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Project Title: A Description of the Clinical and Socio-demographic Factors, Specifically Medication Coverage, Associated with Virologic Suppression of Those Living with HIV in Manitoba

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Summary (250 words max single spaced):

With antiretroviral therapy (ART), those living with Human Immunodeficiency Virus (HIV) have a life-expectancy comparable to the general population. Virologic suppression, a treatment goal defined as an HIV-1 RNA viral load of less than 200 copies/mL, is associated with better health outcomes and often a negligible risk of viral transmission. Virologic suppression hinges on accessible ART, optimal adherence, and long-term engagement in care. Manitobans can access ART through any of the following drug coverage programs, each with their own set of eligibility criteria: Canadian Forces Health Services (CFHS), Interim Federal Health Program (IFHP), Non-Insured Health Benefits (NIHB), Manitoba Pharmacare, Employment and Income Assistance (EIA), private insurance, programs from other provinces, through clinical trials, compassionate supply via pharmaceutical companies, or no coverage at all. In this project we used participant socio-demographic data with clinical data (viral load, CD4 counts, and drug coverage program) collected at distinct points in 2016 and 2017. In 2016, people who inject drugs (PWID) and those with coverage via NIHB or EIA had lower rates of viral suppression than others without those characteristics. That association was no longer seen for PWID and EIA coverage in 2017, with NIHB coverage being the only significant predictor for an unsuppressed viral load. Although many Manitobans can access their ART at little or no out of pocket cost, this is insufficient without other interventions that address systemic issues which have caused the social inequities which may lead to sub-optimal adherence and decreased engagement with care within populations associated with virologic failure.

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Introduction and Background

Human Immunodeficiency Virus (HIV), a cytopathic retrovirus, was first identified in 1983 in the United States, following a cluster of cases of *Pneumocystis carinii* pneumonia and Kaposi's sarcoma among previously healthy men who have sex with other men[1]. The first anti-retroviral drugs were developed in 1987, with combination anti-retroviral therapy (ART) becoming available for HIV treatment in 1996. By 1999, it was shown that mortality, AIDS diagnoses, and hospitalizations due to HIV and co-morbid infections had all decreased by 60-80% as a result of effective combination ART[2]. With currently available therapy, the life-expectancy of someone living with HIV in Canada or the United States is fast approaching that of the general population, although variability exists across gender, race, and other socio-demographic factors[3]. The success of modern ART across populations depends on accessibility of ART, medication adherence, and long-term engagement with healthcare.

Epidemiology of HIV in Canada

Worldwide, certain geographic regions (sub-Saharan Africa and the Caribbean) as well as certain populations (women in sub-Saharan Africa, men who have sex with men, people who inject drugs, and sex workers) continue to be disproportionately affected by HIV[4]. In Canada, 53% of HIV infected persons identified their main risk factor as being a man who has sex with men (MSM), 19% reported intravenous drug use as their major risk factor, and 31% of the HIV infected population indicated unprotected heterosexual contact as their risk factor for acquisition. Among persons living with HIV in Canada, 15% hailed from countries where HIV was endemic, 9% were self-identifying Indigenous peoples, and 22% of the HIV infected population identified as female[5]. These demographics differ from what is known about the HIV epidemic in Manitoba. Of the patients who were entering care with the Manitoba HIV Program in 2016, 25% were MSM, 11% were people who inject drugs (PWID), and 53% reported unprotected heterosexual sex. Importantly, people identifying as African/Caribbean/black (ACB) (31%), Indigenous persons (39%), and women (31%) were disproportionately affected by HIV, when compared to national rates[6].

The HIV epidemic among Indigenous populations (First Nations, Métis, and Inuit), is markedly different than that among non-Indigenous people living in Canada. A 2014 report indicates that risk factors for transmission among Indigenous peoples were 45% PWID, 40% unprotected heterosexual contact, and 10% sex between men[7]. Females also represent a larger proportion of the HIV-infected Indigenous population when compared to all other ethnicities, 47% and 20% respectively[8]. Nearly one third (32%) of HIV diagnoses between 1998 and 2012 in the Indigenous population were in individuals within the ages of 15-29, compared to 22% among the rest of the Canadian population[7]. Previous studies have shown non-white ethnicities to have higher rates of virologic failure, but there is competing evidence on whether risk factors for transmission impact viral load suppression[9,10].

Virologic Suppression

Among persons diagnosed with HIV and entering care, early initiation of ART in the clinical standard. The goal of treatment is virologic suppression defined as a HIV-1 RNA viral load of ≤200 copies per milliliter (mL)—as a goal of ART treatment stems from both individual and population health platforms. Any viral load "blips" that do not exceed 200 copies/mL are not considered clinically relevant and have not been found to contribute to virologic failure or drug-resistance development[11]. High rates of viral load suppression within a population, or decreasing the community viral load, is associated with a decrease in HIV transmission rates[12].

Virologic failure is defined as having an HIV-1 RNA viral load consistently >200 copies/mL and may result from a combination of factors, such as low adherence, decreased antiretroviral

potency, and development of drug-resistance[13-16]. A meta-analysis from 2016 has shown sub-optimal ART adherence has a higher rate of virologic failure compared to optimal adherence, with a smaller study also associated worse clinical outcomes with sub-optimal adherence[17,18]. Many factors play a role in antiretroviral adherence including patient-specific constraints, ineffective healthcare interactions and healthcare system issues as a whole[19]. Focus group studies conducted with people living with HIV have shown a positive patient-provider relationship as a motivating factor for taking and adhering to complex medication regimens, such as ART[20]. Limited access to health care and prohibitively high costs of medications have also been identified as systemic barriers to ART adherence[21-23]. Indeed, a previous Canadian study showed nearly 1 in 10 Canadians reporting poorer adherence due to financial constraints, with this level varying depending on coverage and family income[24].

Federal and Provincial Drug Programs for Manitobans

Although all Canadians have access to universal health care, the federal, provincial, and territorial governments are each responsible for various out-patient drug benefit programs, with each program differing in terms of coverage level, eligibility criteria, enrollment process, and out of pocket costs[25]. The federal government of Canada has a number of programs open to any Canadians who meet their specific criteria, while the regional programs are restricted to those registered within the provincial or territorial health programs. Federal programs include the Non-Insured Health Benefits (NIHB) Program, Interim Federal Health Program (IFHP), and the Canadian Forces Health Services (CFHS). The NIHB Program provides prescription drugs without cost to eligible Canadians who are registered Indians according to the *Indian Act*, Inuks recognized by one of the Inuit Land Claim organizations, or infants less than one-year-old with an eligible parent[26]. The IFHP provides limited, temporary coverage to persons who are not yet eligible for provincial/territorial programs, including protected persons (e.g. resettled refugees) and refugee claimants, among others[27]. The IFHP formulary for antiretroviral mirrors what is available on provincial/territorial programs with no out of pocket cost[27]. Finally, the CFHS is the designated health care provider for Canada's military personnel, with most drugs provided without cost when obtained from a pharmacy on-base or with full reimbursement if filled off-base[25,28].

Manitoba residents without federal or other means of coverage who have Manitoba Health coverage (have lived in Manitoba for 3 months) may obtain their antiretroviral medication through enrollment in the province's Pharmacare program. Manitoba Pharmacare is a family plan, which includes dependents <18 years, with an annual deductible based on a percentage (range: 3.04-6.90%) of adjusted family income[25,29]. Individuals pay for medications included on the Pharmacare formulary until the deductible amount is met, with the Manitoba government taking over 100% of the cost for the remainder of the Pharmacare year (April 1-March 31). Those enrolled in Pharmacare may also apply to pay a fraction of their annual Pharmacare deductible monthly to ease the front-loading of cost associated with the program[30]. Manitobans with partial private insurance coverage (often through their employer) will have that coverage applied to their Pharmacare deductible, while those with 100% private coverage are ineligible for the Manitoba Pharmacare Program, but have their medications dispensed without cost regardless[25]. The Employment Insurance and Assistance (EIA) program of Manitoba provides financial aid and other resources to help residents with no other means to support themselves or their families. Manitoba EIA is available for single parents, persons with disability, and other low-income residents who require general assistance. Manitoba residents enrolled in the EIA program will have their Pharmacare deductibles covered 100% by the Manitoba government[31].

Additionally, there are some instances where a patients' medications may be paid for by programs that exist outside of federal or provincial/territorial jurisdictions. Some persons living

with HIV may receive their medications via participation in clinical research trials. While participating in a clinical trial, the treatment manufacturer is responsible for the cost of the treatment, providing the patient with a cost-free method of antiretroviral therapy[32]. Finally, in some situations where patients are facing challenges to accessing their antiretroviral therapy, the medications may be donated on a compassionate basis by the pharmaceutical manufacturer[33].

Objective

In this project, we aim to understand the factors contributing to virologic suppression among Manitobans living with HIV. Specifically, we focus on describing the socio-demographic characteristics associated with viral load suppression and the association between medication coverage and virologic suppression.

Methods

The Living with chronic HIV (LHIV) Innovation Team is a CIHR-funded, interdisciplinary group of researchers, health professionals, policy makers, HIV clinic managers and networks, and people living with HIV in Manitoba, Ontario, and Newfoundland. The LHIV Innovation Team functions to better understand the overall health, healthcare utilization, and quality of care of persons living with HIV, and aims to create and translate the knowledge, strategies, and tools necessary to provide comprehensive HIV care and ultimately improve the health of people living with HIV. Project One, of the LHIV Study, focuses on creating comprehensive provincial cohorts to compare health, utilization, and quality of care across jurisdictions.

An observational retrospective cohort study was completed, which analyzed participant clinical, demographic, and behavioural information.

Study Population and Setting

The Manitoba HIV Program provides information, specialized care, treatment, and support to the 1285 people, as of January 1, 2017, living with HIV across the province. The Program has two Winnipeg-based sites: Nine Circles Community Health Centre and the Health Sciences Centre outpatient clinic; and one site in the Prairie Mountain Health Region: 7th Street Health Access, a nurse-run clinic in Brandon. The Manitoba HIV Program incorporates infectious disease specialists, family physicians, a nurse practitioner, nurses, pharmacists, a social worker, a dietician and various administrative staff.

The study population was comprised of individuals who received care from the Manitoba HIV Program and had provided informed consent to participate in the LHIV clinical cohort and have their clinical information reviewed. Cohort participants included in this study had provided written consent to the LHIV project between January 23, 2014 and May 19, 2016. A total of 702 Manitoba HIV Program clients were participating in the clinical cohort at time of data collection.

Data Collection

A variety of clinical data had previously been collected from LHIV clinical cohort participants, and supplementary data relevant to this project were collected from private charts, either paper-based as previously used by the Health Sciences Centre (HSC) clinic and/or electronic medical records (EMR), currently used by both Nine Circles Community Health Clinic (NCCHC) and HSC. Types of data available within patient charts used included health administrative, public

health lab, and prescription drug. Demographic information, comorbidities and co-infection rates, and some HIV-specific health data had already been collected as part of the Project One cohort creation. Supplementary data collected included most recent viral load, most recent CD4 absolute count, and current drug coverage program enrollment and was collected at two time points for each participant (June 14 – August 16, 2016; and June 22 –July 13, 2017).

Definition of Variables

Age, as of July 24, 2017, was divided into 4 categories, 18-30, 30-50, 50-65, and greater than 65 years. Age ranges were inclusive of the upper limit of age. HIV transmission risk factors, since not mutually exclusive, were encoded as dichotomous outcomes on separate variables including unprotected heterosexual contact, MSM, PWID, and other, which includes exposure to HIV-infected blood products (after 1978), occupational exposure (e.g. needle stick injuries in health care), and contaminated tattoo equipment. Participant's identified gender was recorded, as well as if this was concordant with their assigned gender at birth. Participants' postal codes were recorded and used to discern whether or not they lived within or outside of the Winnipeg Regional Health Authority. History of hepatitis C virus (HCV) infection was recorded as a dichotomous variable. Any previous HCV infection whether HCV Antibody positive or HCV RNA positive, regardless of present status, was encoded as an affirmative outcome.

The absolute CD4 count and viral load laboratory values used in this analysis were the most recently recorded values during each round of chart review. Viral load was collected as a continuous variable and dichotomized as ≤200 and >200 copies/mL for analyses, to align with the pre-determined definition of viral suppression[6]. Absolute CD4 count was transformed into a categorical variable, classified as ≤200, 200-500, >500 cells/mm^3, representing various levels of immune suppression. A CD4 count of 200-500 cells/mm^3 would make one more susceptible to certain infections like oral and/or esophageal *Candida albicans* and *Mycobacterium tuberculosis* but a CD4 count <200 cells/mm^3 is categorized as severe immune suppression, greatly increases one's risk for AIDS-defining illnesses such as *Pneumocystis jirovecii* pneumonia, and calls for daily prophylaxis[34,35]. The date of testing for CD4 count and HIV-1 RNA viral load was also recorded. Absolute CD4 count at the time of diagnosis was also recorded and categorized as ≤200 and >200 cells/mm^3 as a proxy to late clinic presentation to care.

Drug coverage program enrollment was categorized as Manitoba Pharmacare, private insurance plan, EIA, NIHB Program, compassionate coverage, IFHP, CFHS Program, clinical trial, coverage provincial coverage outside of Manitoba, and no coverage. This was captured at the time of supplementary data collection during the two time points described above.

Data Analysis

Analyses were limited to participants enrolled in the study who were still living in Manitoba at the time of the second round of data collection, had already initiated anti-retroviral therapy at the time of the first chart review, and had at least three months between the dates of the two viral load tests, for a total sample size of 615.

Descriptive analyses were conducted on clinical, behavioural, and demographic data, including viral load, CD4 count, HIV transmission risk factors, identified gender, age group, residence within Winnipeg, CD4 count less than 200 cells/mm^3 (i.e. late presentation to care, HCV infection, and drug coverage program.

Logistic regression analyses were conducted to estimate effects of participants' clinical variables on their odds of being virally suppressed. Predictor variable selection was limited to those showing significant difference between the viral load categories. Participant ethnicity was omitted from analyses due to collinearity as Indigenous ethnicity is a function of the NIHB enrollment criteria. Age (continuous) and gender were included in the regression model as control variables.

Ethics

The study protocol was reviewed and approved by the University of Manitoba's Health Research Ethics Board (HREB number H2012:329), and the Assembly of Manitoba Chiefs Health Information Research Governance Committee also provided support for the study and have been actively consulted throughout the project.

Results

Between June 14, 2016, and July 13, 2017, 702 HIV-infected adults enrolled in Manitoba's HIV program were followed, with 615 participants meeting criteria for analysis (Table 1). At a population-level, this cohort exhibits a viral load suppression rate of 90.6%. The majority of the study participants identified as men (n = 443, 72.0%), self-identified as white/Caucasian (n = 283, 46.0%), and were between the ages of 30-50 years (n = 286, 46.5%). Unprotected heterosexual contact was the most commonly reported HIV transmission risk factor (n = 389, 63.3%), although a majority of the males (n = 225, 50.8%), and a small minority of females (n = 2, 1.2%), reported MSM contact as a transmission risk (results not shown). Females who identify MSM as a transmission risk factor may be transwomen whom have MSM contact before transitioning or women with unprotected sexual contact with a known bisexual man. Nearly one-third of participants (n = 182, 29.8%) presented to care with the Manitoba HIV Program with an absolute CD4 cell count <200 cells/mm^3.

Viral load suppression was significantly (p<0.05) associated with other demographic, behavioural, and clinical characteristics (Table 1). Participants aged 50-65 were more likely to have a suppressed viral load (95.3% suppression rate) than those aged 18-30 (83.3%), 30-50 (87.4%), and over 65 (89.7%). Indigenous participants showed a significantly lower viral load suppression rate (83.4%) compared to Caucasian participants (95.4%). Men who have sex with men were over-represented in the viral load <200 copies/mL category (96.5%), while those reporting unprotected heterosexual contact or intravenous drug use as their HIV risk factor were less likely to suppress their viral loads than participants without those risk factors (87.9% and 82.8%, respectively).

Table 2 shows participant clinical data by calendar year and further categorized by viral load. Participants showed no significant change in rates of viral load suppression between 2016 and 2017 (χ^2 = 0.15, df = 1; p>0.70). There was also no significant change to the aggregate composition of participant drug coverage program over the same period (χ^2 = 11.7, df = 9; p>0.23), although nearly a quarter of study participations (24.7%) were found to have a change in their personal drug coverage program enrollment (results not shown). Participants obtaining

drug coverage through the NIHB Program were made up a significant proportion of those in the unsuppressed viral load category (53.5%). Those whose deductibles are covered via private insurance were much more likely to suppress their viral load (98.3%) than all other program groups (χ^2 = 10.1, *df* = 1; *p*<0.001). The distribution of participants over the CD4 cell count categories showed no significant change between the time of review of 2016 and 2017 (χ^2 = 0.82, *df* = 2; *p*>0.66).

Logistic regression of viral load suppression by calendar year is shown in Table 3. In 2016, PWID were half as likely to suppress their viral load after adjustment for significant demographic and clinical characteristics (adjusted odds ratio [AOR] = 0.51, 95% CI 0.27-0.94). Although included in the model as a control variable, participant age showed similar significant findings in both 2016 and 2017, [1.03 (1.01-1.07)] and [1.03 (1.00-1.06)] respectively. As for drug coverage program, when compared to private insurance (used as reference category) and keeping all other variables constant, those enrolled in the EIA [0.21 (0.05-0.98)] and NIHB [0.14 (0.03-0.600)] programs were significantly less likely to have a viral load <200 copies/mL. Following the 2017 chart review period, the only significant finding within the regression was those with NIHB coverage [0.14 (0.03-0.64)] were over 7 times less likely to have suppressed viral loads compared to the private insurance reference and adjusting for all other variables.

Discussion

Overall, 90% of participants living with HIV were virologically suppressed. However, some Manitobans are doing categorically worse when it comes to HIV health outcomes than others. In 2016, after adjustment for other clinical and demographic characteristics, people who inject drugs and those who obtain prescription drug coverage via EIA or NIHB were significantly less likely to have suppressed viral loads than other study participants. NIHB registrants still exhibited this finding in 2017, whereas this same association was no longer seen for PWID or those with EIA coverage. This means as of July 2017, the only significant predictor for an unsuppressed viral load was NIHB drug coverage.

In 2017, NIHB coverage was the most prevalent (*n* = 177, 28.8%) followed by Manitoba Pharmacare (*n* = 168, 27.3%), EIA (*n* = 132, 21.5%), and Private coverage (*n* = 117, 19.0%). The remaining 20 participants were split between CFHS, clinical trials, compassionate coverage, and no coverage. There were no participants enrolled in the IFHP at time of chart review in 2017. Aggregate distribution of drug coverage program was statistically similar in both 2016 and 2017, although 24.7% of the study population reported a change to their coverage. This proportion is quite high, considering patient's NIHB Program status does not change once enrolled. This means that this proportion of coverage change increases to 34.7% when the denominator excludes those with NIHB coverage. The direction of change (i.e. whether a participant transitioned into a coverage program which was better or worse for them) was not explored as it was out of the scope of this study, although this is something which warrants further exploration in future studies.

In the multivariate analysis of viral load suppression, age was included as a constant in the model. However, age was found to be significant in both 2016 and 2017 with an increase in age by 1 year having an associated 1.03 odds ratio for viral suppression, after adjusting for all other characteristics. Younger age has been shown previously to associate with lower rates of viral load suppression[9,10,36]. This could be due to those who are older having acquired the virus early in life and by this time in their care they have made meaningful relationships with their care providers, grown used to their antiretroviral regimen schedules, and are more likely to be gainfully employed. Another explanation would be the overrepresentation of Indigenous peoples in the lower age ranges, who also represent a large proportion of those with an unsuppressed

viral load. Further research helping to elucidate why age may impact virologic suppression rates would be meaningful.

Indigenous people with Treaty status receive their antiretroviral medications without cost, yet were statistically less likely to have a suppressed viral load than others within Manitoba. The complexities of Indigenous health must be considered and addressed. The social determinants of Indigenous health have been categorized as distal (e.g. colonialism, systemic racism, social exclusion), intermediate (e.g. health care and educational systems), and proximal (e.g. health behaviour, employment and income, and food security)[37-39]. There are services made available by the federal and provincial government intended to address some of the proximal determinants of health. Although access to free coverage of ART is critical and contributes to one's ability to achieve virologic suppression it is insufficient without other interventions. It is important to ensure that these programs are comprehensive, accessible, and culturally relevant. There still remains an urgent need to address the more profound upstream issues at play. Work must be done to dismantle the distal determinants of health in order to proceed, as their "trickling down" is what has caused the social inequities associated with the intermediate and proximal determinants. Perhaps the most important determinant of Indigenous health is the lack of self-determination[40,41]. Self-determination influences all other determinants of health, so Indigenous peoples must be involved in political decision making in order to ensure they are favourable for all. The governments of Canada and Manitoba must work harder to support "bottom-up" approaches to healthcare and work with Indigenous community leaders to develop and provide programming to address all determinants of Indigenous health.

Accessing health care systems is markedly harder for members of marginalized and other vulnerable populations who are generally overrepresented among people living with HIV. Increasingly, HIV is being conceptualized as a chronic illness, and is rarely the only issue in any patient's health. Improving health outcomes will come from ensuring care models have adequate supports in place to aid patients with other health issues such as mental wellness and nutritional intake, but also navigating systems like prescription drug programs and other social supports. Indeed, the increased number of patients enrolled in clinical trials and receiving ART on a compassionate basis is a testament to the Manitoba HIV Program identifying issues with clients' drug coverage and subsequently working with outside organizations to address these gaps.

Health care systems must also work to make access to prescription drugs and other benefits more broadly available and easier to access, particularly regarding cost and administrative efforts. Although both the EIA and NIHB programs require no out of pocket expenses from their beneficiaries, in this study, both groups were significantly less likely to have suppressed viral loads. These programs are not without extensive administrative requirements which is an added stressor to the patient-health care system interaction. For instance, the Manitoba Pharmacare program requires a specific application process and the completion of one's income taxes, which is can be difficult for some Manitobans, especially those whose income is not earned through tradition means (i.e. sex work). It would be worthwhile to consider models similar to those in provinces such as British Columbia, Alberta, and Prince Edward Island where all antiretroviral medications are provided to residents without cost[42-44].

Although the 615 participants included in analysis comprise approximately half of the Manitoba HIV Program, it is a representative sample of those engaged in care in Manitoba[6]. This study is somewhat limited by the dynamic nature of medication coverage and method by which this data was obtained. Using a retrospective cohort study design does not fully capture the fluidity of

drug coverage, rather what was the patient's coverage program captured at the time of data collection.

As of July 2017, the people receiving care within the Manitoba HIV Program had an impressive viral suppression rate over a 90%, but certain subsets of the study participants did not achieve these same successes. Important aspects to consider when working to improve HIV health outcomes in Manitoba are universal access to medications, comprehensive interdisciplinary care teams, recognizing how the complexities of the social determinants of health may play a role and working with the grassroots community-led initiatives while working toward determinant equity.

TABLE 1. Clinical, Behavioural, and Demographic Characteristics of Study Population Stratified by HIV-1 RNA Viral Load at Time of Chart Review 2017

Characteristic	≤200 copies/mL N=557 n (%)	>200 copies/mL N=58 n (%)	Total Population N=615 n (%)
Age*			
Mean [SD]	49.04 [11.29]	44.11 [11.87]	48.58 [11.42]
18-30	30 (5.39)	6 (10.34)	36 (5.85)
30-50	250 (44.88)	36 (62.07)	286 (46.50)
50-65	242 (43.45)	12 (20.69)	254 (41.30)
65+	35 (6.28)	4 (6.90)	39 (6.34)
Gender (Self-reported)			
Female	150 (26.93)	22 (37.93)	172 (27.97)
Male	407 (73.07)	36 (62.07)	443 (72.03)
Gender Concordant with that Assigned at Birth			
Yes	556 (99.82)	58 (100)	614 (99.84)
Ethnicity (Self-reported)*			
Indigenous (First Nations, Métis, Inuit)	191 (34.29)	38 (65.52)	229 (37.24)
Caucasian/white	270 (48.47)	13 (22.41)	283 (46.02)
Latin	5 (0.90)	0 (0)	5 (0.81)
African/black	68 (12.21)	5 (8.62)	73 (11.87)
Caribbean	3 (0.54)	0 (0)	3 (0.49)
Asian	20 (3.59)	2 (3.45)	22 (3.58)
Transmission Risk Factors			
Men Who Have Sex with Men*			
Yes	219 (39.32)	8 (13.79)	227 (36.91)
Heterosexual Contact*			
Yes	342 (61.40)	47 (81.03)	389 (63.25)
People Who Inject Drugs*			
Yes	96 (17.24)	20 (34.48)	116 (18.86)
Other‡			
Yes	19 (3.41)	2 (3.45)	21 (3.41)
CD4 Count at Diagnosis			
≤200	167 (29.98)	15 (25.86)	182 (29.84)
>200	390 (70.02)	43 (74.14)	432 (70.36)
Previous Hepatitis C Infection			
Yes	110 (19.75)	16 (27.59)	126 (20.49)
Residence Within Winnipeg			
Yes	458 (82.23)	48 (82.76)	506 (82.28)

The χ^2 test of independence was used identify differences in participant characteristics across the two HIV-1 RNA viral load categories.
*$p<0.05$ for χ^2 test for independence.
‡Represents occupational exposure, tainted blood products, and contaminated tattoo equipment

TABLE 2. Medication Coverage and CD4 Counts of Study Population Stratified by Calendar Year and HIV-1 RNA Viral Load at Time of Chart Review

Characteristic	2016			2017		
	≤200 copies/mL N = 553 *n* (%)	>200 copies/mL N = 62 *n* (%)	Total Population N = 615 *n* (%)	≤200 copies/mL N = 557 *n* (%)	>200 copies/mL N = 58 *n* (%)	Total Population N = 615 *n* (%)
Drug Coverage Program at Time of Chart Review*						
CFHS	2 (0.36)	0 (0)	2 (0.33)	2 (0.36)	0 (0)	2 (0.33)
Clinical Trial	7 (1.27)	0 (0)	7 (1.14)	8 (1.44)	0 (0)	8 (1.30)
Compassionate	0 (0)	0 (0)	0 (0)	7 (1.26)	1 (1.72)	8 (1.30)
EIA	124 (22.42)	18 (29.03)	142 (23.09)	117 (21.01)	15 (25.86)	132 (21.46)
IFH	0 (0)	2 (3.23)	2 (0.33)	0 (0)	0 (0)	0 (0)
NIHB	142 (25.68)	35 (56.45)	177 (28.78)	146 (26.21)	31 (53.45)	177 (28.78)
No Coverage	1 (0.18)	0 (0)	1 (0.16)	2 (0.36)	0 (0)	2 (0.33)
Out of Province	1 (0.18)	0 (0)	1 (0.16)	1 (0.18)	0 (0)	1 (0.16)
Pharmacare	173 (31.28)	5 (8.06)	178 (28.94)	159 (28.55)	9 (15.52)	168 (27.32)
Private	103 (18.63)	2 (3.23)	105 (17.07)	115 (20.65)	2 (3.45)	117 (19.02)
CD4 Count at Time of Chart Review (cells/mm^3)*						
≤200	27 (4.88)	17 (27.42)	44 (7.15)	28 (5.03)	23 (40.35)	51 (8.31)
200-500	193 (34.90)	30 (48.39)	223 (36.26)	186 (33.39)	26 (44.83)	212 (34.47)
>500	333 (60.22)	15 (24.19)	348 (56.59)	343 (61.58)	9 (15.79)	352 (57.33)

CFHS, Canadian Forces Health Services; EIA, Employment and Income Assistance; IFH, Interim Federal Health; NIHB, Non-Insured Health Benefits.
The χ^2 test of independence was used identify differences in participant characteristics across the two viral load categories within each calendar year.
*P<0.05 for χ^2 test for independence.

TABLE 3. Multivariate Analysis of Viral Load Suppression per Calendar Year

Characteristic	Viral Load Suppression (<200 copies/mL) AOR (95% CI)	
	2016	2017
Gender (Self-reported)		
Male	1.0 (Ref)	1.0 (Ref)
Female	0.75 (0.40-1.44)	0.71 (0.37-1.37)
Age	1.03 (1.01-1.07)	1.03 (1.00-1.06)
Transmission Risk Factors		
Men Who Have Sex with Men	1.55 (0.56-4.33)	2.19 (0.77-6.18)
Intravenous Drug Use	0.51 (0.27-0.94)	0.58 (0.31-1.10)
Heterosexual Contact	0.55 (0.22-1.37)	0.74 (0.30-1.82)
Drug Coverage Program		
CFHS	1.0 (Omitted)*	1.0 (Omitted)*
Clinical Trial	1.0 (Omitted)*	1.0 (Omitted)*
Compassionate	1.0 (Omitted)*	0.17 (0.01-2.15)
EIA	0.21 (0.05-0.98)	0.23 (0.05-1.04)
IFH	1.0 (Omitted)*	1.0 (Omitted)*
NIHB	0.14 (0.03-0.60)	0.14 (0.03-0.64)
No Coverage	1.0 (Omitted)*	1.0 (Omitted)*
Out of Province	1.0 (Omitted)*	1.0 (Omitted)*
Pharmacare	0.61 (0.12-3.24)	0.30 (0.06-1.44)
Private	1.0 (Ref)	1.0 (Ref)

CFHS, Canadian Forces Health Services; EIA, Employment and Income Assistance; IFH, Interim Federal Health; NIHB, Non-Insured Health Benefits; AOR, adjusted odds ratio.
Analyses conducted on 602 observations from 615 participants.
*Omission due to perfect success prediction.

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