



National HIV Prevalence and Incidence Estimates in Canada for 2008

At a Glance

- More Canadians are living with HIV infection: an estimated 65,000 at the end of 2008 compared with 57,000 at the end of 2005.
- An estimated 2,300 to 4,300 new HIV infections occurred in 2008 compared with 2,200 to 4,200 in 2005.

Introduction

This *Epi Update* outlines the estimates of the total number of Canadians who were living with HIV infection (including AIDS) at the end of 2008 (prevalence) and the number of new HIV infections in 2008 (incidence). Estimates published in this report for the years before 2008 replace all previous estimates that we have published concerning HIV prevalence and incidence in Canada, because new data and methods have permitted an improved analysis of the epidemic and more reliable estimates. National estimates of HIV prevalence and incidence are an integral part of the work carried out by the Centre for Communicable Diseases and Infection Control (CCDIC). They are used as a tool to monitor the HIV epidemic and to help evaluate and guide prevention efforts, and they are part of ongoing risk assessment and management work conducted by the Centre. These estimates inform the work that the Public Health Agency of Canada and other federal departments perform under the *Federal Initiative to Address HIV/AIDS in Canada* and will also be used to guide the activities of all stakeholders in their common efforts to support *Leading Together: Canada Takes Action on HIV/AIDS*.

Methods

Methods to estimate prevalence and incidence at the national level are complex and contain a level of uncertainty. We used multiple methods to estimate national HIV prevalence and incidence in 2008, including the workbook method,¹ an iterative spreadsheet model² and two statistical modelling methods.^{3,4} The workbook method multiplies an estimated prevalence or incidence rate by an estimated population size, the statistical models back-calculate estimates of HIV incidence by relating the timing of HIV positive testing with the timing of HIV infection and testing behaviour, and the iterative spreadsheet model incorporates elements of the other two methods.

These methods were used to generate separate estimates of HIV prevalence and incidence in Ontario, Quebec, British Columbia, Alberta, Saskatchewan, and Manitoba, which together account for over 93% of the population of Canada and over 98% of reported HIV and AIDS diagnoses.

Estimates in each province were classified according to the following exposure categories:

- men who have sex with men (MSM)
- people who inject drugs (IDU)
- MSM-IDU

- heterosexual/endemic (non-IDU heterosexual with origin in a country where heterosexual sex is the predominant mode of HIV transmission and HIV prevalence is high, primarily countries in sub-Saharan Africa and the Caribbean)⁵
- heterosexual/non-endemic (heterosexual contact with a person who is either HIV infected or at risk of HIV, or heterosexual as the only identified risk)
- other (recipients of blood transfusion or clotting factor, perinatal and occupational transmission).

(For more information on risk exposure categories and the classification hierarchy, please refer to Appendix 1 in the HIV and AIDS in Canada Surveillance Report to December 31, 2008, available at: http://www.phac-aspc.gc.ca/aids-sida/publication/survreport/2008/dec/surveillance_2008_13-eng.php#Section_5_a1.)

The results of the different methods were averaged to obtain prevalence and incidence estimates specific to exposure category for each of the six provinces. HIV prevalence and incidence estimates for the remainder of Canada were extrapolated from these six provinces using national HIV surveillance data. The national surveillance data were obtained from the national HIV and AIDS surveillance reporting system⁵ with enhancements from two sources: the Laboratory Enhancement Study in Ontario,⁶ which has more complete information on the exposure category of HIV cases, and recently published surveillance data⁷ from Quebec on exposure category breakdown of cases newly diagnosed with HIV during 2002 to 2008.

Bounds of uncertainty for the national HIV estimates were developed on the basis of a conservative consideration of results from a variety of scenarios. Estimates of HIV prevalence and incidence among women and Aboriginal people were derived from the overall estimates obtained from the distributions of reported sex and Aboriginal status, by exposure category, in the national HIV and AIDS surveillance data. The number of undiagnosed individuals living with HIV infection was computed as prevalence less cumulative HIV diagnoses, adjusted for under- and duplicate reporting and mortality.

Results

HIV prevalence in 2008

At the end of 2008, an estimated total of 65,000 (54,000–76,000) people in Canada were living with HIV infection (including AIDS), which represents an increase of about 14% from the 2005 estimate of 57,000 (47,000–67,000) (Table 1). In terms of exposure category, prevalent infections in 2008 comprised 31,330 MSM (48%), 11,180 IDU (17%), 10,710 heterosexual/non-endemic (17%), 9,250 heterosexual/endemic (14%), 2,030 MSM-IDU (3%), and 500 attributed to other exposures (1%) (Table 1). The largest absolute increase was in the MSM exposure category with 3,630 more prevalent infections since 2005 (13% increase). There were an estimated 1,660 more prevalent infections in the heterosexual/non-endemic exposure category (18% increase), 1,390 more in the heterosexual/endemic category (18% increase) and 1,080 more among IDU (11% increase).

Table 1. Estimated number of prevalent HIV infections in Canada and associated ranges of uncertainty at the end of 2008 and 2005 (point estimates, ranges and percentages are rounded)

	MSM	MSM-IDU	IDU	Heterosexual/ non-endemic	Heterosexual/ endemic	Other	Total
2008	31,330	2,030	11,180	10,710	9,250	500	65,000
	(25,400- 37,200)	(1,400- 2,700)	(9,000- 13,400)	(8,300- 13,100)	(6,800- 11,700)	(300-700)	(54,000- 76,000)
%	48%	3%	17%	17%	14%	1%	
2005	27,700	1,820	10,100	9,050	7,860	470	57,000
	(22,400- 33,000)	(1,200- 2,400)	(8,100- 12,100)	(7,000- 11,000)	(5,800- 9,900)	(280-660)	(47,000- 67,000)
%	48%	3%	18%	16%	14%	1%	

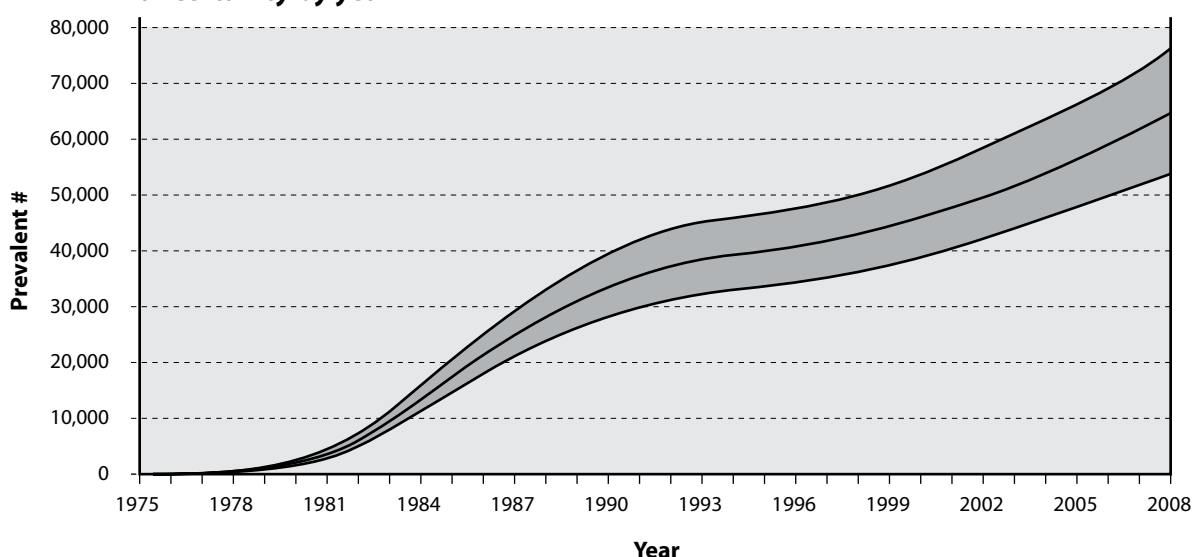
MSM: men who have sex with men; IDU: people who inject drugs; Heterosexual/non-endemic: heterosexual contact with a person who is either HIV infected or at risk of HIV or heterosexual contact as the only identified risk; Heterosexual/endemic: origin from a country where HIV is endemic; Other: recipients of blood transfusion or clotting factor, perinatal and occupational transmission

HIV prevalence: past trends

Prevalent infections (Figure 1) rose steadily during the 1980s, corresponding to the initial rise in HIV infection in the Canadian population, mainly among MSM. This rise slowed during the early to mid-1990s, likely as a result of both increased mortality and effective prevention

programs. Prevalent infections began to rise moderately in the late 1990s as a result of new treatments enabling individuals infected with HIV to live longer combined with continuing new infections.

Figure 1. Estimated number of prevalent HIV infections in Canada, including range of uncertainty by year



HIV incidence in 2008

The number of new infections in 2008 (estimated range between 2,300 and 4,300) was about the same as or slightly greater than the estimated range in 2005 (2,200 to 4,200) (Table 2). On examination of the estimates by exposure category, MSM continued to account for the greatest proportion of new infections (44%), which was only slightly lower than the estimated 45% in 2005,

although the range of new infections was the same (1,000 to 1,900) (Table 2). The new infections estimated among IDU increased from a range of 360 to 680 (16%) in 2005 to 390 to 750 (17%) in 2008. For the heterosexual/non-endemic exposure category, the range increased slightly from 440 to 820 in 2005 to 450 to 860 in 2008; however, the proportion (20%) was unchanged.

Table 2. Estimated ranges of uncertainty for number of incident HIV infections in Canada in 2008 and 2005 (ranges and percentages are rounded)

	MSM	MSM-IDU	IDU	Heterosexual/ non-endemic	Heterosexual/ endemic	Other*	Total
2008	1,000-1,900	50-130	390-750	450-860	370-690	< 20	2,300-4,300
%	44%	3%	17%	20%	16%		
2005	1,000-1,900	40-130	360-680	440-820	360-670	< 20	2,200-4,200
%	45%	3%	16%	20%	16%		

MSM: men who have sex with men; IDU: people who inject drugs; Heterosexual/non-endemic: heterosexual contact with a person who is either HIV infected or at risk of HIV or heterosexual contact as the only identified risk; Heterosexual/endemic: origin from a country where HIV is endemic; Other: recipients of blood transfusion or clotting factor, perinatal and occupational transmission

*New infections in the Other category are very few and are primarily due to perinatal transmission.

People from HIV-endemic countries continue to be over-represented in Canada's HIV epidemic. New infections attributed to the heterosexual/endemic exposure category increased slightly from a range of 360 to 670 in 2005 to 370 to 690 in 2008, although the proportion was unchanged (16%). Approximately 2.2% of the Canadian population were born in an HIV-endemic country according to the 2006 Census;⁸ therefore, the estimated new infection rate among individuals from HIV-endemic countries is at least 8.5 times higher than among other Canadians. With the current methods and available data, however, it is not

possible to differentiate infections acquired abroad from those acquired in Canada.

HIV incidence: past trends

Figure 2 presents the uncertainty range for estimated HIV incidence over time. New infections peaked during 1984–85, and this was primarily associated with the MSM population. The number of incident infections decreased steadily after 1985 until the mid-1990s, levelled off during 1996 to 1999, was followed by a slight increase during 1999 to 2002, and has levelled off again since 2002.

Figure 2. Estimated range of uncertainty (represented by vertical bars) in the number of new HIV infections in Canada for selected years

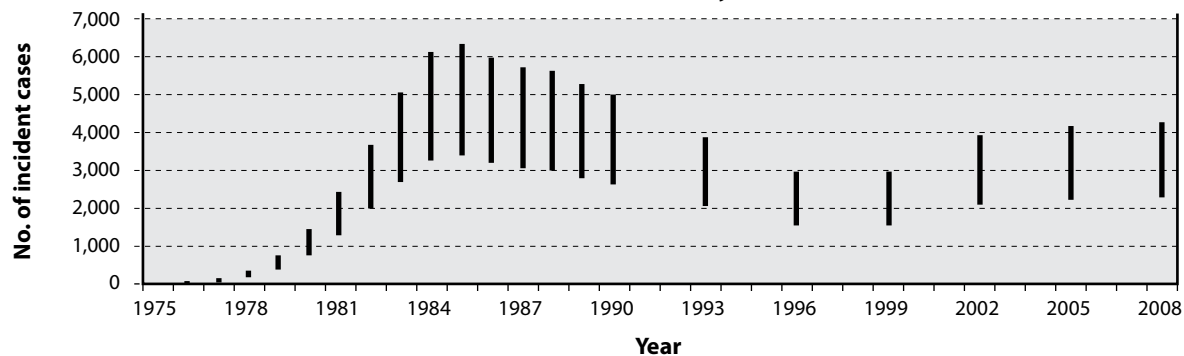
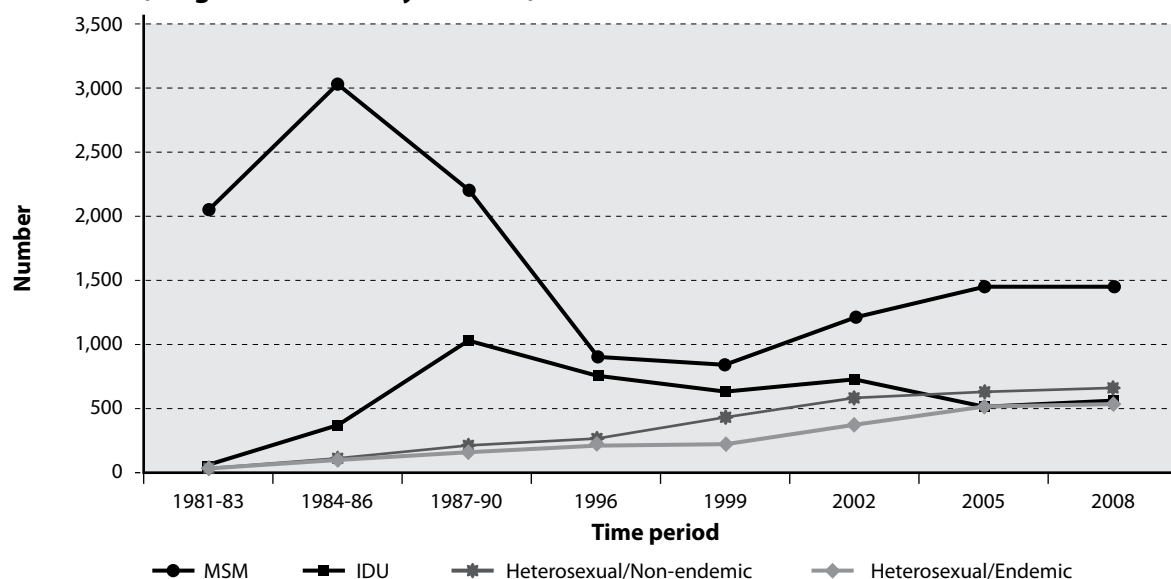


Figure 3 presents the estimated HIV incidence over time by exposure category. The number of incident infections among MSM reached a peak in 1984–86, decreased until 1999, and then increased before levelling off after 2005. The number of incident infections among IDU increased

to a peak during 1987–1990 and has shown a decreasing trend since then. The number of incident infections in both the heterosexual/non-endemic and heterosexual/endemic categories has increased gradually over time.

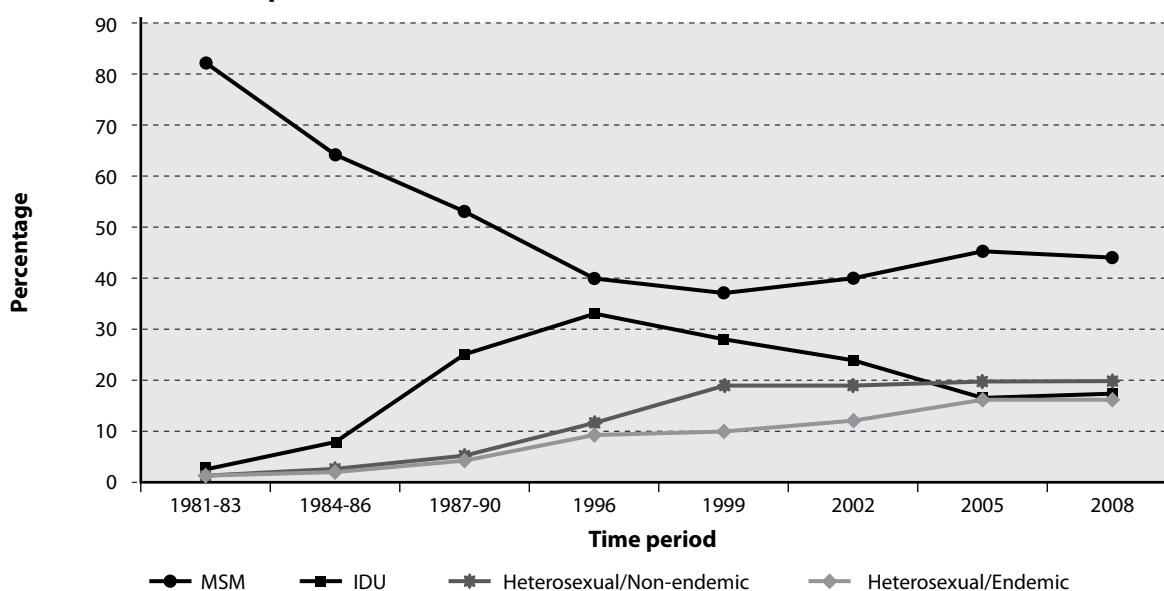
Figure 3. Estimated HIV incidence in Canada over time period by exposure category (range of uncertainty omitted)



The distribution of new HIV infections by exposure category has changed since the beginning of the HIV epidemic in Canada (Figure 4). At the early stage of the epidemic, almost all of the new infections (82%) were among MSM. In the mid-1990s, the majority of new infections occurred among MSM (40%) and IDU (33%),

and both the heterosexual/endemic and heterosexual/non-endemic categories accounted for around 10%. In 2008, the majority of new infections still occurred among MSM (44%), IDU accounted for 17%, heterosexual/endemic for 16%, and heterosexual/non-endemic for 20%.

Figure 4. Estimated exposure category distributions (%) of new HIV infections in Canada over time period



Trends among women

At the end of 2008, there were an estimated 14,300 (12,200-16,400) women living with HIV (including AIDS) in Canada, accounting for about 22% of the national total. This represents a 17% increase from the 12,200 (10,400-14,000) estimated for 2005. There were 600 to 1,120 new HIV infections among women in 2008, representing 26% of all new infections. For 2005, it was estimated that 590 to 1,100 new HIV infections occurred in women, accounting for about 26% of all new infections among women. With respect to exposure category, a slightly lower proportion of new infections among women was attributed to the heterosexual category in 2008 compared with 2005 (71% versus 73%), whereas a slightly higher proportion was attributed to IDU (29% in 2008 and 27% in 2005).

Trends among Aboriginal people

Aboriginal people continue to be over-represented in the HIV epidemic in Canada. An estimated 4,300 to 6,100 Aboriginal people were living with HIV in Canada in 2008, representing about 8.0% of all prevalent HIV infections. This is higher than the estimated 3,500 to 4,900 for

2005, which represented a slightly lower proportion (7.4%) of the epidemic. An estimated 300 to 520 new HIV infections occurred in Aboriginal people in 2008 (12.5% of all new infections). This is higher than the estimated 240 to 430 infections (10.5%) that occurred in 2005. Aboriginal people represented 3.8% of the Canadian population according to the 2006 Census.⁸ Therefore, the overall new infection rate among Aboriginal people is about 3.6 times higher than among non-Aboriginal people in 2008. The distribution of new infections in Aboriginal people by exposure category in 2008 was 66% among IDU, 23% among heterosexual, 9% among MSM, and 2% among MSM-IDU; the corresponding figures in 2005 were 63% among IDU, 24% among heterosexual, 11% among MSM, and 2% among MSM-IDU.

The proportion of new HIV infections in 2008 attributed to IDU was much higher among Aboriginal Canadians (66%) than among all Canadians (17%). This highlights the uniqueness of the HIV epidemic among Aboriginal people and underscores the complexity of Canada's HIV epidemic.

Undiagnosed HIV infections: the hidden epidemic

There have been 67,442 positive HIV tests reported to CCDIC since testing began in November 1985 up to December 31, 2008, which translates to about 70,400 after adjusting for underreporting and duplicates. Of these, we further estimate that approximately 22,300 have died. Thus, there were an estimated 48,100 (70,400 minus 22,300) Canadians living with HIV infection in 2008 who had been given a diagnosis of HIV (tested positive) and are therefore aware of their HIV status. Since there was an estimated total of 65,000 people living with HIV in Canada in 2008, the remaining 16,900 (range of 12,800–21,000) people, or 26% of prevalent cases, are unaware of their HIV infection. This figure is slightly less than the estimate of 27% of people who were unaware of their HIV status in 2005.

The estimated percentage of people living with HIV in 2008 who were unaware of their HIV status varies by exposure category. Approximately 19% of infected people in the MSM exposure category and 25% of infected people in the IDU exposure category were unaware of their HIV infection, whereas there was a much higher proportion (35%) in the two heterosexual exposure categories. These percentages correspond to an estimated 6,000 (4,500–7,500) people infected with HIV in the MSM exposure category, 2,800 (2,000–3,600) people infected with HIV in the IDU exposure category, and 7,000 (5,200–8,800) people infected with HIV in the combined heterosexual exposure category who were unaware of their HIV-positive status.

Discussion

Approximately 65,000 Canadians were estimated to be living with HIV infection at the end of 2008. This number will likely increase as new infections continue and survival improves as a result of new treatments, and this will mean increased future care requirements. The estimated number of new infections occurring in Canada in 2008 was about the same as or slightly greater than the estimated number for 2005. However, the range (2,300 to 4,300) for 2008 is very similar to the range for 2005 (2,200 to 4,200), and a more firm conclusion is that overall incidence is not decreasing.

Incidence in the IDU exposure category appears to be increasing slightly compared with the 2005 estimates. However, the HIV epidemic in this group shows different trends in different jurisdictions in Canada. In the majority of jurisdictions, the rates of reported newly diagnosed cases of HIV infection among IDU are stable or declining,⁵ which is consistent with the trend in most high-

income countries. The role of injecting drug use in national epidemics in Europe and the United States has dramatically declined over the course of the epidemic.⁹ In contrast, injecting drug use is the main HIV exposure category among Aboriginal persons in Canada, and this overlap group (persons who are both Aboriginal and who inject drugs) accounts for the majority of the increasing number of new diagnoses of HIV infection reported in the province of Saskatchewan.⁵

We found that HIV incidence among MSM increased between 1999 and 2005 but levelled off from 2005 to 2008. The re-emergence of the epidemic between 2000 and 2005 among MSM is clearly apparent in many high-income countries.^{9–11} Heterosexual HIV transmission (combined heterosexual/non-endemic and heterosexual/endemic) accounted for 36% of newly infected cases in Canada in 2008, which was in line with trends in Western Europe (29%)⁹ and very similar to the epidemic in the United States (slightly more than one in three new HIV infections).^{9,12}

A combination of methods was used during the estimation process in Canada, and a wide variety of data sources were included. However, the amount of data available was not always sufficient for the modelling to estimate exposure category numbers for all provinces. Several other limitations also need to be acknowledged. Estimates for the Aboriginal subpopulation relied on ethnic variables in the HIV and AIDS surveillance data that are not consistently reported at the national level. Information on risk factors in surveillance data was also incomplete, and this may have led to the misclassification of some cases. Furthermore, insufficient information was available to distinguish infections acquired outside Canada from those acquired within. Therefore, incidence as used in this report refers to a new infection appearing in Canada, either through transmission within Canada or the arrival of an HIV-positive individual from another country. CCDIC is currently working with its partners to obtain data that would allow for the separate modelling of domestically acquired infections and the subsequent addition of newly arrived infections to these estimates. Despite the limitations noted, we believe that these results portray a plausible picture of the epidemic in Canada at the end of 2008 and provide a robust foundation to guide the development of HIV/AIDS programs.

These national estimates do not necessarily reflect local trends in HIV prevalence and incidence. For example, we found that new HIV diagnoses in the IDU exposure category are stable or declining in the majority of jurisdictions; while a substantial increase in recent years has been seen in the province of Saskatchewan.⁵ Overall estimates may mask trends in subpopulations as well.

The estimates do not address all populations affected by the HIV/AIDS epidemic in Canada (such as prisoners), and the estimates are not stratified by age.

Aboriginal people and people from HIV-endemic countries continue to be over-represented in Canada's HIV epidemic. These findings highlight the need for specific measures to address the unique aspects of the HIV epidemic within certain subpopulations. For example, IDU is the main HIV exposure category among Aboriginal people, whereas heterosexual activity is the main risk for women and those from HIV-endemic countries. There also continues to be a sizeable number of people living with but unaware of their HIV infection. Until these people are tested and diagnosed, they are unable to take advantage of appropriate care and treatment services or to receive counselling to prevent further spread of HIV.

To successfully control the HIV epidemic in Canada, more effective strategies are needed to prevent new infections and provide services for all of the key populations identified in the *Federal Initiative to Address HIV/AIDS in Canada*. In addition, there is an increasing need to improve the availability and quality of data to better understand and monitor the full scope of the HIV epidemic in Canada.

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Mission

To promote and protect the health of Canadians through leadership, partnership, innovation and action in public health.

Public Health Agency of Canada

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