SUMMARY: ESTIMATES OF HIV INCIDENCE, PREVALENCE AND CANADA'S PROGRESS ON MEETING THE 90-90-90 HIV TARGETS, 2016

PROTECTING AND EMPOWERING CANADIANS TO IMPROVE THEIR HEALTH

Public Health Agency of Canada
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To obtain additional information, please contact:

Public Health Agency of Canada
Address Locator 0900C2
Ottawa, ON K1A 0K9
Tel.: 613-957-2991
Toll free: 1-866-225-0709
Fax: 613-941-5366
TTY: 1-800-465-7735
E-mail: hc.publications-publications.sc@canada.ca

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SURVEILLANCE AND EPIDEMIOLOGY DIVISION | PROFESSIONAL GUIDELINES AND PUBLIC HEALTH PRACTICE DIVISION | CENTRE FOR COMMUNICABLE DISEASES AND INFECTION CONTROL | PUBLIC HEALTH AGENCY OF CANADA

BACKGROUND

Estimating national HIV incidence, prevalence and progress on the 90-90-90 targets are activities that are undertaken globally to monitor HIV epidemics and to guide prevention and control programs. These estimates support all partners and stakeholders to have a better understanding of key populations and locations where action is needed to reduce the public health impact of HIV and AIDS.

Understanding HIV incidence, the rate at which new infections occur, is critical for tracking the leading edge of the epidemic. It also supports the development of programs and policies that strengthen prevention, enhance testing, and contribute to monitoring and evaluating the impact of multi-sectoral public health actions. Estimating HIV prevalence, the number of people living with HIV (both diagnosed and undiagnosed), is critical for guiding the planning and investment for treatment, care and ongoing support for people living with and affected by HIV and AIDS.

The Joint United Nations Programme on HIV/AIDS (UNAIDS) and the World Health Organization have established a global health sector strategy on HIV that includes global targets to generate momentum towards the elimination of AIDS as a public health threat by 2030.[a] Canada has endorsed this strategy, including the specific set of 90-90-90 targets that by 2020, 90% of all people living with HIV know their status, 90% of those diagnosed receive antiretroviral treatment, and 90% of those on treatment achieve viral suppression.

To guide Canada's efforts, a framework entitled 'Reducing The Health Impact of Sexually-Transmitted and Blood-Borne Infections in Canada by 2030: A Pan-Canadian Framework for Action'[b] was developed by the Public Health Agency of Canada. The framework sets out an overarching and comprehensive approach to address sexually transmitted and blood-borne infections, including HIV, and is composed of 26 opportunities for action that can be informed by the 90-90-90 estimates.

This report provides an update for 2016 on Canada's estimates of national HIV incidence and prevalence and on progress towards meeting the UNAIDS 90-90-90 targets. Reporting on these targets supports a pan-Canadian multi-sectoral response to HIV/AIDS in which this information can be used in new ways to help guide HIV prevention and care work.

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[a] UNAIDS. 90-90-90 An Ambitious Treatment Target to Help End the AIDS Epidemic. Geneva, Switzerland: Joint United Nations Programme on HIV/AIDS; 2014.

[b] Centre for Communicable Diseases and Infection Control. A Summary of the Pan-Canadian Framework on Sexually-Transmitted and Blood-Borne Infections. Canada Communicable Disease Report (CCDR). 2018; 44 (7/8):179–81

METHODS

The Public Health Agency of Canada worked closely with provinces, territories and other government departments to develop the national estimates of HIV incidence, prevalence and 90-90-90 measures for 2016[c] using statistical modelling methods and available information in each jurisdiction.

HIV estimates related to incidence, prevalence and the first 90-90-90 target were developed using HIV surveillance data reported by provinces and territories, estimated deaths among persons living with HIV, and back-calculation statistical modelling methods. Additional detail on these methods is provided in Appendix 1.

The development of estimates for the second and third 90-90-90 targets required additional information from the provinces and territories, including the following where available:

- Centralized HIV care program data, including linked treatment and laboratory viral load data;
- Provincial antiretroviral drug prescription data linked to HIV laboratory data;
- Unlinked data from drug prescription databases, laboratories, and HIV clinics;
- Cohorts of diagnosed persons engaged in HIV care.

Standard definitions for each of the 90s measures were developed and used where possible (Appendix 2). However, in some instances, definitions were adapted by jurisdictions to account and adjust for differences in the definitions of "on treatment" and "suppressed viral load". Measures were refined through an iterative process with provinces and territories, particularly where adjustments were necessary to account for uncertainty due to incomplete or lack of representative data. The national estimates were developed by weighting and rolling-up consensus-based estimates from each jurisdiction.

Data systems, type of data available, and the capacity to link information from different sources vary across jurisdictions. The measures developed through this process should therefore be interpreted within the context of plausible ranges around each estimate, which reflect inherent uncertainty as a result of these measurement considerations and limitations.

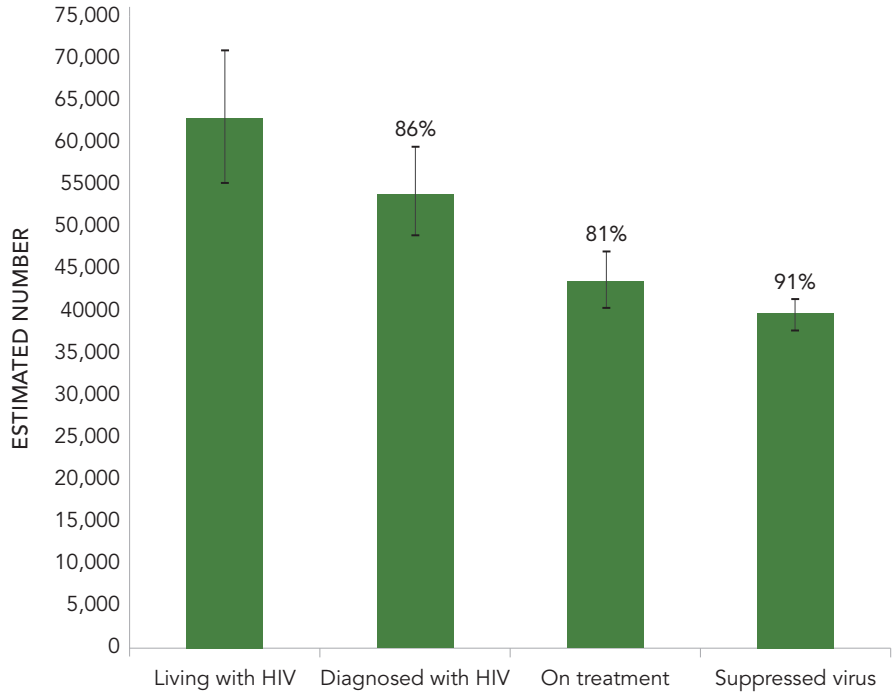
Estimates published in this report replace all previous estimates published by the Agency concerning HIV incidence, prevalence and 90-90-90 targets in Canada. The 2016 estimates should not be compared directly with previously published estimates: assumptions, methodologies and data used to produce the estimates have changed because our knowledge of the epidemic has improved and the primary data provided by the provinces and territories for use in the model have been refined. Revisions to the methodology and data mean that estimates for past years in this report may differ from previously published estimates, and comparisons of estimates for 2016 with past years should only be done with the estimates presented in this report.

[c] Estimates are being published for 2016 since that is the most recent year for which complete HIV surveillance data are available. 2017 data will be available towards the end of 2018.

CANADA'S PROGRESS ON MEETING THE 90-90-90 HIV TARGETS

In Canada at the end of 2016, 86% (plausible range 78–94%) of the estimated 63,110 (plausible range 55,500–70,720) persons living with HIV were diagnosed. Of those diagnosed, 81% were estimated to be on treatment (plausible range 75% to 87%) and an estimated 91% of persons on treatment had suppressed viral load (plausible range 87% to 95%) (Figure 1).

FIGURE 1: Estimated number and percentage of persons living with HIV, diagnosed, on treatment, and virally suppressed in Canada at the end of 2016 (vertical bars represent plausible ranges).



Estimated % Plausible range (%)	–– ––	86% 78–94%	81% 75–87%	91% 87–95%
Estimated # Plausible range (n)	63,110 55,500–70,720	54,020 49,200–53,320	43,680 40,520–47,000	39,960 38,000–41,500

Canada has demonstrated improvement in all three 90-90-90 targets since 2014. Using current methods and data to revise previous estimates, it was estimated that in 2014, 84% (77–91%) of all people living with HIV knew their status, 78% (73–83%) of those diagnosed were on antiretroviral treatment, and 89% (86–92%) of those on treatment achieved viral suppression. Of particular note is that Canada has now achieved the third 90 target with an estimated 91% of people on antiretroviral therapy achieving viral suppression.

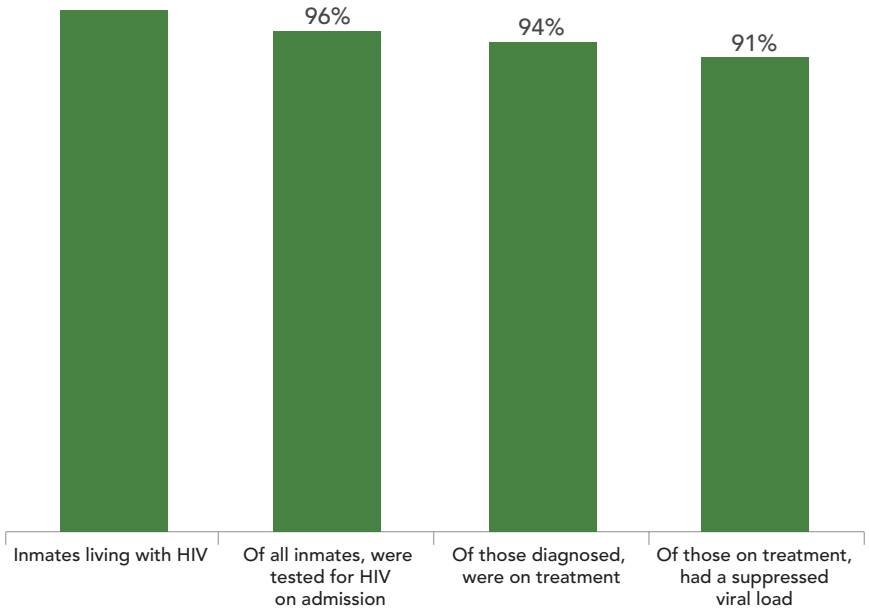
Canada's 2016 90-90-90 estimates lie within the range reported by other developed countries such as the United States of America, Australia, the United Kingdom, Denmark and Germany.

KEY POPULATIONS

Estimates in Federal Correctional Facilities

All inmates in federal correctional facilities are offered a health assessment on admission, and in 2016, 96% of newly admitted inmates accepted a voluntary HIV test to know their status.[d] Inmates are also referred for, or can request, HIV testing anytime during incarceration. As of April 2017, among the 170 inmates diagnosed with HIV, 94% were on treatment, and 91% of those on treatment (with known viral load results) had suppressed viral loads (Figure 2).

FIGURE 2: Estimated percentage of inmates tested for HIV, on treatment, and with suppressed viral load in federal correctional facilities, April 2017



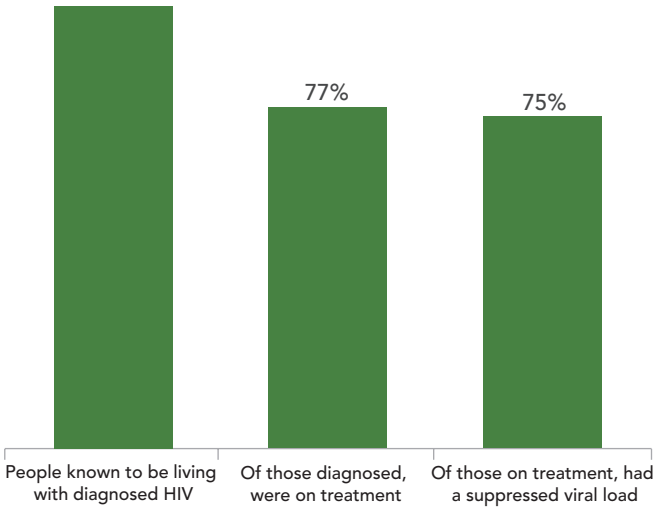
Estimates for on-reserve First Nations communities in Saskatchewan

Data from all First Nations communities in Saskatchewan, which represent over 80 on-reserve communities, showed that at the end of 2016, of the individuals known to be living with diagnosed HIV, 77% were on treatment and 75% of those on treatment had achieved viral suppression (Figure 3).[e]

[d] This preliminary measure is used to proxy the first 90 indicator for federal correctional facilities, based on currently available data. The Correctional Service of Canada is currently investigating other methods to more precisely estimate the first 90 measure.

[e] Estimates provided by Northern Inter-Tribal Health Authority and First Nations Inuit Health Branch, Indigenous Services Canada, based on data from the integrated Public Health Information System & eHealth Saskatchewan.

FIGURE 3: Estimated proportion of persons living with diagnosed HIV who were on treatment, and had a suppressed viral load, First Nations on-reserve communities, Saskatchewan, 2016



Several factors play a role in achieving each of the 90-90-90 targets. HIV testing coverage has improved over the years, however barriers to HIV testing remain. Facilitating early detection through the promotion and availability of testing, particularly for those at high risk, will help Canada reach the first target. This could include supporting health professionals in the implementation of testing programs and improving the availability of innovative testing technologies and approaches in a variety of settings.

The national estimate for the second 90-90-90 target (proportion of those diagnosed who are on treatment) continues to be the lowest of the three targets. This is also observed in other western countries and may be related in part to the fact that the recommendation to treat all HIV-infected persons at diagnosis is relatively recent. A variety of measures could help in the achievement of the second 90 target, such as ensuring the availability of culturally and gender appropriate educational resources, eliminating barriers to treatment such as costs, developing new drugs, and supporting health professionals with resources for appropriate and timely treatment.

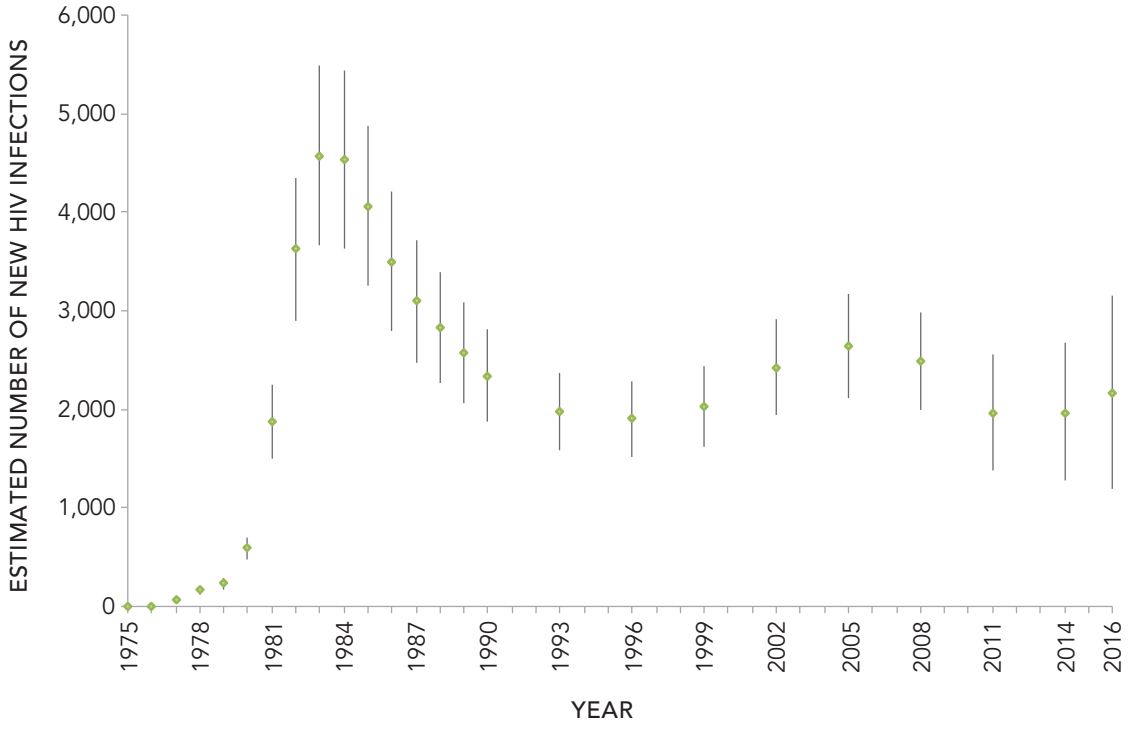
After starting treatment, many patients remain engaged in ongoing care for HIV and have follow-up services to monitor the effectiveness of therapy. These individuals can maintain a suppressed viral load if they are able to take their HIV treatment as prescribed and have a drug combination that is effective against their strain of HIV. The effectiveness of such follow-up may explain why the third 90-90-90 target is higher than the other two targets, which is also observed in other western countries. However, certain social, economic and environmental factors such as the experience of stigma and discrimination, poverty, housing instability, or social isolation may influence whether or not a person achieves a suppressed viral load.

Improvements to the 90-90-90 measures can be achieved by enhancing our understanding of the knowledge, behaviours, attitudes and experiences related to stigma, discrimination and barriers to services, and by reviewing policies that impact the determinants of health.

ESTIMATE OF THE NUMBER OF NEW HIV INFECTIONS IN 2016

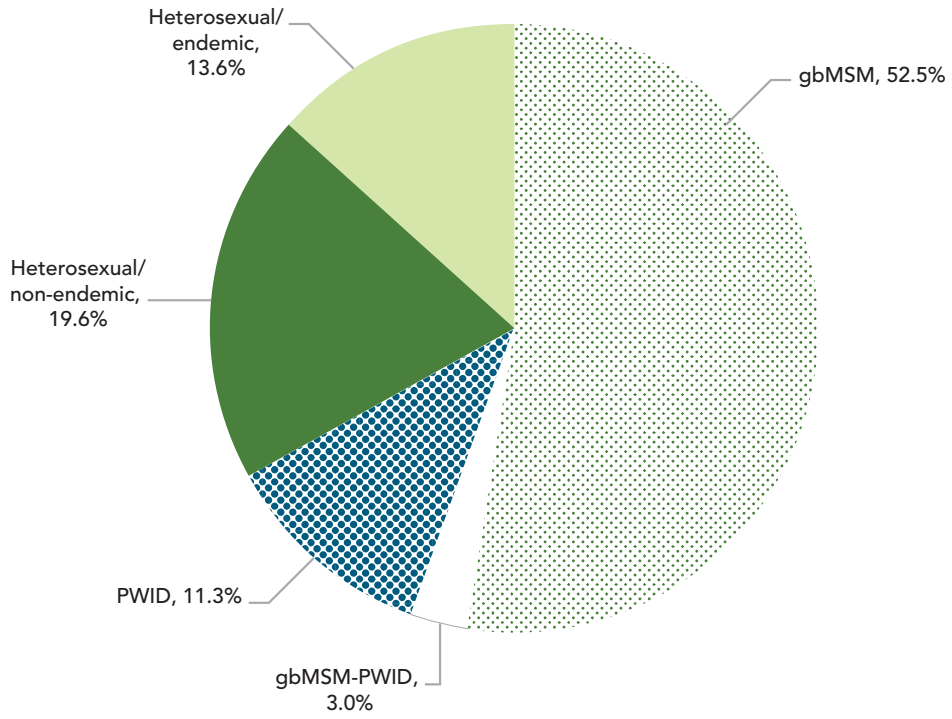
The Agency estimates that 2,165 new infections (range between 1,200–3,150) occurred in Canada in 2016. This estimate is a slight increase from the estimate for 2014 (1,960; range between 1,270 and 2,670) (Table 1, Figure 4). The resulting estimated incidence rate in Canada for 2016 was 6.0 per 100,000 population (range between 3.3 and 8.7 per 100,000 population) which is a slight increase from the estimate for 2014 (5.5/100,000 population; range between 3.6 and 7.5 per 100,000 population).

FIGURE 4: HIV incidence: Estimated number of new HIV infections in Canada for selected years (including plausible ranges for point estimates).



Among the estimated new infections in 2016, approximately 1,136 new infections were attributed to gay, bisexual and other men who have sex with men (gbMSM), representing more than half (52.5%) of all new HIV infections in 2016 (Table 1 and Figure 5), despite representing approximately 2–3% of the Canadian adult male population. Two hundred and forty-four (244) of the estimated new infections in 2016 were among people who inject drugs (PWID), accounting for 11.3% of new infections. The proportion of new infections attributed to heterosexual contact (non-endemic and endemic) remained stable at 33% when compared to 2014 estimates.

FIGURE 5: Proportion of new HIV infections by HIV risk group, Canada, 2016 (n=2,165) (see Appendix 3 for definitions)



Indigenous people and people from countries where HIV is endemic also continue to be over-represented in the HIV epidemic in Canada. An estimated 245 new HIV infections in 2016 occurred among Indigenous people (Table 1) which represents 11.3% of all new infections in 2016, whereas Indigenous people represent 4.9% of the total Canadian population (according to the 2016 Census). An estimated 294 new infections were attributed to heterosexual contact among people born in a country where HIV is endemic (Table 1 and Appendix 3), accounting for 13.6% of new infections in Canada in 2016. By contrast, people born in HIV-endemic countries represented approximately 2.5% of the overall Canadian population according to the 2011 Census.

An estimated 19.6% of new infections in Canada in 2016 were attributed to heterosexual contact among people born in Canada or in a country not on the HIV-endemic list. There were an estimated 507 new HIV infections among females in Canada in 2016 (Table 1). This represents 23.4% of all new infections in 2016, which is similar to the proportion estimated for 2014. The majority of females (78%) acquired their infection through heterosexual contact and an estimated 22% acquired their infection through injection drug use.

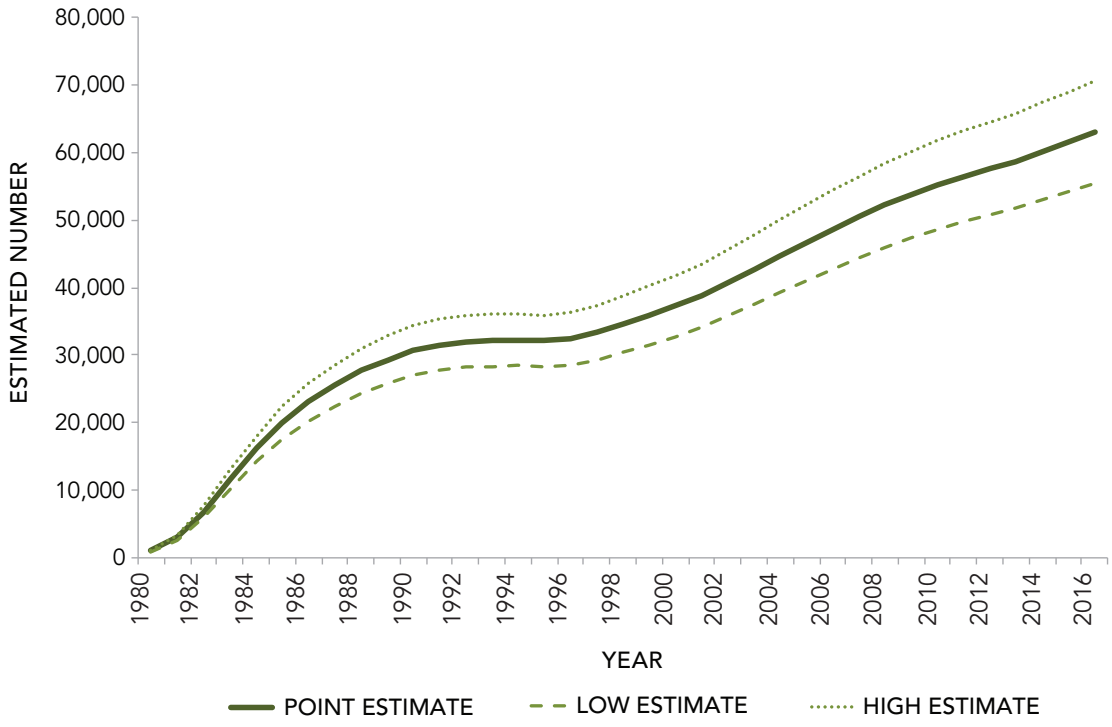
ESTIMATED NUMBER OF PEOPLE LIVING WITH HIV AT THE END OF 2016

The Agency estimates that approximately 63,110 people were living with HIV (including AIDS) at the end of 2016 (range between 55,500 and 70,720). This estimate represents a 5% increase from the estimated 60,165 (range between 52,900–67,430) at the end of 2014 (Table 2, Figure 6). The estimated prevalence rate in Canada at the end of 2016 was 173 per 100,000 population (range between 152 and 194 per 100,000 population).

Of the estimated 63,100 people living with HIV in Canada at the end of 2016:

- Nearly half (49.1%) were among gay, bisexual and other men who have sex with men;
- 14.6% were among people who inject drugs;
- Heterosexual contact among people born in Canada or in a country not on the HIV-endemic list, and heterosexual contact among people born in a country where HIV is endemic, represented 17.6% and 15.0%, respectively, of this total;
- Slightly less than one in 10 was Indigenous (9.6%) with an estimated 6,055 Indigenous people living with HIV at the end of 2016. This represents a 5% increase from the 2014 estimate of 5,760. The resulting estimated HIV prevalence rate for Indigenous people in Canada in 2016 was 362 per 100,000 population, two times higher than the prevalence rate in the general population;
- About one in five was female (23%) and this proportion is similar to what was estimated for 2014.

FIGURE 6: HIV Prevalence: Estimated number of people living with HIV in Canada by year



CONCLUSION

This set of national HIV estimates for 2016 provides updated insight into the trends of HIV in Canada. Progress has been made in addressing HIV/AIDS, however there is still work to be done to reach all three of the 90-90-90 targets by 2020.

Estimated HIV incidence in Canada decreased from 2005 to 2011, but has been stable or possibly increased slightly since 2011. However, due to the wide plausible ranges around the estimates for the most recent time periods, it is unclear if this represents a true increase in the underlying number of new infections. Additional years of data are needed to determine whether this represents a true increase in HIV incidence. This possible increase in estimated HIV incidence could also be due in part to a recent increase in HIV testing related to provincial testing initiatives and other initiatives such as 'Know Your Status'. This is because increased testing for HIV leads to an increase in new HIV diagnoses, which in turn can influence the modelled estimate of HIV incidence.

The distribution of new infections continues to disproportionately affect certain populations in Canada, including gay, bisexual and other men who have sex with men, Indigenous people, and people from countries where HIV is endemic. This highlights the continued need for evidence-informed programs that are culturally and gender appropriate to address the unique aspects of these populations and communities. In addition, one in five new infections in 2016 was attributed to heterosexual contact among people born in Canada or in a country not on the HIV-endemic list, which also emphasizes the need for ongoing, broad-based prevention and education.

At the end of 2016, an estimated 14% of the 63,110 individuals living with HIV in Canada were unaware of their infection. These people are hidden from the health care and disease monitoring systems, and thus cannot take advantage of appropriate prevention, treatment, and ongoing care and support services until they are tested and diagnosed. Since HIV treatment has reduced HIV-related mortality, and new infections are occurring at a rate greater than the number of deaths, the overall number of Canadians living with HIV will likely continue to increase in the years to come. This will mean increased demand for HIV-related care and treatment. Innovative strategies aimed at reaching the undiagnosed population and increasing the number of people adhering to treatment could help Canada achieve the first two 90-90-90 targets.

The Public Health Agency of Canada will continue to work closely with provinces and territories to refine the methodology and enhance data sources to improve the ability to measure and assess progress on the 90-90-90 targets. Some jurisdictions are developing methods to separately assess the 90-90-90 measures by sub-populations to more effectively guide interventions, and future work will include assessing the feasibility of doing this at the national level as well. Estimates of HIV incidence, prevalence and progress on the 90-90-90 targets will support the recently released Pan-Canadian Sexually Transmitted and Blood-borne Infections Framework to help guide multi-sectoral actions to prevent and control HIV in Canada.

TABLE 1: HIV incidence: Estimated number of new HIV infections and plausible ranges in Canada in 2016 and 2014, by HIV risk group*, sex and ethnicity/origin.

CATEGORY	2016			2014		
	POINT ESTIMATE	RANGE**	PERCENTAGE	POINT ESTIMATE	RANGE**	PERCENTAGE
HIV risk group						
gbMSM	1,136	620–1,660	52.5%	1,053	680–1,440	53.7%
gbMSM-PWID	66	30–110	3.0%	47	30–70	2.4%
PWID	244	130–360	11.3%	219	140–300	11.2%
Heterosexual/non-endemic	425	230–620	19.6%	369	240–510	18.8%
Heterosexual/endemic	294	160–430	13.6%	272	170–380	13.9%
Other	<5	0–10	<0.2%	<5	0–10	<0.3%
Sex						
Female	507	270–750	23.4%	436	280–600	22.2%
Male	1,658	910–2,410	76.6%	1,524	990–2,070	77.8%
Ethnicity/origin						
Indigenous	245	130–360	11.3%	217	140–300	11.1%
Non-Indigenous	1,920	1,050–2,800	88.7%	1,743	1,130–2,370	88.9%
Total	2,165	1,200–3,150	100%	1,960	1,270–2,670	100%

* See Appendix 3 for risk group definitions

** Plausible ranges are rounded to the nearest ten.

TABLE 2: HIV Prevalence: Estimated number of people living with HIV and plausible ranges in Canada at the end of 2016 and 2014, by HIV risk group*, sex and ethnicity/origin.

CATEGORY	2016			2014		
	POINT ESTIMATE	RANGE**	PERCENTAGE	POINT ESTIMATE	RANGE**	PERCENTAGE
HIV risk group						
gbMSM	30,980	26,360–35,600	49.1%	29,386	25,000–33,770	48.9%
gbMSM-PWID	1,782	1,410–2,150	2.8%	1,714	1,350–2,080	2.9%
PWID	9,204	7,640–10,770	14.6%	8,980	7,460–10,500	14.9%
Heterosexual/non-endemic	11,105	9,300–12,910	17.6%	10,489	8,800–12,180	17.4%
Heterosexual/endemic	9,438	7,830–11,050	15.0%	8,980	7,460–10,500	14.9%
Other	601	420–780	0.9%	616	430–800	1.0%
Sex						
Female	14,520	12,200–16,840	23.0%	13,765	11,530–16,000	22.9%
Male	48,590	42,280–54,900	77.0%	46,400	40,400–52,400	77.1%
Ethnicity/origin						
Indigenous	6,055	5,000–7,110	9.6%	5,760	4,800–6,720	9.6%
Non- Indigenous	57,055	49,610–64,500	90.4%	54,405	47,310–61,500	90.4%
Total	63,110	55,500–70,720	100%	60,165	52,900–67,430	100%

* See Appendix 3 for risk group definitions

** Plausible ranges are rounded to the nearest ten.

APPENDIX 1: ADDITIONAL DETAIL RELATED TO CANADA'S MODELLING METHOD

Reference: Yan, Ping; Zhang, Fan; and Wand, Handan (2011). Using HIV Diagnostic Data to Estimate HIV Incidence: Method and Simulation. Statistical Communications in Infectious Diseases: Vol. 3: Iss. 1, Article 6.

The statistical modelling method that was used to estimate the number of new HIV infections in Canada is based on a back-calculation method that combines HIV and AIDS diagnostic data (from national routine HIV/AIDS surveillance) with data on the proportions of recent infections among newly diagnosed individuals (from specialized recent-infection laboratory testing algorithms). Surveillance data can only record the date of diagnosis and not the date of infection (which is some time before diagnosis), and so a model is needed to estimate the time trend in the number of past HIV infections, up until the present time (2016 in this case). From this trend in past HIV infections, the model then projects forward to calculate the expected number of HIV diagnoses (using a mathematical formulation of the time between HIV infection and diagnosis based on the recent-infection algorithm data and model assumptions). The most likely trend in past HIV infections is chosen as the one that produces the time trend of calculated HIV diagnoses that most closely matches the observed HIV diagnostic data. The back-calculation method used for incidence estimation in Canada is similar to methods used in the European Union, the USA, and Australia.

Once the time trend in past HIV infections has been estimated, cumulative HIV incidence is calculated by adding up the incidence estimates for all years up to and including the most recent year. Prevalence for the most recent year is then calculated as the cumulative incidence minus estimated total mortality among HIV-infected persons. For this, total mortality needs to be estimated (using data from Statistics Canada, provincial/territorial vital statistics, national reports of AIDS deaths, and Canadian research studies) since vital statistics data only record mortality among persons who died of HIV-related causes. Note that there are additional details not discussed here, such as accounting for HIV cases who had been previously diagnosed or who were likely infected in another province/territory or country.

The number of undiagnosed individuals living with HIV infection in Canada is calculated as the current number of prevalent infections (which includes both diagnosed and undiagnosed cases) minus the number living with diagnosed HIV. The number living with diagnosed HIV is calculated as the cumulative number of diagnosed cases, adjusted for mortality and (where data were available) estimated in/out migration. The first 90 measure is then calculated as the number living with diagnosed HIV divided by estimated prevalence.

APPENDIX 2: DEFINITIONS USED IN CANADA'S 2016 NATIONAL ESTIMATES OF 90-90-90 MEASURES

MEASURE	DEFINITION	NUMERATOR	DENOMINATOR
1st 90	Among those estimated to be living with HIV in Canada at the end of 2016, the proportion (%) of people who were diagnosed.	Number of people living with diagnosed HIV	Number of people living with HIV (both diagnosed and undiagnosed)
2nd 90	Among those living with diagnosed HIV, the proportion (%) of people with ≥1 antiretroviral therapy (ART) in 2016 (prescribed, dispensed or recorded on patient forms)	Number of people on treatment	Number of people living with diagnosed HIV
3rd 90	Among those on treatment, the proportion (%) of people whose last HIV RNA measurement in 2016 was <200 copies/ml	Number of people with <200 copies/ml on their latest VL test in 2016	Number of people on treatment

APPENDIX 3: HIV RISK GROUPS USED FOR THE NATIONAL ESTIMATES OF HIV INCIDENCE AND PREVALENCE

RISK GROUP	TYPE OF EXPOSURE
Gay, bisexual and other men who have had sex with men (gbMSM)	Exposure during male-to-male sexual contact
People who inject drugs (PWID)	Exposure during the use of injection drugs
gbMSM-PWID	Exposure during either male-to-male sex and/or the use of injection drugs (used in instances where both exposures were reported for one person)
Heterosexual/endemic	Exposure during heterosexual sex for a person born in a country where HIV is endemic*
Heterosexual/non-endemic	Exposure during heterosexual sex for a person born in Canada or in a country not on the HIV-endemic list
Other	Exposure attributed to receipt of transfusion of blood or clotting factor, perinatal exposure, or occupational exposure

* The Public Health Agency of Canada defines countries where HIV is endemic as those countries where the prevalence of HIV among adults (age 15–49 years) is 1.0% or greater and one of the following: 50% or more of HIV cases are attributed to heterosexual transmission; a male to female ratio of 2:1 or less among prevalent infections; or HIV prevalence greater than or equal to 2% among women receiving prenatal care.

ACKNOWLEDGEMENTS

The Public Health Agency of Canada acknowledges the Provincial/Territorial Public Health Authorities and other government departments for their contribution to the national estimates of HIV incidence, prevalence and 90-90-90 targets.

The Public Health Agency of Canada acknowledges the efforts by First Nations partners in the prevention of HIV infections, the care of people living with HIV, and their contribution in estimating HIV indicators for First Nations on-reserve for the first time in Saskatchewan.