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## Getting to undetectable: Population differences in Canada

By [Camille Arkell](#)

For people living with HIV, successful antiretroviral treatment (ART) lowers the amount of HIV in the blood to “undetectable” levels (meaning, so low it can’t be measured by routine tests). This greatly improves overall health, increases life expectancy, and significantly reduces the risk of HIV transmission. However, not everyone taking ART has an undetectable viral load and some people have challenges staying engaged in care and taking medications regularly.

This article will review evidence on gaps in the treatment cascade, in particular the likelihood of having an undetectable viral load among people living with HIV who have started treatment in Canada. Paying attention to these gaps can help us to focus efforts on populations that may need greater support to experience the benefits of having an undetectable viral load.

*Note: In Canada, an “undetectable” viral load generally means that there are fewer than 40 or 50 copies of the virus per millilitre of blood, depending on the test used. Many of the research studies reviewed in this article used other thresholds as a marker of a low viral load (either 200 or 500). The term “suppressed viral load” is used throughout this article in cases where these higher thresholds were used.*

### Health and prevention benefits of HIV treatment and an undetectable viral load

We know there are substantial health benefits to starting HIV treatment early.<sup>1,2</sup> We also have strong evidence that when people living with HIV maintain an undetectable viral load, their chance of transmitting HIV to others is dramatically reduced.<sup>3,4,5,6,7,8,9,10,11</sup> In fact, evidence shows that HIV-positive people who are on ART, engaged in care, and have an ongoing undetectable viral load do not pass HIV to their sexual partners.<sup>3,5,10</sup>

### The HIV treatment cascade

There are many steps between acquiring HIV and being able to maintain an undetectable viral load. To become undetectable, a person living with HIV needs to access a range of services, starting with HIV testing. When a person is diagnosed HIV positive following an HIV test, they need to be connected to appropriate medical care, be retained in care over time, have access to ART, and be supported while on treatment to maintain an undetectable viral load. These successive stages are called the [HIV treatment cascade](#), or the continuum of care. At each stage of the cascade, people may be lost to engagement and care for various reasons including individual, social and systemic barriers. The cascade concept is helpful for identifying where people are more likely to fall out of care, and who is less likely to fully realize the health and prevention benefits of HIV treatment.

### What does the cascade look like in Canada?

The Public Health Agency of Canada (PHAC) estimates that 80% of the estimated 65,000 people living with HIV in Canada in 2014 were aware of their status (diagnosed), 76% of those diagnosed were on treatment, and 89% of people on treatment had an undetectable viral load.<sup>12</sup> This means that an estimated 54% of all people living with HIV in Canada had an undetectable viral load in 2014, while almost half did not have an undetectable viral load. These estimates are based on available data, which is limited in some parts of the country, and may not accurately represent all of Canada.

In Ontario in 2015, it was estimated that 81% of Ontarians living with HIV were diagnosed, about 81% of those diagnosed were on treatment, and about 94% of those on treatment were virally suppressed.<sup>13</sup> Based on these estimates, 62% of people with HIV in Ontario are virally suppressed. Another research study in Ontario found that only 76% to 80% of people linked to care were retained in continuous care at any point over a ten-year period from 2001 to 2011.<sup>14</sup>

Research from B.C. in 2011 showed that 96% of diagnosed individuals were linked to care, 87% of linked individuals were retained in care, 91% of retained individuals were on treatment, and 85% of people on treatment were virally suppressed. In total, 64% of people diagnosed with HIV (not all people living with HIV) were virally suppressed.<sup>15</sup> But this is not the whole story. Diagnosed women were much less likely than men to have viral suppression (46% versus 69%).<sup>15</sup> Suppression also differed by population: 81% of men who have sex with men (MSM), 74% of MSM who inject drugs, 67% of heterosexuals, and 53% of people who inject drugs were virally suppressed.<sup>15</sup>

These numbers help paint a picture of where we are losing people along the continuum of care and who we are losing. This loss results in a large proportion of people living with HIV who do not have a suppressed viral load. While all steps in the cascade create potential areas of loss, this article will focus on gaining a better understanding of the proportion of people on treatment who do not have a suppressed viral load.

## **Increasing levels of viral suppression over time**

Over time, improvements in the tolerability of antiretroviral medications, and changes in treatment guidelines are leading to more people living with HIV being able to access ART. Treatment guidelines now recommend that all people diagnosed with HIV should be offered treatment as soon as possible because this has been shown to produce better overall health outcomes. The Association of Medical Microbiology and Infectious Disease Canada (AMMI) recommends that: "In Canada antiretroviral therapy (ART) should be initiated in all adult persons living with HIV-1 infection as soon as a diagnosis of HIV infection is confirmed and regardless of CD4+ count."<sup>16</sup>

There have been increases over time in the overall proportion of people living with HIV in Canada who achieve a suppressed viral load while taking ART.<sup>14,17,18</sup> A large study of more than 100 sites in Canada and the United States found that, in 2009, 93% of people in the study who initiated ART had a suppressed viral load after one year, up from 84% in 2001.<sup>17</sup> Studies from Ontario<sup>3</sup> and B.C.<sup>18</sup> have also demonstrated significant increases in viral suppression over time among people on treatment. The proportion of people on treatment with a suppressed viral load increased from 74% to 99% between 2001 and 2011 in the OHTN Cohort Study,<sup>14</sup> and from 48% to 94% between 1997 and 2010 in B.C.<sup>18</sup>

Still, research has found that certain populations and subgroups in Canada may be less likely to attain or maintain a suppressed viral load, even if they have started treatment.

## **Rates of viral suppression once on treatment**

The following sections will review evidence that shows disparities in rates of viral suppression once on treatment among different populations in Canada.

### ***Women\****

*\*Note that these studies did not report results for transgender people and the data below refers to cisgender women and men.*

Several studies have found that women are less likely to have a suppressed viral load when on treatment, compared to men in Canada.<sup>15,19,20,21</sup> Among HIV-positive people in B.C. in 2011, 73% of women on ART had a suppressed viral load compared to 87% of men on ART.<sup>15</sup> Among people who initiated ART in B.C. between 2000 and 2010, 50% of women had an undetectable viral load within six months of starting treatment, compared to 59% of men.<sup>20</sup> In a Canadian cohort study of people starting treatment between 2000 and 2011, in B.C., Ontario and Quebec, two different analyses showed that women were less likely to be undetectable than men.<sup>19,21</sup> One analysis from this cohort showed that 77% of women on treatment achieved an undetectable viral load compared to 88% of men, meaning that men were 16% more likely to become undetectable.<sup>19</sup> Another analysis found that among people with a history of injection drug use in this cohort, women were 28% less likely to have an undetectable viral load compared to men.<sup>21</sup>

### ***Indigenous people***

Research has shown lower rates of viral suppression among Indigenous people compared to non-Indigenous people when on treatment.<sup>22,23,24</sup> Using data from B.C., Ontario and Quebec, a study among people starting ART between 2000 and 2012 found that 54% of Indigenous participants had an undetectable viral load one year after starting treatment, compared to 77% of Caucasian participants, meaning that Indigenous participants were 42% less likely to be undetectable.<sup>22</sup> A study from northern Alberta of people who started ART between 2006 and July 2012 found that, within six months of starting treatment, 72% of Indigenous patients and 87% of non-Indigenous patients had a suppressed viral load.<sup>23</sup> Indigenous people in this study were 56% less likely to be virally suppressed compared to non-Indigenous people.<sup>23</sup> An earlier study of patients in Alberta who started ART between 1999 and June 2005 found that both Indigenous people who inject drugs and those without a history of drug use were less likely to achieve a suppressed viral load after starting treatment (66% and 62% less likely, respectively), compared to non-Indigenous people without a history of drug use.<sup>24</sup>

### ***People who use injection drugs***

Many studies have found that people who use drugs are disproportionately less likely to have a suppressed viral load while on treatment.<sup>15,19,24</sup> A study of HIV-positive individuals in B.C. found that, in 2011, people who inject drugs had the lowest rates of suppression while on treatment, compared to other populations.<sup>15</sup> For example, while 92% of MSM on ART had a suppressed viral load, only 73% of people who inject drugs were suppressed.<sup>15</sup> Among people who inject drugs and were on treatment, females and people under 30 years old were the least likely to be suppressed.<sup>15</sup> A Canadian cohort study from B.C., Ontario and Quebec found that 73% of people with a history of injection drug use and 89% without a history of drug use achieved an undetectable viral load while on ART.<sup>19</sup> In this study, people who had ever injected drugs were 42% less likely to have an undetectable viral load after starting treatment.<sup>19</sup> Research from an ongoing prospective cohort study of people who inject drugs in Vancouver identified some of the factors that contribute to a lower likelihood of viral suppression among those who have taken ART. Homelessness,<sup>25,26,27,28</sup> eviction,<sup>29</sup> participation in sex work<sup>30</sup> and other forms of criminalized income generation,<sup>31</sup> self-reported hunger,<sup>32</sup> and younger age<sup>33</sup> were all associated with a lower likelihood of having a suppressed viral load among HIV-positive people who inject drugs in Vancouver. Participation in opiate substitution therapies,<sup>26,28,34</sup> a more experienced treating physician,<sup>35</sup> and high adherence to treatment<sup>28,33,36</sup> were associated with a greater likelihood of being virally suppressed.

### ***Gay men and other men who have sex with men***

Although it is estimated that, overall, a high proportion of MSM achieve viral suppression when on treatment,<sup>15,37</sup> disparities exist between MSM based on socio-demographic characteristics. Among HIV-positive individuals on ART in B.C. in 2011, 92% of MSM had a suppressed viral load, but only 84% of MSM who inject drugs were suppressed.<sup>15</sup> Among MSM (without a history of drug use), the proportion on ART with a suppressed viral load ranged from 83% for those below 30 years of age, up to 93% for MSM aged 50 or above.<sup>15</sup> A retrospective analysis of MSM who started ART between 2000 and 2012 in B.C., Ontario and Quebec found that 86% became undetectable after a median time of five months.<sup>37</sup> However, MSM who became undetectable were less likely to have a history of injection drug use and more likely to be older than those who had a detectable viral load.<sup>37</sup>

### ***Sex workers***

Two studies have looked at the likelihood of having a suppressed viral load while on treatment among sex workers in Canada.<sup>30,38</sup> In a Vancouver study, 85% of HIV-positive sex workers who had ever used ART had an undetectable viral load at least once over the study period (from 2010 to 2014); however, only 18% experienced a sustained undetectable viral load.<sup>38</sup> Among sex workers who were on ART, having an undetectable viral load was associated with high adherence to ART, while being homeless and having an intimate male partner were associated with not having an undetectable viral load.<sup>38</sup> Another study of HIV-positive people who use drugs in Vancouver (starting treatment between 1996 and 2012) found that participants who did sex work were 34% less likely to be virally suppressed, compared to those who were not sex workers.<sup>30</sup> Overall, 47% of participants had a suppressed viral load but only 33% of those who reported sex work were virally suppressed.<sup>30</sup>

### ***African, Caribbean and Black populations***

African, Caribbean and Black (ACB) populations in Canada are poorly represented in available literature on the HIV treatment cascade. One study using data from B.C., Ontario and Quebec found that, among people starting ART

between 2000 and 2012, 80% of ACB participants were undetectable after one year, compared to 77% of Caucasian participants.<sup>22</sup> ACB participants were 11% more likely to have an undetectable viral load one year after starting treatment, compared to Caucasian participants.<sup>22</sup>

## Impact of the social determinants of health

Certain socio-economic characteristics may influence a person's likelihood of getting to or maintaining an undetectable viral load. We understand this concept as the social determinants of health (SDOH). These are the range of social, economic and environmental factors (such as poverty, housing instability, or social isolation) that can influence the health status of individuals or populations. Many of these inequities impact certain populations disproportionately because they are related to broader issues such as stigma, homophobia, racism and colonization. We know that SDOH can make a person more vulnerable to HIV infection, and they can also make it difficult for a person to access and use services across the HIV treatment cascade.

Once a person has started treatment, the main reason for not having an undetectable viral load is low or inconsistent adherence to ART medications. Social, structural and environmental factors can present challenges in daily life that may interfere with a person's ability to adhere to their HIV medications, which affects their ability to become or remain undetectable.

One qualitative study of people who inject drugs in Vancouver helps to illustrate this point. The study examined the perspectives of people who had recently experienced viral rebound (when the viral load increases to detectable levels among individuals on ART who were previously undetectable) to better understand why their viral loads did not stay undetectable.<sup>39</sup> The study found that the participants had previously achieved an undetectable viral load, regardless of ongoing drug use, by establishing routines to help maintain daily ART adherence. The viral rebound episodes were associated with external factors that disrupted regular routines, such as housing transitions, challenges in managing co-occurring health issues (for example, mental health issues), and increases in drug use or involvement in the drug scene.<sup>39</sup>

## Why is this important for HIV service providers to know?

The message that "undetectable equals untransmittable" (or U=U)<sup>40</sup> has gained popularity, as service providers and clients are increasingly becoming aware that people living with HIV who maintain an undetectable viral load won't transmit HIV to their sexual partners. The U=U message can help people living with HIV understand the prevention benefits of having an undetectable viral load, and can provide an additional incentive for starting treatment and maintaining treatment adherence.

When promoting U=U, it's important to tell clients about [how to make this strategy work for them](#), but keep in mind that not all people living with HIV have an undetectable viral load. Some people face challenges in being diagnosed, accessing care, continual engagement in care, accessing treatment, and being adherent, in order to achieve and maintain an undetectable viral load over time. Addressing these challenges is key to improving the health of people living with HIV but also realizing the prevention benefits of treatment.

Once on treatment, some people may require more support than others, but most can maintain an undetectable viral load if they are able to take their HIV treatment as prescribed by their doctor and have a drug combination that is effective against their strain of HIV.

The research evidence described above suggests that people with intersecting marginalized identities (such as women or Indigenous people who use drugs, and younger MSM) may face greater challenges in becoming or staying undetectable once on treatment. With this knowledge, service providers may want to consider how they can tailor adherence support programs when clients are socially and/or economically marginalized.

However, we know that increasing the overall proportion of people living with HIV who have an undetectable viral load means supporting clients to access multiple services and supports along the entire continuum of care.

Public health authorities, healthcare providers and frontline service providers all have a role to play in making services more accessible and providing people with ongoing care. This means ensuring that available programming addresses the following key programming areas:

- [HIV testing and diagnosis](#),
- [linkage to HIV care](#),
- support with getting financial coverage for treatment,
- adherence support, once on treatment, and
- support to address issues related to the SDOH (such as housing instability, job insecurity, or mental health

issues).

Some novel programming approaches that are shown to be effective can be found in CATIE's [Programming Connection](#). Some examples from within this collection are [non-clinic based testing programs](#); [linkage-to-care programs](#); [programs in HIV and hepatitis C care for Indigenous peoples](#); and [health navigation](#). While adaptation and implementation of these programs may not be feasible, it may be possible to integrate some of the key elements into current programming.

## Related article

For a discussion on the issues related to getting an undetectable viral load, see [Views from the front lines: Getting to undetectable](#).

## Resources

[CATIE statement on the use of antiretroviral treatment \(ART\) as a highly effective strategy to maintain an undetectable viral load to prevent the sexual transmission of HIV](#)

[HIV treatment and an undetectable viral load to prevent HIV transmission](#) – CATIE fact sheet

[Undetectable viral load and HIV sexual transmission](#)

[Prevention Access Campaign](#)

## References

1. Patterson S, Cescon A, Samji H, et al. Life expectancy of HIV-positive individuals on combination antiretroviral therapy in Canada. *BMC Infectious Diseases*. 2015 Dec;15(1):274. Available from: <http://bmcinfecdis.biomedcentral.com/articles/10.1186/s12879-015-0969-x>
2. The INSIGHT START Study Group. Initiation of antiretroviral therapy in early asymptomatic HIV infection. *New England Journal of Medicine*. 2015 Aug 27;373:795-807.
3. [a](#), [b](#), [c](#) Eshleman SH, Hudelson SE, Redd AD, et al. Treatment as prevention: Characterization of partner infections in the HIV Prevention Trials Network 052 trial. *Journal of Acquired Immune Deficiency Syndromes*. 2017 Jan;74(1):112-6.
4. Cohen MS, Chen YQ, McCauley M, et al. Prevention of HIV-1 infection with early antiretroviral therapy. *New England Journal of Medicine*. 2011 Aug 11;365(6):493-505.
5. [a](#), [b](#) Cohen MS, Chen YQ, McCauley M, et al. Antiretroviral therapy for the prevention of HIV-1 transmission. *New England Journal of Medicine*. 2016 Sep;375(9):830-9.
6. Reynolds SJ, Makumbi F, Nakigozi G, et al. HIV-1 transmission among HIV-1 discordant couples before and after the introduction of antiretroviral therapy. *AIDS*. 2011 Feb;25(4):473-7.
7. Melo MG, Santos BR, De Cassia Lira R, et al. Sexual transmission of HIV-1 among serodiscordant couples in Porto Alegre, Southern Brazil. *Sexually Transmitted Diseases*. 2008 Nov;35(11):912-5.
8. Donnell D, Baeten JM, Kiarie J, et al. Heterosexual HIV-1 transmission after initiation of antiretroviral therapy: a prospective cohort analysis. *The Lancet*. 2010 Jun;375(9731):2092-8.
9. Rodger A, Bruun T, Cambiano V, Lundgren J. HIV transmission risk through condomless sex if HIV+ partner on suppressive ART: PARTNER study. Presented at *21st Conference on Retroviruses and Opportunistic Infections*; 2014 Mar 3; Boston. Abstract 153LB.
10. [a](#), [b](#) Rodger AJ, Cambiano V, Bruun T, et al. Sexual activity without condoms and risk of HIV transmission in serodifferent couples when the HIV-positive partner is using suppressive antiretroviral therapy. *Journal of the American Medical Association*. 2016 Jul 12;316(2):171-81.
11. Grulich AE, Bavinton BR, Jin F, et al. HIV transmission in male serodiscordant couples in Australia, Thailand and Brazil. Presented at *22nd Conference on Retroviruses and Opportunistic Infections*; 2015 Feb; Seattle;. Abstract 1019LB. Available from: <http://www.croiconference.org/sessions/hiv-transmission-male-serodiscordant-couples-australia-thailand-and-brazil>
12. *Summary: Measuring Canada's progress on the 90-90-90 HIV targets*. Government of Canada. 2016 December 1. Available from: <http://www.healthy Canadians.gc.ca/publications/diseases-conditions-maladies-affectations/hiv-90-90-90-vih/index-eng.php>
13. Ontario Advisory Committee on HIV/AIDS. *Focusing our efforts. Changing the course of the HIV prevention, engagement and care cascade in Ontario. HIV/AIDS Strategy to 2026*. Available from: [http://www.health.gov.on.ca/en/pro/programs/hiv/aids/oach\\_strategy.aspx](http://www.health.gov.on.ca/en/pro/programs/hiv/aids/oach_strategy.aspx)
14. [a](#), [b](#), [c](#) Burchell AN, Gardner S, Light L, et al. Engagement in HIV care among persons enrolled in a clinical HIV cohort in Ontario, Canada, 2001-2011. *Journal of Acquired Immune Deficiency Syndromes*. 2015 Sep 1;70(1):e10-e19.
15. [a](#), [b](#), [c](#), [d](#), [e](#), [f](#), [g](#), [h](#), [i](#), [j](#), [k](#), [l](#) Lourenco L, Colley G, Nosyk B, et al. High levels of heterogeneity in the HIV cascade of care across different population subgroups in British Columbia, Canada. *PLoS One*. 2014;9(12):e115277. Available from: <http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0115277>
16. Becker M, Cox J, Evans GA, et al. *AMMI Canada Position Statement: The use of early antiretroviral therapy in HIV-infected persons*. Association of Medical Microbiology and Infectious Disease Canada. 2016. Available from: <https://www.ammi.ca/Content/%28ALL%20Final%29%20Web%20posted%20AMMI%20Position%20Statement%20Early%20ART%20April%2018%202016.pdf>
17. [a](#), [b](#) Hanna DB, Buchacz K, Gebo KA, et al. Trends and disparities in antiretroviral therapy initiation and virologic suppression among newly treatment-eligible HIV-infected individuals in North America, 2001-2009. *Clinical Infectious Diseases*. 2013 Apr 15;56(8):1174-82.
18. [a](#), [b](#), [c](#) Cescon A, Kanters S, Brumme CJ, et al. Trends in plasma HIV-RNA suppression and antiretroviral resistance in British Columbia, 1997-2010. *Journal of Acquired Immune Deficiency Syndromes*. 2014 Jan 1;65(1):107-114. Available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4266465/>
19. [a](#), [b](#), [c](#), [d](#), [e](#), [f](#) Cescon AM, Cooper C, Chan K, et al. Factors associated with virological suppression among HIV-positive individuals on highly active antiretroviral therapy in a multi-site Canadian cohort. *HIV Medicine*. 2011 Jul;12(6):352-60.
20. [a](#), [b](#) Carter A, Min JE, Chau W, et al. Gender inequities in quality of care among HIV-positive individuals initiating antiretroviral treatment in British Columbia, Canada (2000-2010). *PLoS One*. 2014 Mar 18;9(3):392334. Available from: <http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0092334>



21. [a. b. c.](#) Cescon A, Patterson S, Chan K, et al. Gender differences in clinical outcomes among HIV-positive individuals on ART in Canada: A multisite cohort study. *PLoS One* . 2013 Dec 31;8(12):e83649. Available from: <http://journals.plos.org/plosone/article/comments?id=10.1371/journal.pone.0083649>
22. [a. b. c. d.](#) Benoit AC, Younger J, Beaver K et al. A comparison of virological suppression and rebound between Indigenous and non-Indigenous persons initiating combination antiretroviral therapy in a multisite cohort of individuals living with HIV in Canada. *Antiviral Therapy* . 2016 Dec 7; doi:10.3851/IMP3114.
23. [a. b. c.](#) Lefebvre ME, Hughes CA, Yasui Y, et al. Antiretroviral treatment outcomes among foreign-born and Aboriginal peoples living with HIV/AIDS in northern Alberta. *Canadian Journal of Public Health* . 2014;105(4):e251-7.
24. [a. b. c.](#) Martin LJ, Houston S, Yasui Y, et al. Rates of initial virological suppression and subsequent virological failure after initiating highly active antiretroviral therapy: the impact of aboriginal ethnicity and injection drug use. *Current HIV Research* . 2010 Dec;8(8):649-58.
25. Loh J, Kennedy MC, Wood E, et al. Longer duration of homelessness is associated with a lower likelihood of non-detectable plasma HIV-1 RNA viral load among people who use illicit drugs in a Canadian setting. *AIDS Care* . 2016 Nov;28(11):1448-54.
26. [a. b.](#) Hayashi K, Wood E, Kerr T, et al. Factors associated with optimal pharmacy refill adherence for antiretroviral medications and plasma HIV RNA non-detectability among HIV-positive crack cocaine users: a prospective cohort study. *BMC Infectious Diseases* . 2016 Aug 27; 16(1):455. Available from: <https://bmcinfectdis.biomedcentral.com/articles/10.1186/s12879-016-1749-y>
27. Milloy MJ, Kerr T, Bangsberg DR, et al. Homelessness as a structural barrier to effective antiretroviral therapy among HIV-seropositive illicit drug users in a Canadian setting. *AIDS Patient Care and STDs* . 2012 Jan;26(1):60-67.
28. [a. b. c.](#) Palepu A, Milloy MJ, Kerr T, et al. Homelessness and adherence to antiretroviral therapy among a cohort of HIV-infected injection drug users. *Journal of Urban Health* . 2011 Jun;88(3):545-55.
29. Kennedy MC, Kerr T, McNeil R, et al. Residential eviction and risk of detectable plasma HIV-1 RNA viral load among HIV-positive people who use drugs. *AIDS and Behaviour* . 2017 Mar;21(3):678-87.
30. [a. b. c. d.](#) Ti L, Milloy MJ, Shannon K, et al. Suboptimal plasma HIV-1 RNA suppression and adherence among sex workers who use illicit drugs in a Canadian setting: an observational cohort study. *Sexually Transmitted Infections* . 2014 Aug;90(5):418-22.
31. Richardson LA, Kerr TH, Dobrer S, et al. Socioeconomic marginalization and plasma HIV-1 RNA nondetectability among individuals who use illicit drugs in a Canadian setting. *AIDS* . 2015 Nov 28;29(18):2487-95.
32. Anema A, Kerr T, Milloy MJ, et al. Relationship between hunger, adherence to antiretroviral therapy and plasma HIV RNA suppression among HIV-positive illicit drug users in a Canadian setting. *AIDS Care* . 2014 Apr;26(4):459-65.
33. [a. b.](#) Hadland SE, Milloy MJ, Kerr T, et al. Young age predicts poor antiretroviral adherence and viral load suppression among injection drug users. *AIDS Patient Care and STDs* . 2012 May;26(5):274-80.
34. Socias ME, Wood E, Small W, et al. Methadone maintenance therapy and viral suppression among HIV-infected opioid users: The impacts of crack and injection cocaine use. *Drug and Alcohol Dependence* . 2016 Nov 1;168:211-18.
35. Sangsari S, Milloy MJ, Ibrahim A, et al. Physician experience and rates of plasma HIV-1 RNA suppression among illicit drug users: an observational study. *BMC Infectious Diseases* . 2012 Jan 25;12:22. Available from: <https://bmcinfectdis.biomedcentral.com/articles/10.1186/1471-2334-12-22>
36. Nolan S, Milloy MJ, Zhang R, et al. Adherence and plasma HIV RNA response to antiretroviral therapy among HIV-seropositive injection drug users in a Canadian setting. *AIDS Care* . 2011 Aug;23(8):980-7.
37. [a. b. c.](#) Tanner Z, Lachowsky N, Ding E, et al. Predictors of viral suppression and rebound among HIV-positive men who have sex with men in a large multi-site Canadian cohort. *BMC Infectious Diseases* . 2016 Oct 21;16(1):590. Available from: <https://bmcinfectdis.biomedcentral.com/articles/10.1186/s12879-016-1926-z>
38. [a. b. c.](#) Duff P, Goldenberg S, Deering K, et al. Barriers to viral suppression among female sex workers: Role of structural and intimate partner dynamics. *Journal of Acquired Immune Deficiency Syndromes* . 2016 Sep 1;73(1):83-90.
39. [a. b.](#) Small W, Milloy MJ, McNeil R, et al. Plasma HIV-1 RNA viral load rebound among people who inject drugs receiving antiretroviral therapy (ART) in a Canadian setting: an ethno-epidemiological study. *AIDS Research and Therapy* . 2016 Jul 25;13:26. Available from: <https://aidsrestherapy.biomedcentral.com/articles/10.1186/s12981-016-0108-9>
40. Prevention Access Campaign. Available from: <https://www.preventionaccess.org/>

## About the author(s)

**Camille Arkell** is CATIE's Knowledge Specialist, Biomedical Science of Prevention. She has a Master's of Public Health degree in Health Promotion from the University of Toronto, and has been working in HIV education and research since 2010.

## Produced By:



555 Richmond Street West, Suite 505, Box 1104  
Toronto, Ontario M5V 3B1 Canada  
Phone: 416.203.7122  
Toll-free: 1.800.263.1638  
Fax: 416.203.8284  
www.catie.ca  
Charitable registration number: 13225 8740 RR

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