



Cost-effectiveness of HIV/AIDS Front-line Services



Question

What is the cost-effectiveness of services (e.g. prevention, counseling) typically provided by front-line HIV/AIDS organizations?

Key Take-Home Messages

- There is no one-size-fits-all cost-effective HIV strategy. An intervention that is found to be effective at preventing HIV infection has a good chance of being cost-effective due to the averted high costs associated with treating HIV over an individual's lifetime.
- Structural prevention interventions are most cost-effective in populations where HIV prevalence is low (1). Far-reaching prevention interventions for low-prevalence groups would need to be relatively inexpensive in order to be cost-effective (2).
- Targeted prevention interventions that focus on behavior change are most cost-effective among populations where HIV prevalence is high (1). More expensive targeted campaigns for groups such as MSM and IDU can be an effective allocation of resources since they target populations with high HIV prevalence (2).
- HIV counseling and testing is generally cost-effective among infected or high-risk populations (3).
- Cost-effectiveness is not the only factor to consider when developing policy and allocating resources. Although a program may be cost-effective, the up-front costs associated with employing the program may be higher than is realistically possible to fund (4).
- Most cost-effectiveness studies are US-based and may not be translatable to policy decisions and resource allocation in the Canadian context due to different HIV prevalence rates, different front-line service costs, and different costs associated with treating a person living with HIV over a lifetime.

EVIDENCE INTO ACTION

The OHTN Rapid Response Service offers HIV/AIDS programs and services in Ontario quick access to research evidence to help inform decision making, service delivery and advocacy. In response to a question from the field, the Rapid Response Team reviews the scientific and grey literature, consults with experts, and prepares a brief fact sheet summarizing the current evidence and its implications for policy and practice.

Suggested Citation:

OHTN Rapid Response Service. *Rapid Review: Cost-effectiveness of HIV/AIDS front-line services*. Ontario HIV Treatment Network, Toronto, ON, January, 2010

Program Leads / Editors:

Michael G. Wilson, PhD
Jean Bacon
Sean B. Rourke, PhD

Contact:

rapidresponse@ohntn.on.ca

The Issue and Why It's Important

Good HIV policy relies upon employing the most cost-effective interventions, so as to maximize limited resources. The front-line services/interventions provided by community-based HIV/AIDS organizations fall into four main areas: 1) prevention, 2) testing/diagnosis, 3) counseling/case management, and 4) services, programs and integrated service delivery models.

Cost-effectiveness is formally measured in a number of different ways. Some analyses are retrospective, while others project the probability of a hypothetical situation being cost-effective while controlling for a number of variables. In most of the analyses, a cost-effectiveness threshold is determined and a ratio is calculated to measure the amount of money spent or saved in relation to a given marker (e.g. quality of life years).

In most cases, interventions were found to be cost-effective because they prevented HIV infection, thereby preventing the costs associated with managing HIV over a person's lifetime.

What We Found

Prevention

Prevention strategies may be employed at the structural, biomedical, individual or community level and they can focus on behavior change, medical regimens or on increased knowledge exchange. A review of 16 prevention interventions by Pinkerton et al (2002) found that HIV/AIDS prevention interventions are generally a cost-effective allocation of resources. Although the cost-effectiveness of each intervention varied, small group, community-level and outreach-based sexual risk reduction interventions were found to be highly cost-effective whereas other interventions such as a 1-day workshop for adolescents, were not as cost-effective.

A study by Cohen et al (2004) compared various prevention interventions and determined that structural interventions were cost-effective in populations where HIV prevalence was low (1). In contrast, targeted interventions that focused on behavior change were most cost-effective among populations where HIV prevalence was high(1). Overall, school-based HIV prevention campaigns were the least cost-effective strategy, while showing videos on HIV in STD clinics were found to be the most cost-effective strategy(1).

Further analysis by Cohen et al (2005) of national prevention initiatives in the US determined that government spending would be most effective if it were allocated to a combination of nine prevention interventions that covered both low-prevalence and high-prevalence groups (2). Far-reaching prevention interventions for low-prevalence groups would need to be relatively inexpensive in order to be cost effective. Meanwhile, more expensive targeted campaigns for groups such as MSM and IDU (including partner notification initiatives and needle exchange programs) can be an effective allocation of resources since they target populations with high HIV prevalence (2).

The most cost-effective interventions included condom promotion campaigns and post-exposure prophylaxis, in specific populations. Comparing cost-effectiveness between different interventions was challenging due to the different methodologies and models used in each cost-effectiveness analysis. Another study by Pinkerton et al (2001) showed how league tables can be

useful in helping to make comparisons across prevention interventions, using cost-effectiveness ratios (5). They suggest making separate league tables for each population and each category of intervention that is being studied (5). Even then, few comparisons can be accurately made. However, these analyses can aid with the prioritization and allocation of resources.

Large prevention initiatives that target high-risk individuals (such as prevention referrals) can be very costly, but are cost-effective when the high-risk population is large in size (6). Overall, targeted initiatives that focus on high-risk populations are a cost-effective allocation of resources in the prevention of HIV (7). For example, the NIMH multisite HIV prevention intervention focuses on sexual risk reduction among men and women who are at high risk of contracting HIV using small-group cognitive-behavioural therapy program and found that it was cost-effective among high-risk women and was even more cost-effective among high-risk men (8).

Community-level prevention campaigns have also been shown to be cost-effective since resources are used to reach a large number of people. A review by Pinkerton et al (2002) showed that the per-person cost of these broad campaigns is relatively low, making them a cost-effective strategy (10). Since an averted HIV infection prevents high medical costs, these campaigns may also be cost-saving (10). Cost-effective community-level prevention interventions include small-group counseling sessions; testing, counseling and partner notification programs; and antiretroviral treatment to prevent mother-to-child transmission (10).

People Who Inject Drugs

Despite the controversy around Vancouver's supervised injection site (SIS), recent analysis has shown it to be a cost-effective HIV prevention initiative (9). Bayoumi et al. 2008 found that SIS decreased the long-term costs of treating HIV and also increased life expectancy (9). Moreover, the cost savings of averting one HIV infection was found to be \$20,100 CAD and the cost savings of averting one hepatitis C infection was \$444,500 CAD (9). Even if the site is only used by a small number of individuals, the cost savings and health benefits are found to be cost-effective (9).

The Streetworks needle exchange program in Edmonton has also been found to be a cost-effective initiative as the discounted cost per case of HIV averted, amounts to less than the cost of managing a case of AIDS (11). For every case of HIV infection that was delayed for a year, cost-effectiveness was measured at \$9,500 CAD (11).

The North Carolina Cooperative Agreement site (NC CoOp) is a prevention intervention for substance abusers who are out of treatment and who are at risk for HIV. In comparing the use of the standard 2-session education and counseling intervention to a more personalized enhanced intervention, both programs reduced days of drug use (12). However, the increased cost of the enhanced intervention is still outweighed by the benefits of the reduced days of drug use, thereby yielding cost-effectiveness ratios which show that the enhanced program is cost-effective to employ (12).

Women

The WINGS program in the US is a prevention intervention that targets urban women who are at high risk for HIV. The program was evaluated by comparing

costs with the number of averted cases of HIV and the authors concluded that it was likely cost-effective, preventing 0.2195 cases of HIV at a cost of \$215,690 per case that was prevented (13). The inclusion of condom use skills in the intervention was highlighted as being a particularly cost-effective aspect of the prevention program (13).

Although the HIV prevalence rate among women is on the rise in the southern US, this population is broad and the overall prevalence rate is still low. Thus, structural prevention interventions that target this entire population have been found to be the most cost-effective use of resources (14). Although all structural interventions that were looked at were determined to be cost-effective relative for treating HIV over a lifetime, mass media campaigns, access to condoms and alcohol taxation were highlighted as the most cost-effective allocation of resources (14).

Lastly, Holtgrave and Kelly (1996) found a behavioural prevention program aimed at improving condom use in high-risk urban women to be cost-effective at a cost of just \$2,000 per each quality adjusted life year saved (15).

MSM

Behavioural interventions that specifically target gay men have been determined to be cost-effective for preventing HIV. For example, a multi-session educational workshop in the US that focused on education, self-management, sexual assertion, and social support networks cost \$24,000 and when compared to the estimated medical costs of HIV (\$42,000), was found to be cost-saving (16). The initiative was shown to save 5.5 discounted quality adjusted life years (16).

The Mpowerment Project is an HIV prevention intervention that targets young gay men and has been found to be cost-effective. The program has been estimated to prevent 5.0 to 6.2 HIV infections over 5 years, at a societal cost of \$14,600-\$18,300 (over 5 years) per case averted (17). Moreover, the cost of preventing a case of HIV with this program was determined to be far less than the cost of managing HIV over the course of a person's lifetime (17).

Skills training for men who have sex with men has also been found to be both an effective and cost-effective strategy for preventing HIV transmission as the cost of the intervention is less than the projected medical costs for someone living with HIV/AIDS (18). This kind of intervention is cost-saving since the cost per quality adjusted life year was found to be negative (18).

Peer leaders among men who have sex with men are also a cost-effective prevention strategy. This community-level intervention used social networking and cost \$65,000 per HIV infection that was averted (19).

At a recent conference in Toronto, Ontario, Jonathan Anderson discussed the following cost-effectiveness findings for various HIV prevention strategies for MSM in Australia: 1) expenditures on needle syringe programs should be increased rather than decreased because increased spending actually saves more money, 2) early treatment initiation was more cost-effective than other later initiation strategies when prevention benefits were taken into account, 3) intermittent pre-exposure prophylaxis was more likely to be cost-effective than continuous post-exposure prophylaxis regimens, 4) circumcision among MSM is a cost-effective strategy, but involves large up-front costs that may make it an unrealistic strategy to employ, 5) non-occupational prophylaxis was determined to be not cost-effective (4).

References

1. Cohen DA, Wu SY, Farley TA. Comparing the cost-effectiveness of HIV prevention interventions. *Journal of acquired immune deficiency syndromes* 2004;37:1404-14.
2. Cohen DA, Wu SY, Farley TA. Cost-effective allocation of government funds to prevent HIV infection. *Health Affairs* 2005;24:915-26.
3. Farnham PG, Pinkerton SD, Holtgrave DR, Johnson-Masotti AP. Cost-effectiveness of counseling and testing to prevent sexual transmission of HIV in the United States. *AIDS and Behavior* 2002;6:33-43.
4. Anderson J. Is it worth it? Using evidence on cost-effectiveness to inform priorities for HIV prevention and care. 2009.
5. Pinkerton SD, Johnson-Masotti AP, Holtgrave DR, Farnham PG. Using cost-effectiveness league tables to compare interventions to prevent sexual transmission of HIV. *AIDS* 2001;15:917-28.

Youth

HIV prevention interventions among youths include school-based intervention, individual-focused interventions, and community-level interventions. School-based interventions are relatively inexpensive, whereas individual-focused interventions have high per capita costs (20). Community-level interventions can have relatively high or relatively low costs per capita, depending on a variety of factors, including whether or not they target specific risk groups (20). School-based interventions are likely to be less cost-effective than campaigns that specifically target at-risk youth; however, the long-lasting and far-reaching effects of their influence on behavioural development should not be overlooked (20). For example, Safer Choices, a school-based prevention program, was found to be cost-effective and cost-saving for its ability to prevent HIV, other STDs and pregnancy (21).

A cost-effectiveness study on Teens Linked to Care – a behavioural prevention intervention for youths living with HIV/AIDS – was successful in preventing HIV transmission and was found to be cost-effective as the costs of the intervention were less than the costs that would have been incurred to treat a new case of HIV (22). In addition, 82% of the participants decreased their sexual risk behaviours and 31% decreased their substance use behaviours, resulting in 2.02 new infections averted for every 1000 youths living with HIV/AIDS over a 3 month period (22).

Co-morbidities

There is very limited information not only about the effectiveness but also the cost-effectiveness, of behavioural interventions for preventing HIV among people with severe mental illness. An assessment of the first generation of prevention initiatives returned some positive results but cost-effectiveness varied drastically (23). In comparing three behavioural change initiatives, advocacy training was determined to be the most cost-effective among men with severe mental illness as compared to a single-session behavioural intervention and a one-on-one intervention (23). However, the single-session behavioural intervention and the one-on-one intervention were also found to be cost-effective (23). In contrast, only the single-session behavioural intervention was determined to be cost-effective among women (23). A similar study conducted by Pinkerton et al (2001) found that small-group interventions involving sexual communication, condom use skills and safer sex motivation strategies were marginally cost-effective among people with severe mental illness, particularly among women who are at high-risk of contracting HIV (5).

Testing/Diagnosis

HIV counseling and testing has been found to be generally cost-effective among infected or high-risk populations and it is recommended that such programs be employed in tandem with other prevention approaches (3).

As compared to traditional HIV counseling and testing programs, rapid testing programs are generally more cost-effective. However, when focusing only on HIV positive individuals, rapid testing and counseling may not be more cost-effective as individuals who test negative will be informed of their status at the first visit during rapid testing whereas individuals who test positive will be told their status at the first visit during rapid testing and then asked to return to receive confirmatory test results (24). As Farnham et al. (1996) point out, rapid testing is not more cost-effective than current general counseling and testing

6. Heumann KS, Marx R, Lawrence SJ, Stump DL, Carroll DP, Hirozawa AM et al. Cost-effectiveness of prevention referrals for high-risk HIV-negatives in San Francisco. *AIDS care* 2001;13:637-42.
7. Kahn JG. The cost-effectiveness of HIV prevention targeting: how much more bang for the buck? *American Journal of Public Health* 1996;86:1709-12.
8. Pinkerton SD, Holtgrave DR, Johnson-Masotti AP, Turk ME, Hackl KL, DiFranceisco W. Cost-effectiveness of the NIMH multisite HIV prevention intervention. *AIDS and Behavior* 2002;6:83-96.
9. Bayoumi AM, Zaric GS. The cost-effectiveness of Vancouver's supervised injection facility. *CMAJ* 2008;179:1143-51.
10. Pinkerton SD, Johnson-Masotti AP, Holtgrave DR, Farnham PG. A review of the cost-effectiveness of interventions to prevent sexual transmission of HIV in the United States. *AIDS and Behavior* 2002;6:15-31.
11. Jacobs P, Calder P, Taylor M, Houston S, Saunders LD, Albert T. Cost effectiveness of Streetworks' needle exchange program of Edmonton. *Canadian Journal of Public Health* 1999;90:168-71.
12. Zarkin GA, Lindrooth RC, Demiralp B, Wechsberg W. The cost and cost-effectiveness of an enhanced intervention for people with substance abuse problems at risk for HIV. *Health services research* 2001;36:335-55.
13. Chesson HW, Greenberg JB, Hennessy M. The cost-effectiveness of the WINGS intervention: a program to prevent HIV and sexually transmitted diseases among high-risk urban women. *BMC Infectious Diseases* 2002;2:24.
14. Cohen DA, Wu S, Farley TA. Structural interventions to prevent HIV/sexually transmitted disease: are they cost-effective for women in the Southern United States? *Sexually Transmitted Diseases* 2006;33:S46-S49.
15. Holtgrave DR, Kelly JA. Preventing HIV/AIDS among high-risk urban women: The cost-effectiveness of a behavioral group intervention. *American Journal of Public Health* 1996;86:1442-5.
16. Holtgrave DR, Kelly JA. Cost-effectiveness of an HIV/AIDS prevention intervention for gay men. *AIDS and Behavior* 1997;1:173-80. Kahn JG, Kegeles SM, Hays R, Beltzer N. Cost-effectiveness of the Mpowerment Project, a community-level intervention for young gay men. *Journal of acquired immune deficiency syndromes* 2001;27:482-91.

17. Pinkerton SD, Holtgrave DR, Valdiserri RO. Cost-effectiveness of HIV-prevention skills training for men who have sex with men. *AIDS* 1997;11:347-57.
18. Pinkerton SD, Holtgrave DR, Di-Franceisco WJ, Stevenson LY, Kelly JA. Cost-effectiveness of a community-level HIV risk reduction intervention. *American Journal of Public Health* 1998;88:1239-42.
19. Pinkerton SD, Cecil H, Holtgrave DR. HIV/STD prevention interventions for adolescents: Cost-effectiveness considerations. *Journal of HIV/AIDS Prevention and Education for Adolescents and Children* 1998;2:5-31.
20. Wang LY, Davis M, Robin L, Collins J, Coyle K, Baumler E. Economic evaluation of Safer Choices: A school-based human immunodeficiency virus, other sexually transmitted diseases, and pregnancy prevention program. *Archives of pediatrics & adolescent medicine* 2000;154:1017-24.
21. Lee MB, Leibowitz A, Rotheram-Borus MJ. Cost-effectiveness of a behavioral intervention for seropositive youth. *AIDS education and prevention : official publication of the International Society for AIDS Education* 2005;17:105-18.
22. Johnson-Masotti AP, Weinhardt LS, Pinkerton SD, Otto-Salaj LL. Efficacy and cost-effectiveness of the first generation of HIV prevention interventions for people with severe and persistent mental illness. *Journal of Mental Health Policy and Economics* 2003;6(1):23-35.
23. Farnham PG, Gorsky RD, Holtgrave DR, Jones WK, Guinan ME. Counseling and testing for HIV prevention: costs, effects, and cost-effectiveness of more rapid screening tests. *Public Health Reports* 1996;111:44-53.
24. Shrestha RK, Clark HA, Sansom SL, Song B, Buckendahl H, Calhoun CB et al. Cost-effectiveness of finding new HIV diagnoses using rapid HIV testing in community-based organizations. *Public Health Reports* 2008;123:94-100.
25. Phillips KA, Fernyak S. The cost-effectiveness of expanded HIV counselling and testing in primary care settings: A first look. *AIDS* 2000;14:2159-69.
26. Resch S, Altice FL, Paltiel AD. Cost-effectiveness of HIV screening for incarcerated pregnant women. *Journal of acquired immune deficiency syndromes* 2005;38:163-73.

programs if individuals who test positive are not given this information at the first visit.(24).

Another study on rapid testing by Shrestha et al (2008) looked at cost-effectiveness of rapid testing in community-based organizations in both clinic and outreach settings (25). While both settings had different costs associated with rapid testing they were successful in identifying new HIV infections (25). In the clinical setting, the cost per new infection identified was \$3,637 USD, compared to \$13,448 and \$16,985 in the outreach settings (25). The cost of identifying HIV infection in the outreach setting was much higher than in the clinic setting due to added costs associated with operating a mobile testing program (25).

A study by Phillips et al (2000) determined that routine testing and counseling is the most cost-effective strategy for identifying HIV infections with a cost of \$4,200 per identified HIV infection (26). Moreover, offering testing to only those patients who identify risk factors was also found to be cost-effective (26).

A study of incarcerated pregnant women compared the cost-effectiveness of mandatory screening of newborns, voluntary prenatal screening, and routine prenatal screening. Where voluntary newborn screening has been used, switching to routine prenatal screening has only a small effect on the number of HIV infections that are averted (27). Where there was no screening in place, employing routine prenatal screening significantly reduced HIV infections among infants, which thereby saved medical costs associated with treating an infant with HIV (27).

Rapid point-of-care (POC) testing for improving the management of HIV and other STIs among female sex workers has also been found to be cost-effective (28). Lastly, for the HIV-1 RNA assay and third generation HIV-1 EIA assay, the p24 antigen EIA was determined to be the most cost-effective for use in an expanded HIV testing program (29).

Counseling/Case Management

Counseling and testing intervention programs have been found to be cost-effective among HIV-infected and high-risk individuals (3). These programs should be employed along with interventions that are aimed to reduced sexual risk (3). Rapid counseling and testing programs may be more cost-effective than other testing strategies (24). A study in the US found that routine testing for HIV without pre-test counseling is the most cost-effective screening approach (26). However, other strategies that employ pre-test activities such as obtaining risk history information, may also be cost-effective in certain circumstances (26). Partner notification also prevents infections and is a cost-effective strategy (30).

In the prevention of mother-to-child transmission of HIV, voluntary counseling and testing for couples has been found to decrease the number of infants becoming infected with HIV and is also more cost-effective than individual counseling when HIV-1 prevalence is high (31)

Counseling and testing for inmates who are soon to be released from US prisons can identify current infections and prevent new infections. Although this strategy costs the prisons a considerable amount of money, it saves society enough money to be deemed a cost-effective strategy (32).

An antiretroviral adherence counseling program for men who have sex with men

has been shown to not only improve treatment adherence, but to also cost less than \$50,000 USD per quality of life year that is gained from the program (33).

A recent study explored the effectiveness and cost margins of a case management community care program at an AIDS Service Organization in Toronto, Ontario and determined that investing in case managers for PHAs who were accessing support services reduced per annum costs by \$3,300 per person, as compared to self-directed access, suggesting that a case management program would therefore essentially pay for itself within six months (34).

Services, Programs and Integrated Service Delivery Models

Antiretroviral Adherence

A US study found that adding a nursing intervention to standard issued care improved antiretroviral adherence in HIV positive patients who were either initiating or changing antiretroviral therapy or who had a history of problems with adherence, thereby postponing the use of advanced lines of treatment which are generally more expensive (35).

Moderate effectiveness of even a relatively expensive adherence program may positively impact survival and be cost-effective compared to other services (35;36).

Integrated Care

An integrated care program for people with HIV, chronic mental illness and substance use disorders may yield important benefits but the cost-effectiveness and impact on quality of life of such programs has not yet been determined (37).

Factors that May Impact Local Applicability

Many of the front-line initiatives that have been analyzed for their cost-effectiveness have been employed in the United States. Therefore, the costs associated with the initiatives, as well as the costs that are saved by preventing a case of HIV over a person's lifetime, must be adjusted to Canadian estimates. Furthermore, resource allocation and prevalence rates may vary regionally and nationally, making policy and resource allocation decisions very challenging.

What We Did

To identify any systematic reviews we first conducted hand searches of the reviews and protocols from the HIV/AIDS Cochrane review group and hand searched www.health-evidence.ca (reviewed all references in the 'HIV' category under focus of review and the 'community', 'community health centre' and 'community/recreation centre' categories under Intervention Location). To locate additional literature we then searched the Cochrane Library (includes reviews but also clinical trials and economic evaluations) by combining 'cost-effect*' and 'HIV' as search terms. We then searched Medline (1996 to October week 2, 2009) using the following terms: (HIV or Acquired Immunodeficiency Syndrome) [entered as MeSH terms] AND (cost-effectiveness) [entered as a text term]. From this, 362 titles and abstracts were reviewed to identify articles for this summary. We also identified additional relevant articles by checking reference lists and conducted related article searches in PubMed.

27. Vickerman P, Watts C, Peeling RW, Mabey D, Alary M. Modelling the cost effectiveness of rapid point of care diagnostic tests for the control of HIV and other sexually transmitted infections among female sex workers. *Sexually Transmitted Infections* 2006;82:403-12.
28. Coco A. The cost-effectiveness of expanded testing for primary HIV infection. *Annals of Family Medicine* 2005;3:391-9.
29. Varghese B, Peterman TA, Holtgrave DR. Cost-effectiveness of counseling and testing and partner notification: A decision analysis. *AIDS* 1999;13:1745-51.
30. John FN, Farquhar C, Kiarie JN, Kabura MN, John-Stewart GC. Cost effectiveness of couple counselling to enhance infant HIV-1 prevention. *International Journal of STD and AIDS* 2008;19:406-9.
31. Varghese B, Peterman TA. Cost-effectiveness of HIV counseling and testing in US prisons. *Journal of Urban Health* 2001;78:304-12.
32. Zaric GS, Bayoumi AM, Brandeau ML, Owens DK. The cost-effectiveness of counseling strategies to improve adherence to highly active antiretroviral therapy among men who have sex with men. *Medical Decision Making* 2008;28:359-76.
33. Husbands W, Browne G, Caswell J, Buck K, Braybrook D, Roberts J et al. Case management community care for people living with HIV/AIDS (PLHAs). *AIDS care* 2007;19(8):1065-72.
34. Freedberg KA, Hirschhorn LR, Schackman BR, Wolf LL, Martin LA, Weinstein MC et al. Cost-effectiveness of an intervention to improve adherence to antiretroviral therapy in HIV-infected patients. *Journal of acquired immune deficiency syndromes* 2006;43:S113-S118.
35. Goldie SJ, Paltiel AD, Weinstein MC, Losina E, Seage GR, Kimmel AD et al. Projecting the cost-effectiveness of adherence interventions in persons with human immunodeficiency virus infection. *American Journal of Medicine* 2003;115:632-41.
36. Weaver MR, Conover CJ, Proescholdbell RJ, Arno PS, Ang A, Uldall KK et al. Cost-effectiveness analysis of integrated care for people with HIV, chronic mental illness and substance abuse disorders. *The journal of mental health policy and economics* 2009;12:33-46.