal health care sectors, although there is little documentation about the extent and distribution of this practice.

As for the behavioral context and consequent risk of transmission, the sharing of contaminated injecting equipment is thought to confer the greatest risk of contracting HIV compared with other risk factors. Although the dominant routes of drug use in Afghanistan have previously been oral and inhalation, injecting practices are becoming increasingly prevalent. A 2005 survey estimated that Afghanistan has almost 1 million drug users, including 200,000 opium users and 19,000 injecting users, of whom 12,000 inject prescription drugs and 7,000 inject heroin. A 2006 survey in Kabul estimated that several categories of drug use had increased by more than 200 percent in 12 months (World Bank 2007). Most drug users were men, although the proportion of women among people using prescription drugs was high.

A recent study of the IDU population in Kabul showed that high-risk behaviors were very common: 35 percent had ever shared syringes; 76 percent had ever paid for sex with a woman; 27 percent of men had ever had sex with men; 23 percent had received so-called therapeutic injections in the previous six months; 4 percent had ever been paid for donating blood; and 35 percent had injected drugs in prison (Todd et al. 2006). The four viral samples assessed in the study had the same genome sequences previously identified in injecting drug users in Iran, where HIV prevalence is known to be much higher than Afghanistan. Moreover, the prevalence of hepatitis C—also predominantly spread by the sharing of injecting equipment—was already 37 percent, which indicates the very high risk of spreading blood-borne viruses in this population.

The high number of refugees and displaced people in Afghanistan, and of Afghan refugees and displaced people living in neighboring countries, is exacerbating the risk. Compared to Pakistani heroin users,

displaced Afghan heroin users exhibit less knowledge regarding HIV transmission and engage in high-risk behavior (Zafar et al. 2003). They are also at risk due to isolation from their families and lack of means to support themselves.

The use of contaminated needles results in much higher risk of transmission than almost all other types of exposure (see annex table 2.1 for a comparison of risk behavior); hence reduction in these harmful practices is a policy priority. Injection frequency, size of the sharing network, and probability of sharing, drive changes in incidence. The higher the prevalence of HIV within a community, the more likely an instance of sharing can result in HIV transmission (Ball 1998; Hankins, Gendron and Tran 1994). For example, in a population with 10 percent HIV seropositivity, a new user injecting once a day has a 90 percent chance of using an infected needle within 21.5 days from onset of injecting. If the user injects three times a day, the number of days drops to seven; at a rate of five times a day, a new user has a 90 percent chance of using an infected needle within four days (Riehman 1998).

Simple estimates of expected incidence for different vulnerable groups (measures of risky behavior and HIV prevalence) have been useful to guide HIV prevention (Pisani et al. 2003). In the context of Afghanistan, the existing described facts, estimates, and listed behavioral risks pose a strong call for more qualitative analysis, simulations, and collection of observational data in order to better model the future course of disease transmission and to determine the most effective policy responses.

### **Evidence on the Effectiveness and Cost-Effectiveness of HIV Prevention**

Policy makers are aware of the possibility that without preventive measures, Afghanistan may transition from the current low epidemic profile into the stage of concentrated epidemic, where HIV prevalence in key populations is above 5 percent. However, health policy decisions in countries such as Afghanistan are made under extreme resource constraints and informational uncertainty; a difficult double challenge. Additionally, reliable cost-effectiveness studies are lacking in low-income settings, and especially so in this context. Nevertheless, a review of cost-effective disease interventions offers some general lessons for policy priorities.

### ***Effectiveness of Prevention***

A general principle for prevention, especially relevant in the context of a low to concentrated epidemiological course, is that it is more important to change behavior of people with high-level or risk behavior than those with low risk (Bertozzi et al. 2006). Interventions targeting key populations with high-risk behavior are expected to be the most effective and efficient. Global experience suggests that if HIV epidemics associated with IDUs can be prevented or slowed, then the overall HIV epidemic can also be delayed (Ball, Rana, and Dehne 1998). Given the Afghan context, we primarily focus the discussion on the effectiveness and cost-effectiveness of preventive measures related to IDU.

Rapid increases of HIV prevalence among IDUs have usually been associated with a lack of awareness of AIDS as a local problem among IDUs, scarcity of sterile injection equipment, and the presence of other mechanisms for rapid and efficient transmission, such as law enforcement efforts that spur frequent movement among drug users (Des Jarlais and Friedman 1996). Harm reduction activities targeted to IDUs provide possible antidotes to these major drivers of risk (Needle et al. 1998). Harm reduction programs include simultaneously changing drug use practices (reduced injecting, use of alternate, noninjectable substances), needle practices (cleaning and reduced sharing of needles and syringes), and sexual behaviors (Ball 1998). Injection drug use also contributes to sexual transmission of HIV. Evidence from China indicates that younger IDUs have more sexual partners and are unlikely to use condoms (Wu et al. 1997). There is an association between injection drug use and commercial sex work for women (Ball 1998). Its spread among injection drug user populations to their non-IDU sex partners and their offspring is dependent on the mixing patterns between populations, as well as safer sex behavior practices. HIV prevention efforts targeting individuals injecting drugs should therefore include efforts aimed at reducing risks resulting from unprotected sex.

Annexes 2.2 and 2.3 in the annex provides a summary of intervention effectiveness and cost-effectiveness based on systematic review of the literature. General lessons that emerge from this review are the following:

- A number of regional reviews, which examine cost-effectiveness of HIV prevention in low-income countries, agree that health benefits can be best maximized if the next increment of funding is devoted to prevention, some non-highly active antiretroviral therapy (HAART) treatment, and care (Marseille, Hofmann, and Kahn 2002; Creese et al. 2002; Masaki et al. 2003; Hogan et al. 2005).



- While there is difficulty in teasing out which components are most effective in reducing HIV risk behaviors among IDUs, there is clear evidence that needle exchange programs, peer outreach, and oral substitution therapy are effective (Jha et al. 2001).
- Possibly effective interventions to interrupt HIV transmission among IDUs and between IDUs and other groups include programs promoting detoxification and abstinence, and programs targeting risky sexual behaviors of IDUs.
- Efforts to halt drug trafficking through increased surveillance, stiffer criminal penalties for suppliers and users, and other measures in the “war against drugs” generally have not been successful. New drug trafficking routes emerge as existing ones are patrolled or cut. A consequence of market globalization has been the diffusion of drugs into countries or regions that before had no history of injection drug use (Stimson, Adelekan, and Rhodes 1995).

Little has been published on the cost-effectiveness of harm reduction in a low-income context, partly because these interventions are not widely implemented. Given the low cost of syringes, the extremely high efficiency of HIV transmission by this route, and the demonstrated effectiveness of harm reduction programs in changing syringe-sharing behavior, needle exchange programs should be one of the most cost-effective interventions (Bertozzi et al. 2006).

Three studies on a harm reduction strategy in Belarus (Kumaranayake et al. 2004), Russia (Bobrik et al. 2004), and Ukraine (Vickerman et al. 2006), have explored the costs and cost-effectiveness of a harm reduction project working with IDUs. The results show that harm reduction is effective, with a cost of US\$359 per HIV infection averted and US\$18 per disability-adjusted life year (DALY) (Belarus); US\$564 per HIV infection averted and US\$28 per DALY (Russia); and US\$97 per HIV infection averted (Ukraine). Two studies on a harm reduction strategy in Svetlogorsk, Belarus, have explored the costs and cost-effectiveness of a harm reduction project working with IDUs. Walker et al. (2003) found that the cost per person reached was US\$1.19, and the cost per disposable syringe distributed was US\$0.39. Using a mathematical model (Vickerman and Watts 2002), the cost-effectiveness of the Needle Exchange Program (NEP) project was estimated to be US\$71 per HIV infection averted (Kumaranayake et al. 2000). Yet studies note that as prevalence increases, harm reduction is likely not sufficient, but must be combined with other measures. In high-prevalence settings,

harm reduction may reduce incidence, but not as much that it also reduces prevalence in the short term. This speaks to the need for assuring an effective harm reduction program in Afghanistan targeted toward IDUs in as timely a manner as possible.

There is some evidence on the cost-effectiveness of outreach to IDUs. In general, HIV prevention strategies for IDUs are highly targeted (Kumarayanake et al. 2000). Much of the behavior change and AIDS risk reduction that occurs among IDUs appears to occur through social processes (Trotter, Rothenberg, and Coyle 1995). For example, in a study of AIDS risk reduction among IDUs in Bangkok, Glasgow, New York, and Rio de Janeiro, talking with one's drug-using peers about AIDS was the one factor associated with risk reduction in all four cities (Seidman 1983; Des Jarlais and Friedman 1995). As for costs, an IDU outreach project in Kathmandu, Nepal, which relied on street-based outreach on foot, had a cost per client contact of US\$3.21 (Söderlund et al. 1993).

The evidence indicates that harm reduction should be applied early in high-risk populations so the epidemic is controlled before it gets to the stage where additional resources and interventions are required even just to maintain the *status quo*. Alongside this international evidence, locally specific estimates of the relative social efficiency of investments in harm reduction activities can also help guide policy. The next section demonstrates a simple method to generate such estimates.

### **HIV Prevention in Afghanistan—An Economic Perspective**

Building on our observations on the epidemiological situation in Afghanistan, and the lessons from our discussion of the effectiveness of prevention measures, the present section provides an economic perspective on a national HIV and AIDS prevention program being implemented in Afghanistan, specifically the activities supported by the Afghanistan HIV and AIDS Prevention Project supported by the World Bank.<sup>3</sup>

In our earlier discussion, we described the central role of injecting drug use in the transmission of HIV in Afghanistan. More generally, Wilson and Claeson (this volume) point at the intersection of injecting drug use and high-risk sexual behavior in the transmission of HIV. The Afghanistan HIV and AIDS Prevention Project (AHAPP) therefore is geared toward scaling up of prevention programs targeting people engaged in high-risk behaviors, notably injecting drug use and unsafe sex, including vulnerable groups at high risk, like IDUs, sex workers and their clients, truckers, and

prisoners. Additionally, the project aims to improve the knowledge of HIV prevention among the general population, strengthen surveillance of HIV prevalence and high-risk behaviors, map and estimate the sizes of groups engaged in high-risk behavior, and use communications and advocacy to reduce stigma related to HIV and AIDS.

As noted earlier, obtaining an accurate picture of Afghanistan's current epidemiologic situation, let alone forecasting the future course of disease, is fraught with difficulties in this data-scarce environment. Nevertheless capturing and conveying the economic impact of prevention efforts requires forecasts of possible future courses of the disease. Afghanistan's neighbors may serve as one example. If Afghanistan were to follow the Iranian example described above, then an increase from less than 0.1 percent of the general adult population (ages 15–49) to 0.2 over five years represents a minimum of 16,000 new infections.<sup>4</sup> This hypothetical course of the epidemic in the absence of enhanced disease prevention serves as the baseline progression of the disease in Afghanistan for the economic analysis below.

There are numerous approaches commonly applied to assessing the economic consequences of HIV prevention measures. The two most common approaches are (1) an assessment that relates the costs of some measures to the benefits in terms of years of life saved or some other health measure such as the number of infections prevented, or (2) an assessment that relates the economic benefits of some intervention to its costs. Below, we apply each approach to assess the postulated economic benefits of an HIV prevention program in Afghanistan.

Afghanistan, with support from the World Bank, is planning to spend US\$10 million over the next three years on the HIV and AIDS prevention project. This is part of a larger national operational program to which other donors also contribute, notably the Global Fund to Fight AIDS, Tuberculosis and Malaria. The World Bank support corresponds to a net present value of US\$9.4 million.<sup>5</sup> Subsequently, the expected annual costs will be somewhat lower than in the initial period, at around US\$3 million per year (table 2.1).

For the purposes of this exercise, the assumed impact of the project in its entirety on transmission is set at the deliberately conservative expected value of a 30 percent reduction in expected infections over the period 2007–10 (approximately equal to 4,800 infections averted). A conservative assumption of hypothesized impacts seems particularly germane given the information uncertainties previously discussed. With this assumption, disease prevalence in the overall adult

**Table 2.1 Estimated Costs of HIV and AIDS Prevention Program in Afghanistan**  
(in U.S. dollars)

<i>Activity</i>	<i>Estimated cost</i>
Initial costs (2008–10)	\$10,000,000
Annual costs (post-2010)	
Communication and advocacy	\$404,400
Strengthening HIV surveillance system	\$533,260
Targeted interventions for vulnerable groups at high risk	\$1,457,400
Program management and monitoring and innovation fund	\$580,800
Total	\$2,975,860

*Source:* World Bank 2007 and authors' calculations.

population in five years time would be 0.03 percent less as a result of the program if the trajectory of the epidemic had followed the Iranian pattern. To further underscore the uncertainty of both intervention effectiveness and future disease transmission, we assume a standard deviation of 25 percent, or 1,200 infections averted, in outcomes. The uncertainty is expressed through a Monte Carlo analysis, where key parameters, such as infections averted, are treated as random variables. In each simulation, a new draw of infections averted is taken from the hypothesized distribution of this key parameter in order to explore the benefits of the project under various levels of effectiveness.

In order to estimate program costs per life-year saved—in the absence of more precise demographic and epidemiological information—it is necessary to make some assumptions regarding the number of life years saved per infection. The benchmark that we will use below is that one infection averted corresponds to 20 life-years saved. Judging from aggregate demographic estimates, this assumption appears to be conservative. In Afghanistan, the remaining life expectancy at age 20 is about 40 years, and it falls to 20 years only by age 50 (UN Population Division 2007). With most deaths due to HIV and AIDS occurring between ages 20 and 50, the effect on life-years saved could be much higher, based on these data. However, to the extent that HIV infections are driven by injecting drug use, and injecting drug users have a lower life expectancy even excluding the impacts of HIV and AIDS, the aggregate data would be misleading, so we adopt a lower benchmark of 20 life-years saved per infection averted. Given uncertainty over this estimate, we assume a standard deviation of four years, or 20 percent.

With discounted estimated project costs of US\$9.4 million over the first three years, and an estimated 4,800 infections averted, the mean costs per infection averted comes out at US\$1,960 per infection prevented. As the 4,800 preventions averted correspond to about 96,000 life-years saved, this translates into a cost of about US\$98 per life-year saved. Given the stochastic assumptions concerning the effectiveness of prevention and the uncertainty over life-years saved, the cost per life-year saved ranges from US\$47 to US\$439. These estimates are summarized in table 2.2, which presents various benchmark percentiles in estimated outcomes. The majority of estimates, contained in the 10th to 90th percentiles, range over the shorter intervals of (3,194, 6,452) infections averted and (US\$69, US\$161) per year of life saved.

With additional assumptions, the benefits from prevention activities can be translated into a monetary equivalent in order to compare directly with program costs. The monetized benefits from a reduced number of HIV infections are here determined as the sum of three factors: the costs of medical treatment forgone, the value of lost earnings for people living with HIV and AIDS (PLWHAs) given increased mortality, and the value of lost earnings for the typically familial and unpaid caretakers. These are some of the more direct costs of infection. Additional costs require even further assumptions and so the analysis makes no attempt either to directly value the years of life lost due to premature mortality or to cost the pecuniary savings from a reduction in tuberculosis and other opportunistic infections transmitted to HIV-negative individuals. Clearly, taking these values into account will substantially increase the estimated benefits depicted here.

Wage and earnings information for Afghan workers is incomplete and often of questionable validity. One careful small-scale longitudinal study conducted in three urban centers (Kabul, Herat, Jalalabad) estimate mean annual earnings to be US\$425 (Beall and Schutte 2006) (see table 2.3). Since this study spans a 12-month period, it includes seasonal spells of underemployment and unemployment. Approximately 80 percent of earners are male, so this wage estimate is heavily weighted toward male earners. There are no direct estimates of wage earnings among IDUs or their likely sexual partners. Furthermore, there are no direct estimates of wages earned by recovered IDUs who are no longer injecting. Given these uncertainties, and the fact that the majority of IDUs are male, this study directly adopts the estimate of earnings mentioned above. Real wages are set to grow an average of

**Table 2.2 HIV Prevention Program: Costs and Years of Life Lost (YLL) Averted**  
(costs in U.S. dollars)

	Percentile								
	1st	10th	25th	50th	75th	90th	99th		
Total program cost	10,000,000	10,000,000	10,000,000	10,000,000	10,000,000	10,000,000	10,000,000	10,000,000	10,000,000
Present value of total program cost	9,399,600	9,399,600	9,399,600	9,399,600	9,399,600	9,399,600	9,399,600	9,399,600	9,399,600
Number of infections averted	2,087	3,184	3,891	4,907	5,764	6,452	7,202		
Total averted YLL	35,908	58,283	72,991	95,152	119,173	136,899	185,777		
Present value of cost of YLL averted	262	161	129	99	79	69	51		

Source: Authors' calculations.

**Table 2.3 Cost Parameters**  
(in units indicated)

Average annual earnings of all workers	US\$425
Mean annual real wage growth (random variable)	3%
Standard deviation of annual real wage growth	0.5%
Average wage loss for caregivers, in final year of illness	US\$212
Average private health care costs, excepting final year of life	US\$60
Average public health care costs, excepting final year of life	US\$60
Average private health care costs in final year of life	US\$420
Average public health care costs in final year of life	US\$420
Discount rate applied	5%

*Source:* Beall and Schutte 2006; Johns Hopkins University 2006; Author's assumptions.

3 percent a year (in line with economic projections), with a standard deviation of 0.5 percent. This additional source of variation ensures that every simulation will have unique real wage growth rates.

When infected individuals fall sick, they need care, and the cost of forgone earnings for the caretakers is another substantial cost. For example, in Vietnam, three-quarters of PLWHAs interviewed in a recent UNDP-sponsored qualitative study claimed they required the assistance of a caregiver on average for five hours a day. A quarter of caregivers reported having to give up a job in order to spend time with the infected person (UNDP 2004). This analysis sets the expected earnings loss for caregivers at one-half of annual earnings, and this loss occurs in the final year of life for PLWHAs, when they are most in need of home care.

The expected lifespan, after infection, of a PLWHA is assumed to be nine years, and an enhanced level of health care will be necessary in the final five years, with the final year of life preoccupied with even greater medical care (Zaba et. al. 2004). Little information on the costs of care for PLWHAs, both out-of-pocket private expenditures and public sector spending, exists in Afghanistan. A combined facility and household survey estimates that 49 percent of total Afghan health spending was out-of-pocket private expenditure (Johns Hopkins University 2006). The same study estimates that the average monthly expenditure for a sick adult presenting to a health facility is US\$20. This analysis assumes that after an HIV-positive individual begins to suffer from opportunistic infections and falls ill, by the fifth year of infection, he or she will present three times annually to a health facility, for an average private

cost of US\$60 a year. The study further assumes an equal amount of resources in the public sector is devoted to that individual's care (since the amount of spending in the health system from private and public sources is estimated to be roughly equal).

It is to be expected that this level of care, including the maintenance of opportunistic infections, will be necessary for several years, while in the final year the costs are expected to rise substantially. The same UNDP-sponsored Vietnam study referenced above found that the average per-capita health expenditure per PLWHA rose sevenfold in the final year of life (UNDP 2004). This study takes the same multiplier and applies it in the Afghan context. Hence, public and private spending each averages US\$420 in the final year of life for a PLWHA.

Table 2.4 summarizes the results of our estimates and simulations. The median present value of total costs averted is estimated at US\$30.8 million, yielding a gross benefit-cost ratio of 3.28. Indeed, almost every point in the range of possible outcomes is associated with a substantially higher present value of total costs averted. In only one simulation (out of 500) is the estimated gross benefit less than cost. Given that these rough calculations—based on deliberately conservative assumptions—show a positive return, and often a substantially positive return, we find that effective harm reduction activities can result in significant savings for Afghanistan as a whole.

These savings are further increased when reduced demand for health services is also taken into account. The median present value of savings to the health care system due to reduced system expenditures on PLWHAs is estimated at US\$2.04 million, resulting in a net program cost of US\$7.36 million and a net benefit-cost ratio of 4.19. Between the 1st and the 99th percentile, the benefit-cost ratio ranges between 1.47 and 7.59. These ranges of gross and net benefit-cost ratios calculated here are consistent with the ratios found in other countries in the region, especially when the conservative estimates of program impact are taken into account. Even with these very conservative assumptions on program impact, made in a data-scarce environment, the anticipated net benefits are substantial.

## Conclusions

While HIV prevalence in Afghanistan is low, the large number of IDUs suggests the potential for an escalation of HIV prevalence, both within the drug-injecting population, and onward transmission of the virus. Many of



**Table 2.4 HIV Prevention Program: Costs and Outcomes**  
(costs in U.S. dollars)

	Percentile								
	1st	10th	25th	50th	75th	90th	99th		
Total program cost	10,000,000	10,000,000	10,000,000	10,000,000	10,000,000	10,000,000	10,000,000	10,000,000	
Present value of total program cost	9,399,600	9,399,600	9,399,600	9,399,600	9,399,600	9,399,600	9,399,600	9,399,600	
Number of infections averted	2,087	3,184	3,891	4,907	5,764	6,452	7,202	7,202	
Present value of total costs averted	12,539,100	19,481,900	24,545,100	30,801,800	36,647,600	41,415,300	48,592,700	48,592,700	
Present value of public costs averted	869,100	1,326,100	1,620,600	2,044,000	2,400,800	2,687,400	2,999,800	2,999,800	
Net program cost	8,530,500	8,073,500	7,779,000	7,355,600	6,998,800	6,712,200	6,399,800	6,399,800	
Gross program costs per HIV infection averted	4,504	2,952	2,416	1,916	1,631	1,457	1,305	1,305	
Gross benefit-cost ratio	1.33	2.07	2.61	3.28	3.9	4.41	5.17	5.17	
Net program costs per HIV infection averted	4,087	2,536	1,999	1,499	1,214	1,040	889	889	
Net benefit-cost ratio	1.47	2.41	3.16	4.19	5.24	6.17	7.59	7.59	

Source: Author's calculations.

the IDUs are returnees, and the refugee situation also contributes to the spread of the epidemic geographically, a situation amplified by poverty, lack of access to information about HIV and AIDS, and the lack of effective prevention interventions, such as harm reduction.

The second part of this chapter (Prevention in Afghanistan—An Economic Perspective) describes a model calibrating the costs and economic benefits of a comprehensive HIV prevention program. In light of the very limited knowledge about the state of the epidemic in Afghanistan, it allows for some uncertainty regarding intervention effectiveness or disease dynamics. The median estimates return a cost-benefit ratio of 3.3, which increases to 4.2 when fiscal savings arising from reduced demand for public health services are taken into account. These results, when considered alongside the international evidence on cost-effectiveness, reinforce the view that Afghan investments in effective harm reduction activities constitute not solely good health policy, but sound economic policy as well.

### **Annex 2.1 Estimated HIV Transmission Probabilities by Exposure**

<i>Type of exposure</i>	<i>Estimated risk</i>
Receptive Anal Intercourse	≤ 3% (1/125 to 1/31) (DeGruttola et al. 1989)
Receptive Vaginal Intercourse	≤ 0.1% (1/2,000 to 1/677) (Mastro et al. 1994; Wiley, Herschkorn, and Padian 1989)
Insertive Vaginal or Anal Intercourse	≤ 0.1% (1/3,000 to 1/1,111) (Nagachinta et al. 1997; Peterman et al. 1988)
Needlestick Injury	= 0.3% (1/313) (Henderson et al. 1990)
Use of Contaminated Injecting Drug Equipment	= 0.6% (1/149) (Kaplan and Heimer 1992)

*Source:* Bertozzi et al. 2006.

## Annex 2.2 Evidence on Effectiveness of Harm Reduction in Injecting Drug Users (IDUs), and Other Preventive Measures

<i>Intervention</i>	<i>Outcome</i>	<i>Impact/policy implication</i>	<i>Methodology</i>	<i>Country/region</i>	<i>Source</i>
Various Methods of Harm Reduction	HIV Incidence	Significant reduction in HIV incidence in the intervention group was found in both studies.	Meta-analysis	Global <sup>6</sup>	Des Jarlais and Friedman 1996
Outreach to IDUs	Reduced risk behavior	The baseline to follow-up measurements showed substantial reductions in HIV risk behavior in the National AIDS Demonstration Research studies. However, only a few of the NADR projects showed significantly greater risk reduction in the “enhanced” versus the “standard” interventions. <sup>7</sup>	Randomized clinical trial	50 cities in the United States	Friedman and Des Jarlais 1991
Bleach Disinfection	HIV incidence	2 studies (Baltimore and New York) found no protective effect of self-reported bleach disinfection, while the third (Miami) found a moderately strong protective effect. <sup>8</sup>	Cohort studies using multivariate analysis	Baltimore, New York, and Miami	Vlahov et al. 1994; Titus et al. 1994; Weatherby et al. (in Des Jarlais and Friedman 1996)
Bleach Disinfection	Life-years saved and change in cohort HIV prevalence	Bleach programs can produce the greatest life-year (LY) savings in areas of low HIV prevalence. In the lowest prevalence scenario (0.02), the projected LY savings is 2.3 years/HIV negative drug user, compared with 1.7 and 1.3 under medium (0.25) and high prevalence (0.60). The results suggest the introduction of bleach programs early, when prevalence is still comparatively low in the IDU population.	Markov model simulation 4 hypothetical cohorts of IDUs	Data for simulation: urban health study, San Francisco	Siegel et al. 1991

(continued)

## Annex 2.2 Evidence on Effectiveness of Harm Reduction in Injecting Drug Users (IDUs), and Other Preventive Measures (Continued)

Intervention	Outcome	Impact/policy implication	Methodology	Country/region	Source
Syringe Exchange (SE)	HIV incidence	Low: HIV incidence among syringe-exchange participants is uniformly low in areas with low HIV seroprevalence. <sup>9</sup> Participants in the syringe exchange program in Kathmandu, Nepal, have a low HIV incidence rate (Maharjan et al. 1994 <sup>10</sup> ). Intermediate: The two cities with intermediate HIV seroprevalence levels (London and Montreal) show strong contrast. HIV incidence among Montreal <sup>11</sup> SE participants was 6/100 person-years at risk. High: Results from syringe-exchange programs in the high-seroprevalence areas are generally encouraging. Syringe-exchange programs in these areas are not sufficient to eliminate all new HIV infections, but the pattern is clearly one of relatively low rates of new HIV infections.	Meta-analysis	Global	Des Jarlais and Friedman 1996 (based on Des Jarlais, Report to UK Health Department, Hankins personal communication)
Needle Exchange (NE)	Re-use/Sharing of syringes	Significant reduction in needle sharing in the intervention group was found in all three studies; correlation between needle exchange program attendance and lower needle sharing was found in one study.	Empirical analysis <sup>i</sup> Meta-analysis <sup>iii</sup>	Bangladesh <sup>i</sup> Global <sup>ii</sup>	Jenkins et al. 2001; <sup>ii</sup> Ksobiech 2003; Peak et al., 1995; Vlahov et al. 1997

Needle Exchange (NE)	HIV infection	<p>On average, seroprevalence increased by 5.9% per year in the 52 cities without NE programs (NEPs), and decreased by 5.8% per year in the 29 cities with NEPs. The average annual change in seroprevalence was 11% lower in cities with NEPs (95% CI -17.6 to -3.9, <math>p = 0.004</math>). Results, together with the clear theoretical mechanisms by which NEPs could reduce HIV incidence, strongly support the view that NEPs are effective.</p>	<p>Meta-analysis of NEPs in 80 cities, combined with unpublished information from the CDC on seroprevalence of IDUs entering treatment in the United States between 1988 and 1993.</p>	Global	Hurley, Jolley, and Kaldor 1997
Needle Exchange (NE)	HIV infection	<p>Starting from prevalence rates for 23% (whites) and 88% (natives), based on 24 seroconversions among 257 follow-up visits, estimated HIV incidence was 18.6 per 100 person-years (95% confidence interval, 11.1-26.0). Despite having the largest NEP in North America, Vancouver has been experiencing an ongoing HIV epidemic. Whereas NEPs are crucial for sterile syringe provision, they should be considered one component of a comprehensive program including counseling, support, and education.</p>	<p>Prospective study. logistical regression of semiannual case-control data on 1,000 IDUs, reached through street outreach or self-referred to NEP</p>	Vancouver	Strathdee et al. 1997

### Annex 2.3 Evidence on Cost-Effectiveness of Harm Reduction in Injecting Drug Users (IDUs) and Other Prevention and Treatment Measures

<i>Outcome</i>	<i>Impact/policy implication</i>	<i>Methodology</i>	<i>Country</i>	<i>Source</i>
Cost/Intervention and Cost-effectiveness (CE)	The most effective harm reduction is eliminating drug use. In a street-based outreach in Kathmandu, Nepal, cost per client contact was US\$3.21. In Svetlogorsk, Belarus, cost per person reached was US\$1.19, and the cost per disposable syringe distributed was \$0.39. Using a mathematical model, the CE of the project was estimated to be US\$71 per HIV infection averted.	Systematic review <sup>12</sup>	Developing countries	Walker 2003
Cost/HIV Averted/Treated, Total LYs Gained, and Cases Averted/Treated	Both the cost-effectiveness and the budgetary analysis suggest that HIV prevention interventions are much more cost-effective than ARV treatment. Both blood screening and STD control among sex workers are the most CE preventive interventions at the costs of US\$3.35 and US\$3.95 per life-year saved, respectively. ARV treatment is the least cost-effective, costing US\$1,317 per life-year saved at generic drug prices. In the budgetary simulation scenario with donated drugs, ARV treatment consumes the entire budget, saving up to 2,974 life-years annually. A portfolio of prevention interventions does not require the entire budget and results in 135,030 life-years saved. HIV prevention interventions should be prioritized if poor countries hope to maximize the scarce resources available for reducing the impact of the AIDS epidemic.	Comparative CEA of HIV treatment and prevention <sup>13</sup> and static budgetary simulation	Resource-scarce countries	Masaki et al. 2003

<p>Cost/Intervention and Cost-effectiveness (CE)</p>	<p>(i) Median costs in NEP per participant contact range from US\$1.35 in the United States to US\$3.21 in Nepal. Cost-benefit analysis (CBA) of NEPs found ranges of the cost per HIV infection averted in the United States to be between US\$3,800 to almost US\$100,000, below the estimated lifetime cost of treating an HIV-infected person (Lurie et al.1997).</p> <p>(ii) Annual costs of methadone maintenance in the United States run US\$5,250 per person, based on an analysis of 600 programs conducted by Barnett et al. 2001. (iii) The supply control strategies being employed in many African countries, for example, have demonstrated only limited effectiveness based on reports of increasing trading activities and drug availability.</p>	<p>Systematic review of effectiveness and cost-effectiveness</p>	<p>Low- and middle-income countries</p>	<p>Jha et al. 2001</p>
<p>HIV Infection and DALYs</p>	<p>US\$359/HIV Infection US\$18/DALY</p>	<p>CEA (Financial and economic cost) modeling<sup>14</sup></p>	<p>Belarus</p>	<p>Kumaranyake et al. 2004</p>
<p>HIV Infection and DALYs</p>	<p>US\$564/HIV infection US\$28/DALY</p>	<p>Empirical</p>	<p>Russia</p>	<p>Bobrik 2004</p>
<p>HIV Infection</p>	<p>US\$97/HIV infection (Between 1999 and 2000, at the coverage of between 20% to 38%, and an IDU HIV prevalence of 54%, projections suggest 792 HIV infections were averted, a 22% decrease in IDU HIV incidence, but a 1% increase in IDU HIV prevalence. Cost per HIV infection averted was US\$97. Scaling up the intervention to reach 60% of IDUs remains CE and reduces HIV prevalence by 4% over five years. At the current coverage, the harm reduction intervention in Odessa is CE but is unlikely to reduce IDU HIV prevalence in the short term. To reduce HIV prevalence, more resources are needed to increase coverage.</p>	<p>Mathematical modeling of economic providers' costs with empirical data</p>	<p>Odessa, Ukraine</p>	<p>Vickerman et al. 2006</p>

(continued)

### Annex 2.3 Evidence on Cost-Effectiveness of Harm Reduction in Injecting Drug Users (IDUs) and Other Prevention and Treatment Measures (Continued)

Outcome	Impact/policy implication	Methodology	Country	Source
HIV Infection CER	CER US\$20,947/HIV infection	CEA using cost and process data. Alternative estimates calculated using published data and simplified circulation model. HIV treatment cost taken from literature.	New York	Laufer 2001

Source: Authors (Expanded from Bertozzi et al. 2006).



## Notes

1. Unfavorable conditions include rate and pattern of sexual partner change, the presence or absence of male circumcision, and injecting drug use—frequently coupled with sex work. War—through increased mobility and psychological distress—can amplify the problem, increasing the number of displaced people and refugees, and drug-injecting prisoners. Disempowerment of women and fragmented social networks are further contributing factors to increased likelihood of HIV transmission in vulnerable groups.
2. Wollants et al. (1995), and Smallman-Raynor and Cliff (1991) discuss the implications of armed conflict for the spread of HIV/AIDS in El Salvador and the Central African Republic, respectively.
3. For more information, see <http://go.worldbank.org/GL463NSC10>.
4. This assumes a mortality rate of 15 percent over the next five years for individuals already or soon to be HIV positive).
5. Our analysis adopts a discount rate of 5 percent, a typical value for the evaluation of health projects.
6. Studies classified as “global” are skewed toward research in developed countries.
7. The National AIDS Demonstration Research (NADR) program was an outreach program to IDUs not in treatment in 50 cities in the United States, which randomly assigned individual subjects to “enhanced outreach” intervention (treatment group) and “standard outreach” (control group). *Standard Intervention* includes: risk behavior interview, HIV counseling and testing (VCT), and basic AIDS education. *Enhanced Intervention* includes: additional hours of individual or small-group counseling and skills training
8. Potential reasons for failure of bleach disinfection: IDUs not following adequate disinfection procedures; formidable measurement problems (difficult to measure “good” disinfection and therefore identify valid control group); need to distinguish between IDUs using only sterile/unused equipment, IDUs using bleach disinfection, and IDUs not using bleach disinfection; and IDU injection practices vary (Des Jarlais and Friedman 1996).
9. This in part reflects the dynamics of HIV transmission, where “equal” risk-reduction programs will have greater impact if they are implemented when seroprevalence is low.
10. Maharjan et al. (1994) was the first report of a successful SE program in a developing country.
11. The reasons for the high incidence rate among Montreal syringe-exchange participants have not yet been determined (Bruneau, personal communication by Des Jarlais), but may include: (1) attracting a group of participants at extremely high risk for HIV infection; and (2) an insufficient number of

syringes exchanged per visit, given the high frequency of drug injection among the participants.

12. Databases: Medline, HealthStar, Popline, Health Economic Evaluation Database (HEED), ISI, Science and Social Sciences, Embase, and Cab Health; and correspondence with donor organizations.
13. This study examined five prevention interventions: (1) voluntary counseling and testing; (2) prevention of mother-to-child transmission; (3) STD mass treatment for general population; (4) STD management for sex workers; and (5) blood screening, and four drug price scenarios for ART for HIV-positive patients.
14. Kumaranayake et al. (2004) undertake an analysis of the cost-effectiveness of a harm reduction and HIV prevention project for IDUs in Eastern Europe. Economic evaluation methods were adapted to consider the effect of an eight-month financing gap that negatively impacted project implementation. Financial and economic costs of implementing the intervention were analyzed retrospectively. The data were also modeled to estimate the costs of a fully functioning project. Estimates of the intervention impact on sexual and drug injecting behavior were obtained from existing pre- and postintervention behavioral surveys of IDUs. A dynamic mathematical model was used to translate these changes into estimates of HIV infections averted among IDUs and their sexual partners. Projections of the potential effect of the shortfall in funding on the impact and cost-effectiveness of the intervention were made. In Svetlogorsk, Belarus, where in 1997 the IDU HIV prevalence was 74 percent, the intervention averted 176 HIV infections (95 percent CI 60–270) with cost-effectiveness of US\$359 per HIV infection averted (95 percent CI US\$234–US\$1,054). Without the US\$2,311 reduction (7 percent) in financing, the estimated cost-effectiveness ratio of the project would have been 11 percent lower. The costing methods used to measure donated mass media can substantially influence cost and cost-effectiveness estimates. Harm reduction activities among IDUs can be cost-effective, even when IDU HIV prevalence and incidence is high. Relatively small shortfalls in funding reduce impact and cost-effectiveness. Increased and consistent allocation of resources to harm reduction projects could significantly reduce the pace of the HIV epidemic in Eastern Europe.

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