The Economic Cost of HIV/AIDS in Canada

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BACKGROUND

This report was undertaken to provide an updated estimate of costs related to HIV/AIDS in Canada, with a particular focus on the costs of treatment and costs associated with loss of productivity for lost work hours. It is a follow-up document to the 2001 study The Cost of HIV/AIDS in Canada by Colin Dodds, MA, Ronald Colman, PhD, Carol Amaratunga, PhD, and Jeff Wilson, BES, GPI Atlantic: http://www.gpiatlantic.org/pdf/health/costofaids.pdf

The report is to be shared with other non-government and government organizations working in the field of HIV/AIDS, and with members of the Canadian AIDS Society, who are primarily community-based AIDS organizations whose mission is to provide care, treatment, prevention and support services to people living with and affected by HIV/AIDS.

INTRODUCTION

Canadian AIDS Society: About Us

The Canadian AIDS Society (CAS) was created in 1986 and serves as a national coalition of over 120 community-based AIDS service organizations across the country from St. John's to Victoria and from Windsor to Yellowknife. Our mission is to strengthen the response to HIV/AIDS across all sectors of society and to enrich the lives of people and communities living with HIV/AIDS. We advocate on behalf of people and communities affected by HIV/AIDS, facilitate the development of programs, services and resources for our member groups, and provide a national framework for community-based participation in Canada's response to HIV/AIDS.

HIV/AIDS Primer

The Human Immunodeficiency Virus (HIV) attacks healthy immune system cells and destroys or severely impairs their function. Initial infection is followed by progressive deterioration of the immune system leading to immune deficiency. The immune system is considered deficient when it can no longer effectively fight diseases and prevent infections. Infections that occur due to HIV are known as opportunistic infections because they take advantage of a weakened immune system (World Health Organization, 2011).

In contrast, Acquired Immunodeficiency Syndrome (AIDS) is a surveillance term. The definition has been determined by the US Centers for Disease Control and Prevention (USCDC) and by the European Centre for the Epidemiological Monitoring of AIDS (Euro HIV). In Canada, AIDS is diagnosed if a person has undergone testing for HIV and received a positive result and has one or more of the clinical illnesses, or indicator diseases, that characterize AIDS (Canadian AIDS Society, Centre for Infectious Disease Prevention and Control, 2002). The majority of people begin to experience symptoms of an HIV infection within 5-10 years of having contracted the virus[1]. However, the time between HIV infection and an AIDS diagnosis can be 10–15 years and is often much longer for most people. Anti-retroviral therapy (ART) is effective in retarding disease progression by decreasing an infected person's viral load (number of infected cells in a drop of blood).

HIV can be transmitted in many ways. However, transmission requires that the following five conditions be adequately met:

1. There must be a source of infection: the virus must be present in certain bodily fluids, such as, blood, semen, vaginal fluid, or breast milk.
2. There must be a means of transmission: specific types of sexual activity, unclean needles (and other situations involving piercing of the skin), mother-to-child transmission (in uterus, during birth or breastfeeding) or blood transfusions.
3. There must be a host susceptible to infection: the virus is harmless until it finds susceptible cells within a host body. Every human being is considered to be a host susceptible to infection.
4. There must be an appropriate route of entry to the target cells of the body: the HIV-susceptible cells must be reachable by infected blood, semen, vaginal fluid or breast milk. This usually happens via a break in the skin or through mucosal membranes of bodily cavities.
5. There must be a sufficient level of virus delivered to establish infection: because of a higher concentration of virus, some body fluids are efficient media for transmitting HIV (semen, vaginal fluid, blood, breast milk), while others are not (urine, saliva, tears). The viral load also plays a role in judging sufficiency of HIV(Canadian AIDS Society, 2005).

According to estimates by The World Health Organization and UNAIDS, there were 33,300,000 PLWHIV/AIDS at the end of 2009. That same year, 2.6 million people became newly infected with HIV and 1.8 million people died of AIDS, of which 260,000 children. Two thirds of all HIV infections are in sub-Saharan Africa. In Canada, there have been 69,844 positive reports of HIV since 1985 (Public Health Agency of Canada, 2010).

1 Some common symptoms of HIV are fatigue, severe weight loss, swollen glands, white coating on tongue, purple spots on the skin in certain areas, etc.

Approximately 26% of people living with HIV/AIDS in Canada are not aware of their HIV positive status .(Public Health Agency of Canada, 2010). In 2009, 2,417 Canadians were diagnosed with HIV. On average in Canada, approximately 12 are infected every day.

For epidemiological and policy purposes, the Public Health Agency of Canada has divided the HIV positive population according to specific exposure categories. The specific populations are:

- Men who have sex with men (MSM)
- Intravenous drug users (IDU)
- Men who have sex with men (MSM) / Intravenous drug users (IDU)
- Blood/blood product recipients
- Heterosexuals
  - Via sexual intercourse
  - From HIV endemic countries
- Perinatal transmission (due to pregnancy)[2]

At the end of 2009, MSM accounted for the greatest proportion of positive HIV test reports made in Canada (56.4%) since 1985. Women represent a growing proportion of positive HIV test reports (17.7%), as do Aboriginal people (12.5%). In contrast, Aboriginal people comprise only 3.8% of the Canadian population. Within the Aboriginal community, youth represented 32.6% of new infections within their community, marking an acute rise (Public Health Agency of Canada, 2010).

HIV/AIDS Treatment

There is no known cure for HIV/AIDS. Currently, medications are only able to significantly slow down the progression of HIV's effects on the immune system. The accepted treatment guidelines prescribe the use of highly active anti-retroviral therapy (HAART) or anti-retroviral therapy (ART), a combination treatment using multiple medications simultaneously to reduce viral presence in the blood. This is accomplished by impeding the reproductive cycle of the virus.

Potency of the combinations under HAART guidelines rises as the health status declines and the virus forms a resistance to the medication. First-line combinations are the primary prescriptions given to new HIV/AIDS patients, unless their individual condition requires more serious treatment immediately. Due to the formation of resistance to first-line treatments, more powerful second-line treatments are prescribed. The progression times from first to second-line treatment are highly variable. Many factors are associated with an increased risk of treatment failure, including baseline patient factors, such as:

- previous treatment failure
- drug resistance
- poor treatment adherence
- anti-HIV medications poorly absorbed by the body
- other illnesses or conditions
- poor health before starting treatment
- side effects of medications or interactions with other medications
- substance abuse leading to poor treatment adherence (National Institutes of Health, 2009).

Consistent adherence to a prescribed ART protocol has been proven to bring viral progression to a near halt (National Institutes for Health, 2008) As a result, PLWHIV/AIDS can live longer, more productive lives (World Health Organization, 2008).

The greater involvement of people living with HIV/AIDS (GIPA) reflects the needs of PLWHIV/AIDS to be

2 Exposure Categories have been determined by the Public Health Agency of Canada

meaningfully engaged in decisions that affect their lives. People living with HIV have been at the forefront of the response to HIV and AIDS and as such are expert actors in leading and developing responses in prevention, awareness and treatment.

In addition to ART, PLWHIV/AIDS need counselling and social support. Access to adequate nutrition, productive community participation and equal opportunity contribute toward improving the quality of life.

Public Sector Initiatives toward HIV/AIDS in Canada

The early days of the AIDS epidemic saw a lot of community mobilization; as the epidemic worsened, governments, including the federal government, became involved in tracking and responding to HIV/AIDS. By 1990 a National AIDS Strategy, representing an interconnected approach to HIV/AIDS, was funded, and since then the federal government has supported collaborations among community, researchers, government and people living with HIV/AIDS. The Federal Initiative to Address HIV/AIDS in Canada is the most recent federal government commitment to developing programs and policies focused on responding to HIV/AIDS in Canada. Federal action under the initiative is guided by the three principles:

1. Partnerships between federal, provincial, territorial and municipal departments; and engagement with voluntary, private and professional sectors.
2. Integration with other support programs to provide a rounded approach to program implementation.
3. Mutual accountability of the federal government and its partners through the annual world AIDS reports.

The plan identifies five areas of action to respond to HIV/AIDS: programs and policy interventions; knowledge development; communications and social marketing; coordination, planning, evaluation and reporting; and global engagement. With goals of preventing new transmissions and acquisition; slowing disease progression; reducing social and economic impact; and contributing to reduce the spread of HIV on a global basis, the Federal Initiative has strengthened the role of the federal government in the Canadian response to HIV/AIDS. (Government of Canada, 2004).

In 2005, the Canadian Public Health Association released Leading Together: Canada Takes Action on HIV/AIDS. This is a five-year plan, intended to serve as Canada's blueprint to fight the spread of HIV. It calls for the consolidated effort of government, community, research-groups and individuals involved in Canada's response to HIV/AIDS. Its vision statement, "The End of The Epidemic is in Sight", clarifies its goals (Canadian Public Health Association, 2005).

About this Report

The aim of this report is to update the 2001 estimates of the cost of HIV/AIDS to Canadian society from the last estimation (Dodds et al., 2001). It includes the current cost of treatment, productivity and quality of life losses related to HIV/AIDS over the lifetime of those infected in 2009[3].

There has been little economic research on the impact of HIV/AIDS in the last decade. As a result, the estimates that are currently available are not particularly useful in developing effective strategic policies. The purpose of this paper is to provide an updated estimate of the economic costs of HIV/AIDS in Canada. With respect to lack of research done in this area, the TD Bank Special Report states:

> in the absence of a proper accounting of the costs to industrialized nations of world poverty, instability, and hopelessness, humanitarian support [for HIV/AIDS] may be under-funded. Once these enormous economic costs are properly accounted for, there is a clear case for action (Drummond and Kelly).

To accomplish our goal of revising the cost estimates, we estimate the current direct and indirect costs included in the last cohort study, with the addition of the intangible cost of the reduced quality of life. In undertaking this analysis, not only do we update the 2001 cost figures, we provide a more comprehensive assessment of the burden of HIV/AIDS in Canada.

Discussion and Methods

In this section, we discuss two types of costs that may be considered (direct costs and indirect costs) as well as two different approaches to assess them (prevalence or incidence costing).

i. Direct and Indirect Costs

A cost study can include only direct costs, or it can take a broader, more inclusive, perspective and also include indirect costs. The direct costs of a medical condition include the resources used to treat that illness. Direct costs include prescribed medications, in-patient and out-patient care and the patient's out-of-pocket expenses. The patient's out-of-pocket expenses may include the cost of over-the-counter medications, co-payments for prescription medications and nutritional supplements, which are not covered by government or private health care plans. Cost-of-illness studies often only include treatment costs because these figures are, generally, readily available from government reports and professional publications.

The addition of indirect cost provides a more comprehensive estimate of the burden of a disease. Indirect costs account for the ramification of the illness on an individual's life and can include the impact on the individual's social network (i.e. their family and friends). The illness may require modifications to the work life and lifestyle of the individual and, perhaps, his/her family and friends. For example, an illness may mean that an individual must gradually withdraw from the workforce. As the illness progresses over time, a person may require caregivers, which may mean that family and/or friends must also gradually withdraw from the workforce to provide unpaid care to their loved one. The disease may eventually lead to the death of the individual when they would have otherwise lived into retirement and transitioned into voluntary work. An illness can also exact a toll on the individual's feeling of well-being and the enjoyment of their remaining years. The lost quality of life is an intangible cost of the disease, the value of which may also be estimated. The income foregone by the individual and his/her caregiver, their reduced voluntary service to the community and lost quality of life are as a result of the illness. They represent the ripple (or indirect) costs of the disease.

3 Henceforth, individuals who were infected with HIV in 2009 will be referred to as "recently infected individuals".

In this study, we attempt to capture some of the indirect costs of HIV/AIDS. We estimate the impact on patient's lifetime earnings, volunteerism and quality of life losses. Due to the lack of available data, our calculations do not include transportation costs or lost time to attend medical appointments, lost job opportunities, the economic impact on family members (such as lost pay or promotions due to work interruptions in order to provide care-giving activities), modifications of homes to extend independent living or changes in the use of social supports (i.e. decreased use of old age pension plans, increased use of social assistance, etc.).

ii. Prevalence versus Incidence costing

There are two types of cost-of-illness approaches: prevalence and incidence costing. Prevalence costing measures costs over a given period of time, usually one year, attributable to those who are currently living with a condition, regardless of the stage of the condition. Under this approach, direct costs and, if applicable, indirect costs incurred during the set study period are included. This approach requires data on the number of individuals with the condition by stage, health status and age, the number deaths related to the illness and the cost of treatment per stage of the illness. This approach presents several challenges for the cost analysis of HIV/AIDS. First, the number of deaths related to HIV/AIDS is under-reported. A significant percentage of HIV-positive individuals may die without health professionals ever knowing that they had HIV/AIDS; in addition, HIV/AIDS-related death is not a mandatory reportable variable (Public Health Agency of Canada, 2009). Second, although age-specific data are available for those testing positive each year, data on the age and stage of those currently living with HIV/AIDS are not[4]. This information is crucial for providing an adequate estimate of the cost of the disease.

An alternative to prevalence costing is incidence costing, given sufficient epidemiological information is available. Incidence costing measures the future cost of those newly diagnosed with a condition over a set period of time, usually one year. Under this approach, direct costs and, if applicable, indirect costs over the lifetime of those individuals are estimated. Future costs are discounted to account for the "time value of money[5]". Incidence costing requires data on the progression of the disease, survival rates, age at diagnosis, treatment costs by stage of the disease and the effect of the illness on lifetime earnings. This information is available in the professional and governmental literature; therefore, we elected to use incidence approach to estimate the cost of HIV/AIDS. We present all costs in 2009 Canadian dollars and discount future costs by 3% per year. All figures are approximate. For instance, percentages are rounded to the first percentage point.

Cost Estimation

We estimate the net present value of the economic loss attributed to those recently infected with HIV to be $4,031,500,000, or $1.3 million per person. Omitting quality of life lost for the sake of comparison, the current figures are about 22% higher than those estimated in 2001 after accounting for inflation[6]. Below, we discuss our costing methodology and discuss differences from the 2001 study. In Appendix A, we present a sensitivity analysis of our estimates.

4 Dodd et al. (2001) estimate the number of individuals at various stages of HIV/AIDS based on year of infection and estimating the progression rate of the infection. They do not mention whether they took into consideration that HIV-related deaths are under reported.

5 The term "time value of money" simply refers to the fact that people would willingly forgo cash in the future for a smaller amount now. How much less they would be willing to accept for now in lieu of the future payment would depend on the current interest rate, the inflation rate and the individual's level of impatience.

6 Dodds et al. (2001) use GDP per capita to estimate productivity losses. GDP per capita increased faster than the inflation rate between 2001 and 2009. If we substitute the 2009 GDP per capita into the 2001 estimation, the differences in the cost estimations falls to less than 1%.

Table 1: **Estimated Net Present Value of the Lifetime Economic Loss Attributed to All Those Who Tested Positive in 2008 (2009 $s)**

	Total Cost	Cost per person	Percentage of total
Health Care	$768,120,000	$250,000	19%
Labour productivity	$2,083,190,000	$670,000	52%
Quality of life	$1,180,180,000	$380,000	29%
Total	$4,031,490,000	$1,300,000	100%

i. Incidence of HIV infection by sex and age.

The Public Health Agency of Canada reported that in 2009 there were 2417 individuals who tested positive for HIV (Public Health Agency of Canada, 2010); however, they acknowledge the numbers are probably under-reported by about 27%[7] (Public Health Agency of Canada, 2003). In Table 2 below, we estimate that 3070 people actually contracted HIV in 2009 – 791 women, 2251 men and 28 others for whom their sex was not determined (i.e. 27% higher than the published number). Since only the age group of the person testing positive is published, we estimated the age at infection at the mid-points of each group, with three exceptions: for the "under 15" category, 14 years of age was used; for the "over 50 years" category, 60 years of age was used; where no age was given, the average of all age groups was used (32 years of age). In order to calculate costs, we assigned the 28 individuals for whom sex was not reported to sex categories based on the female to male ratio of the individuals for whom sex was known (i.e. 7 were assigned to the female category and 21 to the male).

Table 2: **Number of Individuals Testing Positive for HIV in 2009 Inflated by 27% to Account for Under-reporting, by Sex, Age Group and Approximate Age**

		Number			
Age Group	Age Estimate	Females	Males	Sex Unknown	Total
< 15 years	14	18	11	0	29
15 to 19 years	17	36	27	0	63
20 to 29 years	24	199	474	4	677
30 to 39 years	34	286	623	9	918
40 to 49 years	44	175	733	5	913
≥ 50 years	60	77	378	4	459
Age group not reported	32	0	5	6	11
Total		791	2,251	28	3,070

Source: Based on data from Public Health Agency of Canada, 2010.

ii. Life years lost by age and sex

Table 3 demonstrates that the impact of HIV on life years lost decreases as the age at infection increases. For example, 47 years of life are lost if a 15 year old boy were infected, while only eight years of life are lost if a 70 year old man were infected (Harrison et al., 2010). On average, women survive HIV/AIDS for two years longer than men, 24 years as opposed to 22 years (Harrison et al., 2010). The average life expectancy for those recently infected was estimated to be 59 years (up from 41 years in the 2001 study).

7 A 2010 publication from the Public Health Agency of Canada, (HIV/AIDS Epi Updates) has revised this estimation to 26%, however all calculations presented here use the 2003 estimate.

Table 3: **Estimated Life Years Lost due to HIV Infection by Age and Sex**

	Males			Females		
	Life Expectancy			Life Expectancy		
Estimated Age at Infection	General Population*	HIV**	Life Years Lost	General Population*	HIV**	Life Years Lost
14	78	36	42	83	38	45
17	78	39	39	83	41	42
24	78	46	32	83	48	35
34	79	56	23	83	58	25
44	79	66	13	83	68	16
60	82	71	11	86	75	11
32	79	54	25	83	56	27

Source: * Statistics Canada, CANSIM Table 1020504

** Harrison et al., 2010

iii. Health Care costs by stage of infection

Lopez-Bastida et al. (2009) estimate that 75% of the newly infected individuals will receive adequate health care treatment without delay, while the remaining 25% will either be unaware of their HIV-status (20% of total) or be aware of their status but will not access appropriate care (5% of total). Those who delay treatment are assumed to present for treatment only when the disease progresses to AIDS, eight years after they are infected. These individuals are expected to receive treatment for two year prior to succumbing to the disease in the tenth year (Smith et al. 2010).

Table 4: **Direct Health Care Costs**

Disease stage	Inpatient*	Outpatient*	Medications*	Out-of-pocket expenses**	Total	Years per Stage per Person #
Asymptom-atic HIV	$46	$1,638	$10,905	$1,865	$14,453	5
Symptomatic HIV	$461	$2,073	$12,447	$1,865	$16,846	5
AIDS***	$6179	$3,536	$12,927	$1,865	$22,642	12

Source: * Lopez-Bastida (2009) Additional file 4, except for AIDS stage.

** Williams (1996) as cited by Albert and Williams (1999).

*** Krentz and Gill (2006).

Assuming the individual presents for treatment immediately after they are HIV positive.

We estimate that the net present value of treating individuals with new HIV infections will be about $768,100,000 over their remaining lifetimes (or $250,000 per person) about 18% higher than the 2001 estimates after accounting for inflation. There are four main reasons for the difference in these estimates. First, people are surviving longer with HIV/AIDS than in the past; therefore, their course of treatment is longer. Second,

incidence of HIV infection is higher now than at the beginning of the century[8]. Third, we account for under-reporting of HIV infections. Fourth, we acknowledge that not everyone who contracts HIV will seek treatment immediately. While the first three reasons would each inflate our estimates compared to those in 2001, the latter one would deflate our estimates.

iv. Productivity losses

HIV has a significant impact on an individual's lifetime earnings since it generally affects people in their prime earning years. HIV may cause an individual to reduce their time spent working for three main reasons. First, a HIV infection leaves a person fewer healthy hours per week to spend working (Cunningham et al. 1999 and Rabkin et al. 2004). Second, the individual may succumb to the disease prior to reaching the age of retirement (Harrison et al., 2010). Third, since the individual will likely spend fewer years, if any, in retirement, they have a reduced need to work to save for retirement (Auld, 2002).

We assume that, were it not for the infection, those with HIV would have had the same attachment to the paid and unpaid work forces, and same earnings, as the average Canadian of the same age and gender. We estimate the value of volunteer time to be $12.46 per hour[9].

Those that receive immediate treatment for HIV are assumed to work about 58% of the average time as their age-sex counter-parts in the general population[10]; therefore, 62% of HIV/AIDS patients are assumed to be either unemployed or not looking for work[11]. We assume people living with HIV will not completely withdrawal from the paid and unpaid work force until they develop AIDS (Dodds et al. 2001). We assume that those who do not participate in treatment (25% of those with new HIV infections) will withdraw completely from the paid and unpaid workforce six years after contraction of the virus.

Table 5: **Net Present Value of Productivity Losses Attributed to All Those Who Tested Positive in 2008 (2009 $s)**

	Total Cost	Cost per person
Paid work	$2,038,570,000	$660,000
Unpaid work	$44,620,000	$10,000
Total	$2,083,190,000	$670,000

Sources: Participation in, and earnings from, paid work for the general population: Statistics Canada, Cansim Table 2820002.
Volunteer work participation by age: Hall et al., 2009.
Withdrawal from the work force: Dodds et al., 2001.
Labour participation of individuals with HIV: Rabkin et al., 2004.
Value of volunteer work: Chandler, 1994.

We estimate that the net present value of productivity losses, including paid and volunteer work, associated with new HIV infections will be about $2,083,200,000, or $670,000 per person. After adjusting the past estimates for inflation and the growth in GDP per capita, our estimates are 4% lower than the 2001 figures[12]. Productivity losses have decreased as survival rates for PLHIV/AIDS have improved.

8 In 1999 and 2000, 2190 and 2,099 individuals were reported testing HIV positive, as opposed to 2,636 and 2,417 in 2008 and 2009, respectively.
9 Our valuation of volunteer work is based on the average of the net opportunity, gross opportunity and replacement costs of household work in 2009 dollars (Chandler 1994).
10 Participation rates for those with HIV/AIDS were based on Rabkin et al. (2004). Participation and age-sex specific earnings information for the general population was obtained from Statistics Canada, Labour force survey estimates (LFS), by sex and detailed age group, annually, Cansim Table 2820002.
11 Cunningham et al (1999) estimate that 45% to 65% of all individuals living with HIV/AIDS are either unemployed or disabled.
12 We estimate the ratio of productivity losses the health care costs at 2.71. Dodds et al. (2001) estimated the ratio at 2.58.

v. Quality of life losses

The emotional trauma associated with HIV infection represents an additional cost that can sometimes overshadow the economic impact. Several studies find that emotional well-being of those with HIV deteriorates with respect to the general population much earlier than does their physical well-being. Emotional well-being of those with asymptomatic HIV, symptomatic HIV and AIDS are each significantly lower than the general population's; however, the physical health of those with asymptomatic HIV is not significantly different than the general population's (Hays et al, 2000). Rai et al (2010) and Lopez-Bastida et al (2009) find an inverse relationship between quality of life and the progression of illness. Individuals diagnosed with HIV are often affected by anxiety and depression (Hayes et al, 2000), which makes everyday life less enjoyable even in the absence of the symptoms of HIV/AIDS.

Aiken and Zamula (2009) estimate the average evaluation of one quality-adjusted life year (QALY)[13] lost is $50,000[14]. Hornberger et al. (2010) estimate 7.5 QALY are lost when adults contract HIV, while 19.9 QALY are lost when children contract HIV. We estimate that net present value of lost quality of life attributable to HIV will $1,180,200,000 over the lifetimes of those contracting the virus in 2009, or $380,000 per person.

Table 6: **Quality of Life Losses per Person**

Age Groups	Years lost*	Cost**
Less than 15	19.9	$995,000
Over 15	7.5	$375,000

Source: * Hornberger et al (2007)

** Based on Aiken and Zamula (2009)

Concluding Notes

In conclusion, this paper shows that health care and productivity costs associated with HIV/AIDS have, in total, increased since previous estimates by about 22%. Since 2001, increased survival rates have reduced productivity losses per person and increased the cost of health care per person with HIV/AIDS. The inclusion of quality of life years lost provides a more inclusive estimate of the burden of HIV/AIDS in Canada.

13 A QALY is equal to one for one year of perfect health. It is equal to zero if a person is dead. It is set between 0 and 1 for most other health states; however, it can be less than one for health states for which death would be more desirable.

14 The Aiken and Zamula (2009) study was based an analysis of jury awards for pain and suffering in non-fatal injury cases. They estimated the upper bound value to be $113,000 per QALY.

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APPENDIX A

Table A 1: **Sensitivity Analysis**

• Discount Rate: If a discount rate of 1% were used instead of 3%, the average total economic loss would increase to $1,660,000 per person; if 5% were used, the loss would be $1,080,000.
• Treatment participation: If 100% of those with HIV/AIDS participate in treatment, the total average economic loss per person would rise to $1,310,000 per person; if 50%, the loss would be $1,300,000. The total cost remains relatively stable with lower participation because the productivity losses offset health care cost savings.
• If those who do not present for treatment immediately (i.e. 25% of all those newly infected) presented when they become symptomatic (i.e. 5 years after infection) and were treated for five years before being treated for five years for AIDS, the cost per person would rise to $1,310,000.
• Treatment costs: If the health care costs were 25% higher, the cost per person would increase to $1,330,000; if they were 25% lower, the cost per person would decline to $1,290,000.
• Productivity losses: Cunningham et al. (1999) estimate that between 45% and 65% of those living with HIV/AIDS are unemployed or disabled. If 45% are assumed unemployed or disabled instead of 62%, the total cost per person would be $1,180,000; if 65% were assumed, $1,360,000.
• Value of unpaid work: If $18.30 (the upper bound cited in Dodds et al. (2001) after accounting for inflation) were used as an estimate of the value of volunteer work, the average total economic loss per person would be $1,320,000.
• Quality of life losses: Jury awards may underestimate the cost of pain and suffering (Aiken and Zamula, 2009). If the upper bound of $113,000 per QALY lost (Aiken and Zamula, 2009) were used instead, the total cost per person would be $1,790,000.