The costs of HIV prevention strategies in developing countries

N. Söderlund,[1] J. Lavis,[2] J. Broomberg,[3] & A. Mills[4]

Since many evaluations of HIV (human immunodeficiency virus) prevention programmes do not include data on costs, a preliminary analysis of the costs and outputs of a sample of HIV prevention projects was attempted. Case studies, representing six broad HIV prevention strategies in developing countries with differing levels of per capita gross domestic product, were sought on the basis of availability of data and potential generalizability. The six prevention strategies studied were mass media campaigns, peer education programmes, sexually transmitted disease treatment, condom social marketing, safe blood provision, and needle exchange/bleach provision programmes. Financial cost data were abstracted from published studies or were obtained directly from project coordinators. Although estimates of cost-effectiveness were not made, calculations of the relative cost per common process measure of output were compared. Condom distribution costs ranged from US$ 0.02 to 0.70 per condom distributed, and costs of strategies involving personal educational input ranged from US$ 0.15 to 12.59 per contact.

Introduction

Despite widespread implementation of a broad range of HIV (human immunodeficiency virus) prevention strategies and programmes in the last decade, the evaluation of interventions has progressed little beyond quantifying such indicators as the numbers of condoms distributed rather than the numbers of cases of HIV prevented. Economic evaluation in any form is thus poorly represented in the published literature. This absence of rigorous evaluation of costs and effectiveness of HIV prevention strategies occurs against a backdrop of increasing resource constraints and the related need to consider the opportunity costs of any expenditure. For any given objective or set of objectives, governments and other funding agencies are increasingly aware of the need to choose the strategy or combination of strategies bearing the least cost.

This paper presents the results of a cost analysis of HIV prevention strategies as a step towards developing the literature on economic evaluation. Cost analysis can indicate relatively low-cost strategies and provide useful information on affordability to those who are involved in the planning, management and evaluation of health strategies in developing countries (1, 2). Similar disease-specific cost analyses have been performed before in the health sector; for example, Barlow & Grobar (3) reviewed the costs of controlling parasitic diseases, and Phillips et al. (4) reviewed the costs of selected intervention for the prevention of diarrhoea. In addition to presenting data on the costs and outputs of HIV prevention projects, this paper discusses some of the difficulties faced in economic evaluation in this area, and suggests directions for further research.

Methods

Case studies of currently operating programmes representing six broad categories of HIV prevention strategies were chosen for study. The six strategies were:

(1) *Promotion of safer sexual behaviours through mass strategies*, which usually includes teaching essential facts about HIV, promoting healthy behaviour, reducing anxiety about casual transmission, and preventing discrimination against those infected (5). This strategy usually involves minimal targeting of vulnerable groups.

(2) *Promotion of safer sexual behaviours through person-to-person education*, which involves more intensive intervention targeted at vulnerable groups for which the potential benefit from a given input is perceived to be high.

[1] Department of Public Health and Primary Care, University of Oxford, Oxford, England.

[2] Research Fellow, Centre for Health Economics and Policy Analysis, Department of Clinical Epidemiology and Biostatistics, McMaster University, Hamilton, Ontario, Canada.

[3] Research Fellow, Department of Public Health and Policy, London School of Hygiene and Tropical Medicine, London, England.

[4] Reader, Health Economics and Financing Programme, London School of Hygiene and Tropical Medicine, Keppel Street, London WC1E 7HT, England. Requests for reprints should be sent to this address.

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(3) *Provision of condoms through social marketing*, which encompasses market research, product importation, branded packaging, advertising, and distribution (with retail costs often subsidized by donors or government) (*6*).

(4) *Provision of sexually transmitted disease (STD) treatment and prevention services*, which is important because STDs both rank among the top ten most important health problems in developing countries in terms of healthy life-years lost (*7*) and can facilitate transmission of HIV (*8*).

(5) *Prevention of unsafe drug use behaviours for intravenous drug users (IVDUs)* who are unable or unwilling to enter drug abuse treatment programmes, which includes education in the need to eliminate needle sharing, instruction in disinfecting contaminated injection equipment, bleach distribution, and needle exchange.

(6) *Provision of a safe blood supply for transfusion*, which involves screening donated blood for HIV and the disposal of infected blood.

A sample of case studies, representing each of these HIV prevention strategies, was sought on the basis of availability of cost and output data, and potential generalizability. As far as possible at least one case study for each strategy was selected from each of the three broad income categories of developing countries as defined by the World Bank (low, low-middle, and upper-middle income countries) (*9*). In addition, a fourth category, that of eastern European, former socialist economies, was added. Identification of potential projects was initiated through a combination of literature searches and interviews with key workers in the field.

Simple costing guidelines published elsewhere (*10, 11*) would have covered the requirements of this evaluation quite adequately; in general, the difficulties encountered in costing HIV prevention are similar to those encountered when studying other health interventions. There are, however, a few features that are relatively unique to HIV. All HIV prevention programmes are relatively new, and cost estimates are thus more likely to be unstable. Furthermore, many HIV prevention programmes are small, and appear to have been set up very rapidly with a minimum of capital, often by volunteers. Under these circumstances the true economic costs are difficult to calculate, and financial costs are almost certainly underestimates.

A capital/recurrent cost framework was adopted for the study. Cost data were abstracted from published studies (when available) or obtained directly from project coordinators using a standard form. Only costs incurred by the providing agency were considered; all costs falling on clients were excluded because of the impossibility of obtaining comparable data. Donated goods and services were valued according to local prices. Premises, staff and equipment that were shared with other programmes were costed on the basis of estimated proportional usage. Capital expenditures were annuitized using simple straight-line depreciation without applying a discount rate. The life-span of buildings was assumed to be 20 years, vehicles and equipment 5 years, and training 3 years, in accordance with guidelines published by WHO (*10*). All costs were converted to US dollars in the year incurred, and adjusted to 1990 US dollars using United States consumer price indices (*12*). While purchasing power parities would provide more valid comparisons of some costs (*13*), these are not available for most of the countries studied.

Results

Promotion of safer sexual behaviours through mass strategies

Case studies of mass education campaigns were taken from the Dominican Republic (A. Jimmerson, personal communication, 1992), Gabon (J. Dubow, personal communication, 1992), and Hungary (J. Forrai, personal communication, 1992). The Dominican Republic and Gabon studies involved mass media campaigns in the countries' largest cities. Owing to the large size of the campaigns, the small size of the countries, and the high proportion of the population resident in the capital cities, the projects were regarded as nationwide campaigns. The third case study, the Sex Education and AIDS Prevention Programme (SEAPP) in Hungary, involved a school-based education programme for 11–14-year-olds in Budapest and its environs.

The costs of the projects studied are presented in Table 1. The costs of the two national interventions consisted mostly of media expenditures, and show a considerable range when expressed per capita. The school-based education programme in Hungary was more costly (US$ 1.33 per pupil-year of education, which was defined as a one-hour lesson per class per month); these costs consisted almost entirely of teachers' salaries.

Promotion of safer sexual behaviours and provision of condoms through person-to-person education

The case studies selected were from Uganda, Yaoundé (Cameroon), Bulawayo (Zimbabwe), and Rio de Janeiro (Brazil). The Ugandan example was a workplace education project aimed at the 400 000 employees of 400 participating companies (F. Rwakagiri, personal communication, 1992). The programmes in Yaoundé (M. Mony-Lobe, personal

Table 1: **The annual cost of programmes to promote safer sex behaviours through mass media (in US$, as of 1990)**

Project	Dominican Republic	Gabon[a]	Hungary
Capital costs	12 993 (4%)[b]	N/A	268 (0.4%)
Recurrent costs	425 744	N/A	63 112
Salaries	82 200 (19%)	N/A	56 154 (88%)
Media costs:			
Radio/TV	160 244	210 384	—
Print/other	150 300 (71%)	117 922 (92%)	604 (1%)
Total costs	438 677 (100%)	357 347 (100%)	63 380 (100%)
Output	Total pop. = 7 444 000	Total pop. = 1 100 000	Teachers trained = 140 Pupils educated/year = 41 250
Cost per output	Cost per capita = 0.06	Cost per capita = 0.32	Cost per: teacher trained = 90.30 pupil year of education = 1.33

[a] This project, which was administered under contract by a private advertising agency, included the overheads and salary costs within the total cost for each form of mass media.
[b] Percentages of the total costs are given in parentheses.

communication, 1992) and Bulawayo (S. Forsythe et al, unpublished data, 1992) were aimed at prostitutes, their clients and other vulnerable groups, while the fourth, from Rio de Janeiro (P. Longo, personal communication, 1992), was focused more narrowly on male adolescent prostitutes. All projects made use of person-to-person peer education; the Ugandan project also used video screenings.

Costs for each project are shown in Table 2. Capital costs for the Ugandan project were high, consisting almost entirely of vehicles purchased to facilitate training visits to geographically dispersed workplaces. Salaries constituted the principal costs in Cameroon and Brazil where the project interventions were provided by full-time staff; peer educators for the Ugandan and Zimbabwean projects were either payed small per diems or were volunteers, and the salary costs were consequently much lower. The Zimbabwean project had a high proportion of non-salary recurrent costs, primarily because most educators were volunteers, and hence the salary costs were disproportionately low. The large number of condoms distributed (accounting for 27% of total costs against 0% for the Cameroon project, where cost recovery was achieved through condom sales) was also a contributory factor.

Costs per condom distributed are shown in Table 2 and range from US$ 0.10 in Zimbabwe to US$ 0.70 in Brazil. Costs per contact established

also show a wide range (US$ 0.47 to 1.89). A cost of US$ 25.80 per reported new condom user was calculated for the first year in the Brazil project from results of a study done to evaluate changes in reported behaviour among male prostitutes (P. Longo, unpublished data, 1992).

Provision of condoms by social marketing programmes

Data were obtained on ten condom social marketing programmes, three from low-income countries (Ghana, Indonesia and Zaire) and seven from low-middle-income countries (Bolivia, Côte d'Ivoire, Dominican Republic, Ecuador, Mexico, Morocco and Zimbabwe). Only two of these (Côte d'Ivoire and Zaire) were targeted at HIV prevention (A. Boner, personal communication, 1992), the remainder being primarily contraceptive social marketing programmes (6). It was assumed that the total costs would be similar regardless of whether a project's aim was disease prevention or contraception, though different measures of effect and target coverage rates would apply.

Cost breakdowns by type of expenditure were available for Zaire and Côte d'Ivoire only and are presented in Table 3. Table 4 shows costs per condom sold and numbers of condoms sold for all the countries studied. There is a broad range of costs per

Table 2: **The annual cost of projects to promote safer sexual behaviours and condom use by person-to-person contact (in US$, as of 1990)**

Project	Uganda	Cameroon	Brazil	Zimbabwe
Capital costs	18 604 (25%)[a]	0	780 (2%)	307 (0.4%)
Recurrent costs	56 410	203 600	32 770	72 220
Salaries	19 548 (26%)	194 500 (96%)	21 032 (63%)	21 363 (30%)
Other costs	36 862 (49%)	9100 (4%)	11 736 (35%)	50 857 (70%)
Total costs	75 014 (100%)	203 600 (100%)	33 550 (100%)	72 527 (100%)
Outputs:				
No. of condoms distributed	480 000	593 000	48 000	708 000
Other outputs	Employee contacts = 53 400	Educators working = 40	Prostitute contacts = 9000	Contacts = 154 632
Cost per:				
Condom distributed	0.21	0.34	0.70	0.10
Other output	Cost per employee contact = 1.89	Cost per educator/ year = 5090.00	Cost per prostitute contact = 3.73	Cost per contact = 0.47

[a] Percentages of the total costs are given in parentheses.

condom sold (US$ 0.02 to 0.30) across different countries. An important observation is the increase in condom sales as the projects progressed and the associated decrease in unit costs.

Provision of STD treatment and prevention services

The three case studies selected offer examples of interventions that were integrated into existing primary health care infrastructures (Maputo City and Province, Mozambique) (14), or were free-standing referral services (Johannesburg, South Africa) (C.

Table 3: **The annual cost of providing condoms through social marketing (in US$, as of 1990) for Zaire and Côte d'Ivoire**

Location	Zaire	Côte d'Ivoire
Capital costs	23 865 (1%)[a]	4681 (2%)
Recurrent costs	2 043 406	263 719
Salaries	389 622 (19%)	85 724 (32%)
Other	1 653 784 (80%)	177 995 (66%)
Total costs	2 067 271 (100%)	268 400 (100%)
Output: No. of condoms sold	18 301 507	1 828 434
Cost per condom sold	0.11	0.15

[a] Percentages of the total costs are given in parentheses.

Evian & I. Pinto, personal communication, 1992), or were targeted at a specific high-risk group (prostitutes in the Pumwani area of Nairobi, Kenya) (15).

The cost analysis (Table 5) shows that capital costs were relatively low (though it should be noted that rent was included as a recurrent cost for all three). The bulk of recurrent costs consisted of salaries and supplies (especially diagnostics, antibiotics and condoms). The cost per visit is in the US$ 10.00 range for the two non-targeted interventions, and significantly higher at over US$ 50 for the targeted project in Nairobi.

Prevention of unsafe drug use behaviours through needle exchange/bleach provision programmes

Cost data were obtained for two case studies in developing countries (Khatmandu, Nepal and Ljubljana, Slovenia). Since both were relatively new, small-scale projects, a complementary case study was chosen from the USA (Tacoma, Washington). The Khatmandu and Tacoma case studies involved community-based outreach, and Ljubljana a drop-in centre as well as a 24-hour telephone hotline. All data were obtained by personal correspondence (A. Peak, 1992, Khatmandu; H. Hagan, 1992, Tacoma; V. Flaker, 1992, Ljubljana).

The costs of programmes are presented in Table 6. Capital costs were low, and in the case of the Tacoma project represented staff training and the purchase of equipment (e.g., cellular phones and a

Table 4: **Cost per condom sold by social marketing programmes per year (in US cents, as of 1990)**

	Low-income countries			Low-middle-income countries						
Year	Ghana (D)[a]	Indonesia (CP)[a]	Zaire (D)	Bolivia (D)	Ecuador (D)	Mexico (CP)	Morocco (D)	Zimbabwe (D)	Dom. Rep. (D)	Côte d'Ivoire (D)
1986		4.4								
		(2372)[b]								
1987	8.8	4.7				78.4				
	(2532)	(5958)				(1029)				
1988	7.8	6.8				30.1		181.2	20.9	
	(3501)	(7206)				(2183)		(50)	(26)	
1989	9.5	6.2				12.2	108.3	25.8	17.5	
	(3216)	(7868)				(1542)	(280)	(301)	(290)	
1990	7.6	1.8		59.5		5.0	28.9	16.7	7.8	
	(3587)	(5858)		(118)		(3975)	(1054)	(769)	(450)	
1991	7.0	1.7	11.3	30.4	18.3	1.6	15.4	18.3	5.0	14.7
	(3748)	(5929)	(18 302)	(377)	(214)	(5579)	(1775)	(1182)	(869)	(1828)

Mean cost/condom sold = 6 cents   Mean cost/condom sold = 15 cents
Mean duration of programmes = 5 years   Mean duration of programmes = 2.9 years

[a] D = donated condoms; CP = commercially purchased condoms.
[b] Figures in parentheses are the numbers of condoms, which should be multiplied by 1000, sold per year.

vehicle) for outreach. The Nepal project relied on street-based outreach on foot, while the Slovenian project used a rented flat for most interactions. Salaries and supplies (e.g., needles and syringes) constituted the bulk of recurrent costs. The cost per client contact ranged from US$ 2.25 in Tacoma to US$ 3.21 in Khatmandu and US$ 12.59 in Ljubljana.

Provision of safe blood for transfusion

Case studies included two examples of national, centralized blood transfusion services: Uganda (16) and

Table 5: **The annual cost of providing STD treatment and prevention services (in US$, as of 1990)**

Location	Mozambique	Kenya	South Africa
Capital costs	0	3346	6654
	(0%)[a]	(5%)	(2%)
Recurrent costs	367 600	67 293	272 830
Salaries	23 960[b]	17 194	165 624
	(7%)	(24%)	(59%)
Other costs	343 640	50 099	107 206
	(93%)	(71%)	(39%)
Total costs	367 600	70 684	279 484
	(100%)	(100%)	(100%)
No. of visits	38 867	1276	27 506
Cost per visit	9.46	55.39	10.16

[a] Percentages of the total costs are given in parentheses.
[b] Only salaries of support and administrative staff are included in this figure; clinic staff costs were included within the other costs' category.

Zimbabwe (D. Connolly, personal correspondence, 1992). The third case study was drawn from a hospital-based service in Monze, Zambia (S. Foster & A. Buve, unpublished data, 1992). Under this type of strategy, blood required for hospital inpatients was collected only when required, so the costs for recruitment, collection, storage and transportation were low. However, blood is usually not available for emergency transfusions and safety measures may be less extensive than centralized services (in Monze, blood was screened only for HIV and not for hepatitis B or syphilis). In all three examples, blood was screened anonymously and donors were not informed of the result of the test.

Table 6: **The annual costs of programmes preventing unsafe drug use behaviours (in US$, as of 1990)**

Location	Nepal	Slovenia	USA
Capital costs	0	0	6009
	(0%)[a]	(0%)	(4%)
Recurrent costs	7333	18 889	140 517
Salaries	3567	13 575	97 813
	(49%)	(72%)	(67%)
Other costs	3766	5314	42 704
	(51%)	(28%)	(29%)
Total costs	7333	18 889	146 526
	(100%)	(100%)	(100%)
No. of client contacts	2287	1500	65 000
Cost per client contact	3.21	12.59	2.25

[a] Percentages of the total costs are given in parentheses.

The costs of ensuring a safe blood supply in the services studied are shown in Table 7. The total cost per unit of blood produced ranged from a low of US$ 20.90 in the hospital-based service to US$ 34.50 and US$ 51.60 for the Zimbabwean and Ugandan blood transfusion services, respectively. The cost of HIV safety per unit produced can be calculated by adding the costs of HIV testing materials, staff time, laboratory overheads, and the replacement costs of blood discarded because of a positive test. For comparative purposes, the Ugandan blood usage rate was scaled up to reflect per capita blood use at the Zimbabwean rate, and the cost of HIV safety per capita calculated.

Discussion

Methodological shortcomings

A number of potential methodological shortcomings need to be borne in mind in interpreting and discussing the results. These concern the accuracy of the data obtained, the valuation on inputs in a common currency, and the potential generalizability of the results.

The accuracy of the reported data is difficult to estimate. There were no standard definitions of cost categories or systematic ongoing data collection in most case studies reviewed. Hence cost analysis involved the imposition of a costing framework on diversely organized data sets, often developed retrospectively by the project coordinators. Without site visits, we were unable to verify independently the

Table 7: The annual cost of providing a safe blood supply (in US$, as of 1990)

Location	Uganda	Zambia	Zimbabwe
Cost per unit produced	51.6	20.9	34.5
Cost of HIV safety per unit produced:			
Counselling	—	—	0.21
HIV screening	5.7	5.1	2.1
Confirmatory tests	—	—	0.23
Replacement of infected blood	7.6	4.0	1.3
Total	13.3	9.1	3.9
Donor HIV seroprevalence	20%	20%	3.8%
Units produced per year	11 410	1500	60 000
Units produced per capita of population (for national programmes only)	7/10 000 pop.	N/A[a]	61/10 000 pop.
Cost of HIV safety per capita of population (assuming blood usage at Zimbabwe rate)	0.078	N/A	0.024

[a] N/A: not applicable.

data provided. However, whenever possible, uncertainties were clarified by telephone with local staff.

The conversion of all costs to constant US$ using the 1990 exchange rates and US consumer price indices may have under- or overestimated the real value of inputs, especially labour, in developing countries. However, the lack of purchasing power parity data necessitated this approach. This problem is by no means unique to this study.

A number of factors might limit the generalizability of the results. An attempt was made to include a reasonably representative set of programmes, but ultimately case studies were included primarily on the basis of availability of data and therefore reflect a convenience sample which may be subject to selection bias. It is possible that programmes with better cost data are better organized and more efficient than is generally the case. The feasibility and costs of interventions will be influenced by the political and economic climate and the geographical and social accessibility of target groups in the country, as well as by the local price structure and degree of development of the infrastructure that the project can draw on (*17*).

Nevertheless, the scanty published data on similar types of intervention for other diseases do indicate a range of costs of similar orders of magnitude. For example Shepherd (*18*) compared the costs of two mass education campaigns for diarrhoeal disease control in the Gambia and Honduras. Total costs per annum were US$ 233 322 and US$ 422 500 respectively, which are similar to those found here for mass strategies to promote safer sexual behaviour. A school-based hygiene promotion campaign in Indonesia cost US$ 1.87 per pupil-year of education (*19*), which is similar to that found in the SEAPP project. Comparison of the case studies of STD treatment and prevention services with available data on the costs of an outpatient visit in developing countries (averaging around US$ 5 to 7 in 1988 prices, Barnum & Kutzin, unpublished data, 1993) suggests that the case studies are of similar magnitude but on the expensive side.

Influence of strategy

The costs of programmes to promote safer sexual behaviours through mass strategies are highly variable. Costs per capita in the Gabon project (US$ 0.32) were considerably higher than in the Dominican Republic (US$ 0.06), but total costs were similar, suggesting economies of scale resulting from different population sizes. The number of people reached through a mass media campaign, however, is often difficult to quantify. The higher cost per pupil-year of education for the school education

project reflects the greater intensity of contact under this type of programme.

Large variations in costs and the quality of mass media campaigns have been documented for similar interventions aimed at breast-feeding (4) and oral rehydration (18). Production costs have been found to vary from US$ 175 to 50 000 for one hour of television (20), and although production costs for radio are considerably cheaper, the latter may still vary two- to threefold between countries (21). Broadcasting costs are highly variable and may be very low or free in countries with state-run broadcasting systems or laws requiring commercial stations to provide free airtime for educational programmes (e.g., Brazil). At the opposite extreme, projects may have to purchase time at normal advertising rates on private commercial networks at an exorbitant cost. Several studies document convincing changes in knowledge and attitudes regarding safer sexual behaviours as a result of mass strategies (22), but the evidence for changes in behaviour is less convincing (5).

The promotion of safer sexual behaviours and provision of condoms through person-to-person contact are for obvious reasons more expensive per contact than mass media campaigns. Factors influencing the cost of the former include the total number of persons targeted and the social and geographic accessibility of the target groups. The difference in cost per condom distributed between the Cameroon and Zimbabwean projects may also partly have been because of the charge for condoms distributed in Cameroon, and hence a lower demand.

In condom social marketing programmes, costs appeared to decline significantly as the projects progressed, and began to level out after 3–5 years. The high costs in the initial years were due to the start-up costs for baseline market research, project design and project launch, as well as the low numbers of condoms sold. Unit costs dropped sharply as condom sales began to rise. Although the mean cost per condom sold was significantly less in low-income countries (US$ 0.06) than in low-middle-income countries (US$ 0.15), this was probably because of the longer mean age of projects in low-income countries (5 years as against <3 years for low-middle-income countries).

There was also considerable variation in condom social marketing costs between projects of similar age, which was attributable partly to market size and, probably more importantly, to the condom-source model used. The model used in Indonesia involved the importation of condoms by a private partner via commercial channels and the use of donor funds to build the market through advertising and promotion. A second model, used in Mexico, Ecuador and Morocco, involved initial donation of condoms, with a switch to commercial purchase over three to five years. The final model (in Bolivia, Côte d'Ivoire, Dominican Republic, Ecuador, Ghana, Morocco, Zaire and Zimbabwe) used only donated condoms. Data were not sufficient to detect any difference in unit costs between primarily contraceptive and primarily HIV-prevention programmes, but these could feasibly have existed.

Price can have a significant impact on per capita sales and the potential for cost recovery. The price of condoms (expressed as a proportion of a daily wage) accounts for a large proportion of the variation in per capita sales across programmes (23). Such an effect suggests that price must be kept as low as possible to generate sufficient demand among target consumers while at the same time allowing some form of cost recovery if sustainability and self-sufficiency is to be achieved. The Indonesian DuaLima Red condom project is currently self-sufficient and the Moroccan and Mexican projects are likely to become so in the near future. It is unlikely, however, that projects in most low-income countries will become self-sustaining in the foreseeable future, as they lack a well-developed commercial infrastructure, access to foreign exchange and/or the potential for cost recovery. Cost recovery, volume of sales, and wastage rates (which are likely to vary according to price) must all be carefully considered and balanced in project planning and management.

The cost per visit for STD services was in the US$ 10.00 range for non-targeted programmes, regardless of whether they were horizontally or vertically structured, but the data are inadequate to compare these alternatives. The far higher cost per visit for the targeted intervention in Nairobi reflects the relatively small target population, with only 1270 visits to the service per year. Applying an epidemiological model of HIV transmission to Kenyan data, Moses et al. (12) argued that for US$ 8.00 to 12.00, an intervention targeted at a high frequency core transmitter group could prevent one case of HIV. It is important to emphasize, however, that most of this effect is related to the use of condoms and not directly to the diagnosis and treatment of conventional STDs. The authors argued, however, that in the absence of effective and accessible health services, it is unlikely that clients would be as receptive to the programme's efforts in health education and promotion.

The variations in costs per client contact for prevention of unsafe drug use behaviours are likely to primarily reflect differences in the length of operation of the projects and resulting numbers of clients. The Tacoma needle exchange project had been in operation for five years, while the Khatmandu sterile needle exchange and the Ljubljana stigma projects

had been operational for only 1 year and 5 months, respectively, at the time data were collected. Similarly, unit costs would be expected to vary with different sizes of IVDU populations in the area served.

The costs of providing safe blood for transfusion in different countries appear to depend on a number of fairly easily identifiable factors, and have been well described elsewhere (24). The Ugandan costs (total per unit produced and of HIV safety per unit produced) are highest partly because of the high capital costs incurred in setting up the programme from nothing, but also because of the high HIV seroprevalence in the donor population. While the total cost per unit in Zimbabwe is higher than in Zambia (Monze), the cost of HIV safety is considerably lower. This difference is likely to be attributable to the substantially lower HIV seroprevalence amongst Zimbabwean donors, as well as economies of scale associated with bulk testing in Zimbabwe.

The principal factors affecting the costs of providing safe blood for transfusions would thus appear to be, firstly, the HIV seroprevalence among blood donors. This is in turn dependent on the overall population prevalence and the way in which donors are recruited. Secondly, the structure of the blood transfusion service (whether it is hospital-based or centralized) appears to be important. The relative costs of these two approaches may vary depending on national geography and transportation infrastructure, availability of skilled technical staff, minimal acceptable quality guidelines and rural/urban differences in HIV seroprevalence. Other factors affecting blood safety costs include the size of the blood transfusion service, since economies of scale are likely to exist, and the blood-testing protocol used (i.e., whether or not donors are informed of their results, and thus require pre-and post-test counselling).

Comparisons between strategies

The current poor level of knowledge about effectiveness of HIV prevention strategies allows us only to make rough comparisons of the cost by process indicator, such as cost per condom distributed and cost per person reached by educational campaigns. The degree to which such process indicators reflect effectiveness in terms of numbers of cases of HIV prevented is open to question. Comparing programmes which involve condom distribution shows a broad range of costs per condom distributed for person-to-person initiatives (US$ 0.10 to 0.70), while condom social marketing projects operating for three years or longer have a narrower and clearly lower range of costs (US$ 0.02 to 0.18). Person-to-person peer-education programmes were more expensive per educational contact (US$ 0.47 to 3.73) than the

school education programme (US$ 0.15 assuming 9 classes per year), but cheaper than needle exchange/bleach provision programmes (US$ 2.25 to 12.59).

However, comparisons using common process measures of effect may be inappropriate if they do not reflect the principal aim of the intervention. For example, although the number of condoms distributed by person-to-person education projects was measured, this was not the primary objective of the strategy. A comparison with condom social marketing, which measures success by numbers of condoms sold, may thus be unfair.

Moreover, strategies involving educational contact, such as mass-media and person-to-person interventions, vary significantly in the intensity, and probably also the quality, of contact established. Hence, their effect on behaviour is also likely to differ. Furthermore, the effectiveness of either strategy is dependent on the relative risk of the person contacted, and this clearly differs between, for example, schoolchildren and vulnerable groups such as prostitutes and intravenous drug users. Strategies which involve condom distribution through social marketing appear cheaper than person-to-person education, but it is not known whether socially marketed condoms reach the same vulnerable groups targeted in person-to-person campaigns, or if wastage rates are lower if condoms are purchased rather than received free. Different strategies displace the costs onto the recipients of services to different degrees. Because we have only measured the costs incurred by providers, programmes which involve cost-sharing may seem more efficient than they really are.

Conclusion

Governments and donors currently face significant problems in deciding on the appropriate allocation of resources between various HIV prevention strategies. Economic evaluation is just one tool which can help policy-makers to make these decisions. The current absence of a common output or effectiveness measure renders rigorous comparisons between different strategies impossible.

Cost-effectiveness analysis thus still represents a significant gap in HIV research which will be filled only by a concerted reorientation of evaluative efforts over a number of years. This analysis, however, has provided a preliminary insight into the financial costs and output of a sample of HIV prevention projects which will help funding agencies, national governments and project workers to plan and budget for future activities. It also allows an estimation of the relative cost per process measure of effect for strategies which have in common either personal education or condom distribution.

Furthermore, this study suggests a research agenda for the economic evaluation of HIV prevention strategies. Firstly, much effort is needed to build on this groundwork in order to develop a database of costs which could help guide the planning, management and evaluation of HIV prevention projects at district, national and international levels. Multiple national research initiatives would circumvent some of the weaknesses associated with the valuation of inputs (such as exchange rates) and programme effectiveness in different environments, but require costly duplication of research efforts. An international database could provide estimates of the total costs and cost structures of strategies, which could then be interpreted in the light of prevailing local conditions. Requiring the collection of cost data in project evaluations would help other projects and also allow programme planners and managers to make better informed decisions when reviewing programme performance or when initiating programme expansion.

Secondly, we would hope this analysis gives impetus to efforts to use cost data in conjunction with epidemiological simulation models in order to model the cost-effectiveness of alternative strategies. As more data on behavioural change and transmission dynamics accumulate, these new findings could be used to further refine the models. Such an approach seems the only realistic way to estimate and compare cost-effectiveness in the immediate future.

Résumé

Le coût des stratégies de prévention de l'infection à VIH dans les pays en développement

Des études de cas représentatives de six grandes stratégies de prévention de l'infection à VIH ont été sélectionnées dans quatre groupes de population dans des pays de niveaux économiques différents (faibles revenus, tranche inférieure des revenus intermédiaires, tranche supérieure des revenus intermédiaires, anciennes économies socialistes). Ce choix a été effectué en tenant compte de la disponibilité des données, de l'efficacité des programmes et des possibilités de généralisation. Les données relatives aux coûts ont été extraites de la littérature ou obtenues directement auprès des coordinateurs de projets à l'aide d'un questionnaire normalisé. Seuls les coûts du secteur public ont été inclus dans l'analyse après avoir été convertis en dollars des Etats-Unis aux taux de 1990 pour faciliter les comparaisons.

Les coûts des programmes d'éducation de masse visant à favoriser les comportements sexuels à moindres risques sont extrêmement variables ($US 0,06 à 0,32 par personne); le coût total et le coût unitaire sont du même ordre de grandeur que pour les campagnes entreprises dans les médias pour lutter contre les maladies diarrhéiques. Les économies d'échelle peuvent être importantes et dépendent de la taille des populations. La promotion des comportements sexuels à moindres risques et la fourniture de préservatifs à l'occasion de campagnes d'éducation personnalisée semblent plus coûteuses ($US 0,47 à 3,73 par personne contactée), mais cette stratégie permet probablement un meilleur contact. Les coûts dépendent de la taille et de l'accessibilité du groupe cible.

Lorsque les préservatifs sont distribués dans le cadre de campagnes de commercialisation à but social, le coût unitaire diminue à mesure que le projet avance. Le coût de chaque préservatif vendu ($US 0,02 à 0,30) dépend aussi de la taille du marché et du mode d'acquisition des préservatifs, les coûts les plus faibles étant observés lorsque le secteur public est associé à des partenaires du secteur privé. Lors de l'établissement du prix, il faut trouver un compromis entre le recouvrement des coûts (qui a des incidences sur la viabilité du projet) et le taux de couverture (un prix élevé peut avoir un effet dissuasif, tandis qu'un prix dérisoire favorise le gaspillage).

Les services de traitement et de prévention des maladies sexuellement transmissibles se sont révélés plus coûteux ($US 9,46 à 55,40 par visite) que ne le laissaient prévoir les données disponibles sur le coût des soins de santé primaires dans les pays en développement, ce qui donne à penser que les études de cas retenues étaient particulièrement coûteuses. Mais ces services, en plus de prévenir l'infection à VIH, guérissent aussi des maladies qui ont leur propre morbidité et mortalité.

Il est normal que le coût unitaire initial de la prévention des comportements à risque chez les utilisateurs de drogues grâce à des programmes

d'échange d'aiguilles et de distribution de désin-
fectant soit élevé, car il faut du temps pour recru-
ter la clientèle cible. En fait, ces coûts ont varié
de $US 2,25 à 12,59 par contact. La fourniture de
sang non contaminé est le seul exemple de stra-
tégie dont le coût unitaire varie notablement selon
le niveau de prévalence, car une prévalence éle-
vée augmente le coût de remplacement des lots
de sang contaminé. Des économies d'échelle sont
certainement possibles pour les programmes
nationaux. Certains programmes réalisés à l'éche-
lon hospitalier peuvent être moins coûteux, mais
la qualité risque d'en souffrir.

Cette analyse ouvre la voie à l'élaboration
d'une base de données sur le coût des stratégies
de prévention qui servira de guide pour la planifi-
cation, la gestion et l'évaluation des interventions
au niveau local, national et international. Elle per-
mettra aussi d'évaluer le coût relatif, en fonction
des résultats obtenus, des différents modèles de
mise en œuvre des stratégies fondées sur la dis-
tribution de préservatifs ou l'éducation. Enfin, elle
donne des informations qui pourront être utilisées
à l'avenir dans des modèles de simulation épidé-
miologiques pour estimer le rapport coût/efficacité
d'un projet.

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