

# Appendix B

## Selected Studies of the Cost-Effectiveness of Preventive Interventions in Developing Countries

**T**HE TABLE BELOW SUMMARIZES STUDIES OF THE cost-effectiveness of interventions to prevent HIV in developing countries and several other studies that have measured only the costs of program outputs, without measuring their effects.<sup>1</sup>

Readers are advised to use this table cautiously. The cost-effectiveness of a particular intervention is not a constant; the costs, effects, and ranking of different interventions are very likely to differ across countries because of the degree to which the intervention is targeted to those with high rates of partner change, the prevalence of HIV in high- and low-risk groups, the length of time that an intervention has been in the field, the labor-intensity of the intervention, and the local cost of labor and other inputs (*background paper*, Mills and Watts 1996). Thus, the results of the different studies in the table are not directly comparable with each other. Ideally, we would like to have measures of cost-effectiveness across multiple interventions for a single country (see box 3.9 of the text).

The cost per HIV infection averted is available for only four interventions—one targeted to people with very high rates of partner change (sex workers) in Nairobi and three others addressed to those with lower rates of partner change. As discussed in chapter 3, government has a strong interest in supporting interventions that prevent the most secondary

infections per dollar spent. However, except for one study, secondary infections were not included in the benefits.

- The annual operating costs of the Nairobi, Kenya, sex worker program came to roughly \$70,000, or \$140 per sex worker per year (Moses and others 1991). At the beginning of the program, 80 percent of the participants were infected with HIV and they had a mean of four clients per day. The annual cost per case of HIV averted came to \$8, under the assumption of 80 percent condom use, or \$12, under the assumption of 50 percent condom use. The number of cases of HIV prevented among the clients of sex workers and among sex workers themselves were included in the calculations, but infections prevented among the partners of clients were not included. Had they been, the intervention might have been even more cost-effective. Reportedly, the largest share of the program's costs was for STD treatment, although most of the benefits arose because of increases in condom use (Mills and others 1993). However, the availability of STD treatment may have been a major factor in obtaining the cooperation of participants.
- The Mwanza, Tanzania, STD intervention is the only one in the table for which the cost per DALY saved has been calculated—\$10–11 (Richard Hayes, personal communication). The cost-effectiveness of this intervention is understated because the authors did not include prevention of any secondary infections in their analysis. The intervention might also have been more cost-effective had it been implemented in an urban area, where the number of secondary infections prevented might have been greater for each primary case. Of the total cost of \$10.08 per treated case of STD, \$2.11 was for drugs (Richard Hayes, personal communication). The incremental annual cost of this intervention, which served a catchment population of about 150,000 people, was \$59,000, or \$0.39 per capita. By comparison, the recurrent health budget of Tanzania in 1993 amounted to \$2.27 per capita.
- The cost-effectiveness of safe blood programs is strongly dependent on the level of HIV prevalence in the population and on the extent of risky behavior among transfusion recipients. The Ugandan study included only averted primary infections, that is, infections due directly to transfusions (European Commission 1995a,b). It assumed a prevalence rate of 16 percent among blood donors and of 40 percent and 9 percent, respectively, among adult and child

**Table B.1 Annual Costs per Infection Averted, per Condom, and per Contact for Interventions To Prevent HIV**

| <i>Intervention</i>                                                             | <i>Location, implementing agency and year of launch</i>                                                                                               | <i>Cost per HIV infection averted</i> | <i>Cost per condom distributed</i> | <i>Cost per contact</i>               |
|---------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------|------------------------------------|---------------------------------------|
| <i>Interventions targeted to people with high-risk behavior</i>                 |                                                                                                                                                       |                                       |                                    |                                       |
| Information, condoms, STD treatment for female sex workers                      | Nairobi Kenya, research project (1985–91)                                                                                                             | \$8.00–\$12.00 <sup>a</sup>           |                                    |                                       |
| Peer education and condoms, female sex workers                                  | Prostitute peer education project, Yaounde, Cameroon; Ministry of Health (1989)                                                                       |                                       | \$0.34 <sup>b</sup>                |                                       |
| Education and condoms, male sex workers aged 11–23                              | Pegação programme, Rio de Janeiro, Brazil, Social Health Guidance Unit (NOSS, 1989)                                                                   |                                       | \$0.70 <sup>c</sup>                | \$3.73                                |
| Peer education and condoms, female sex workers and clients, others <sup>d</sup> | Bulawayo peer education project, Bulawayo, Zimbabwe; Bulawayo City Health Department, University of Zimbabwe, AIDSTECH (1989)                         |                                       | \$0.10 <sup>b, e</sup>             | \$0.47                                |
| Needle exchange, bleach, education, condoms, health care to IDUs                | Kathmandu, Nepal, Lifesaving and Lifegiving Society (1992)                                                                                            |                                       |                                    | \$3.21                                |
| <i>Population-level interventions</i>                                           |                                                                                                                                                       |                                       |                                    |                                       |
| Treatment of symptomatic STDs                                                   | Research project, six rural communities of Mwanza Region, Tanzania, early 1990s<br>Maputo city and province, Mozambique<br>Johannesburg, South Africa | \$2.34                                |                                    | \$10.08<br>\$9.46<br>\$10.16          |
| Condom social marketing                                                         | Ten programs (Bolivia, Congo DR., Cote d'Ivoire, Dominican Republic, Ecuador, Ghana, Indonesia, Mexico, Morocco, Zimbabwe)                            |                                       | \$0.02–\$0.30 <sup>f</sup>         |                                       |
| Safe blood supply                                                               | Uganda                                                                                                                                                | \$1.72                                |                                    | \$50 (per unit of blood) <sup>g</sup> |
| Short-course AZT therapy to prevent mother-to-child transmission                | Hypothetical intervention in Sub-Saharan Africa, assuming perinatal transmission is reduced from from 25% to 16.5%.                                   | \$3,748                               |                                    |                                       |

a. Lower figure assumes 80% condom use, higher figure assumes 50% condom use. b. Includes the value of donated condoms. c. Cost excluding technical assistance from AIDSTECH is \$0.07 per condom distributed. d. Also included people in bars, workers, STD patients. e. Formerly Zaire. f. \$27–29 per unit collected, \$33–35 per unit used in 1993. Mills and others (1995) find a cost of \$51 per unit produced for the same program but possibly for an earlier year.

Sources: Nairobi study, Moses and others (1991); Cameroon, Brazil, Zimbabwe sex worker peer counseling and condom programs, condom social marketing programs, and STD treatment in Mozambique and South Africa, Mills and others (1993); Mwanza STD treatment, Richard Hayes, personal communication; and Gilson and others (1996). Ugandan safe blood, European Commission (1995a,b). AZT therapy in Sub-Saharan Africa, Mansergh and others (1996).

transfusion recipients. The calculations concerning the number of primary infections averted are in box 4.2 of this report. The cost per HIV infection averted was obtained by dividing the total additional costs of HIV screening in 1993 (\$319,894) by the total number of infections averted (1,863).

- The effectiveness of short-course zidovudine (AZT) therapy to prevent mother-to-child transmission is not known as of this writing; clinical efficacy trials are under way in a number of countries. The cost-effectiveness numbers in the table are, therefore, hypothetical. The calculations assume that the therapy would reduce transmission from 25 percent to 16.5 percent, or half the effect of longer-course therapy. Program costs were estimated from the literature and are based on those in Sub-Saharan Africa, where most mother-to-child transmission occurs (Marsersgh and others 1996). The authors calculated that a national program in a country with a 12.5 percent HIV seroprevalence rate would lower incidence of HIV by 12 percent. Since infants and young children are very unlikely to transmit HIV to others, there are virtually no secondary cases generated by this intervention. Preventing infection of children is one of the important external benefits of preventing infection in their mothers (see box 4.6 of the report).

The cost per case of HIV averted or per DALY has not been calculated for the other studies in the table; only the costs are available. A needle exchange and bleach program serving injecting drug users in Katmandu, Nepal, cost \$3.21 per contact after only one year of observation and was organized with community-based outreach. A second program in Lubljana, Slovenia (not shown), was based in a fixed facility and had been operating only 5 months when costed at \$12.59 per contact (Mills and others 1993). The cost per condom distributed varied from \$0.10 to \$0.70 for three highly targeted programs that had peer education and condoms for sex workers. Costs were much lower for ten condom social marketing programs—from \$0.02 to \$0.30 per condom distributed, including the value of donated condoms.

## Note

1. For examples of studies of cost-effectiveness and cost-benefit analysis of HIV/AIDS interventions in industrial countries, see Holtgrave, Qualls, and Graham (1996) and National Research Council (1991). Key principles of the economic analysis of health projects are reviewed in Hammer (1997).