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Factors linked to transitions in adherence to antiretroviral therapy among HIV-infected illicit drug users in a Canadian setting

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Abstract

HIV-positive people who use illicit drugs typically achieve lower levels of adherence to antiretroviral therapy and experience higher rates of sub-optimal HIV/AIDS treatment outcomes. Given the dearth of longitudinal research into ART adherence dynamics, we sought to identify factors associated with transitioning into and out of optimal adherence to ART in a longitudinal study of HIV-infected people who use illicit drugs (PWUD) in a setting of universal no-cost HIV/AIDS treatment. Using data from a prospective cohort of community-recruited HIV-positive illicit drug users confidentially linked to comprehensive HIV/AIDS treatment records, we estimated longitudinal factors associated with losing or gaining ≥ 95% adherence in the previous six months using two generalized linear mixed-effects models. Among 703 HIV-infected ART-exposed PWUD, becoming non-adherent was associated with periods of homelessness (Adjusted Odds Ratio [AOR] = 2.52, 95% Confidence Interval [95% CI]: 1.56 - 4.07), active injection drug use (AOR = 1.25, 95% CI: 1.01 - 1.56) and incarceration (AOR = 1.54, 95% CI: 1.10 - 2.17). Periods of sex work (AOR = 0.51, 95% CI: 0.34 - 0.75) and injection drug use (AOR = 0.62, 95% CI: 0.50 - 0.77) were barriers to becoming optimally adherent. Methadone maintenance therapy (MMT) was associated with becoming optimally adherent (AOR = 1.87, 95% CI: 1.50 - 2.33) and was protective against becoming non-adherent (AOR = 0.52, 95% CI: 0.41 - 0.65). In conclusion, we identified several behavioural, social and structural factors that shape adherence patterns among PWUD. Our findings highlight the need to consider these contextual factors in interventions that support the effective delivery of ART to this population.

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Keywords

Antiretroviral therapy; adherence; drug users; methadone; incarceration; sex work

Introduction

The advent of antiretroviral therapy (ART) has led to substantial declines in HIV/AIDS-associated morbidity and mortality among people living with HIV (PLWH) worldwide (Beck et al., 1999; Murphy et al., 2001; Palella et al., 1998; Panos et al., 2008). Following initiation of treatment, optimal adherence to ART is strongly associated with suppression of plasma HIV-1 RNA viral load, preventing disease progression to AIDS and premature death, as well as virtually eliminating onward viral transmission (Baeten et al., 2012; Donnell et al., 2010; He et al., 2013; Ledergerber et al., 1999; McGowan & Shah, 2000; Quinn et al., 2000).

Despite the clear benefits of ART on HIV disease progression and transmission, access remains heterogeneous worldwide and some groups have not experienced the full benefits of ART (Baeten et al., 2012; Donnell et al., 2010; He et al., 2013). In particular, studies of PLWH who use illicit drugs such as cocaine, heroin and methamphetamine have described elevated rates of sub-optimal HIV/AIDS treatment outcomes (Barash et al., 2007; Lucas et al., 2006; Lucas et al., 2002). Fortunately, PLWH who use illicit drugs have been shown to attain ART outcomes comparable to individuals in other risk categories given adequate levels of ≥ 95% adherence (Wood, Montaner, et al., 2003b; Wood et al., 2004). Thus, there is an urgent need to promote access and adherence to ART and to introduce interventions that reduce the clinical, behavioural, social, and structural barriers to effective HIV/AIDS treatment and care faced by people who use illicit drugs (PWUD) (Milloy et al., 2012; Wolfe et al., 2010).

Research has revealed a broad range of behavioural, social, and structural risk factors for non-adherence to ART (Malta et al., 2008; Wood, Kerr, Tyndall, & Montaner, 2008). Systematic reviews of studies of adherence among PWUD reveal that almost all studies are cross-sectional and dichotomize individuals as adherent or non-adherent at a given point in time and thus cannot consider changes in adherence over time (Krusi, Wood, Montaner, & Kerr, 2010; Malta et al., 2008; Wood et al., 2008). Increasingly, adherence is understood as a dynamic and complex process and renewed HIV/AIDS prevention and treatment efforts are focused on retaining PLWH in care over the long term. Thus, using data from a long-running community-recruited cohort of HIV-infected PWUD, we sought to identify the behavioural, social, and structural factors associated with losing or attaining ≥95% adherence to prescribed ART among PWUD.

Methods

In this study, we used data from the AIDS Care Cohort to evaluate Exposure to Survival Services (ACCESS), an ongoing prospective observational cohort of illicit drug users living with HIV/AIDS in Vancouver, British Columbia (BC), Canada. Described in detail elsewhere (Milloy et al., 2011; Strathdee et al., 1998), recruitment for the cohort began in

May, 1996, and focused on the city's Downtown Eastside neighbourhood, a post-industrial area with an open drug market and high levels of illicit drug use, poverty, and HIV infection (Strathdee et al., 1997; Tyndall et al., 2003). Eligibility criteria for participation in ACCESS are HIV-serostatus, aged ≥ 18 years, use of illicit drugs other than cannabis in the previous month, and written informed consent. At the baseline interview, and each biannual interview thereafter, participants respond to an interviewer-administered questionnaire, are examined by a study nurse, and provide blood for serologic analyses. At recruitment, participants provide their personal health number (PHN), a unique and persistent identifier issued for billing and tracking purposes to all residents of BC by the government-run universal and no-cost medical system. The ACCESS study has been approved by the University of British Columbia/Providence Health Care Research Ethics Board.

Information gathered through the interview and examination process is augmented by data on HIV treatment and clinical outcomes. This information is available through a confidential linkage with the provincial Drug Treatment Program (DTP). As described in detail elsewhere (Strathdee et al., 1998), the DTP provides ART and related care free of charge to all PLWH in BC and is administered by the British Columbia Centre for Excellence in HIV/AIDS (BCCfE) according to the International Antiviral Society's current therapeutic guidelines (Thompson et al., 2012). Data collected through the DTP provides a complete retrospective and prospective clinical profile for each participant including CD4+ cell counts, plasma HIV-1 RNA viral load, and all ART dispensations. Due to BC's province-wide free healthcare including all HIV/AIDS medications and care, we are able to evaluate the effects of various exposures on treatment uptake and adherence free of the confounding influence of treatment cost.

The present analyses included all participants who had initiated ART at least one day prior to a baseline or follow-up interview. Participants who initiated ART after the baseline were included from the follow-up after initiation onward. To be eligible for these analyses, individuals had to have contributed ≥ 2 survey interviews following ART initiation and had to have at least one CD4+ cell count observation within ± 180 days of the baseline interview.

Using pharmacy refill data, adherence to ART was calculated as the ratio of the number of days for which ART was dispensed over the number of days since the previous interview or since ART initiation, up to a maximum of 180 days. Optimal adherence was defined as equal to or greater than 95%, meaning participants had been dispensed enough ART for ≥95% of the days since the previous interview or since ART initiation. Pharmacy refill compliance has been previously validated and shown to be a reliable measure of ART adherence, with a demonstrated association with both virologic suppression and survival (Grossberg, Zhang, & Gross, 2004; Wood et al., 2004; Wood, Hogg, et al., 2003a).

The primary outcomes of interest in this study were transitions in adherence to ART. Transitions were dichotomized as either out of optimal adherence or into optimal adherence. Transitions out of optimal adherence occurred when a participant's ART dispensation data indicated a drop in actual dispensations from ≥95% of eligible dispensations in the previous six-month period to below 95% in the following six-month period. Transitions into optimal adherence occurred when a participant's ART dispensation data indicated a rise in actual

dispensations from below 95% of eligible dispensations in the previous six-month period to ≥95% in the following six-month period.

We considered a range of explanatory variables including: age (per year older), gender (female vs. male), self-reported Caucasian ethnicity (yes vs. no), level of education attained (≥ high school diploma vs. < high school diploma), homelessness (yes vs. no), employment (formal employment including regular, temporary, or self-employment vs. none or non-formal employment), injection drug use (yes vs. no), non-injection drug use (yes vs. no), self-reported binge drug use (runs or binges in which participant reported using more drugs than usual; yes vs. no), involvement in sex work (yes vs. no), incarceration (yes vs. no), and engagement in methadone maintenance therapy (MMT; yes vs. no). Clinical variables considered were CD4+ cell count (per 100 cells/mL) and physician HIV-related experience (< 6 vs. ≥ 6 patients previously enrolled in the province-wide HIV registry). CD4+ cell counts were conducted through the ACCESS study in addition to any measurements conducted outside of the study setting, for example, by a participant's personal physician. CD4+ data was calculated as a mean of all observations in the last six months or, if no observations were made during the six-month period, the most recent measure. All explanatory variables were time-updated and referred to the six-month period in which a transition in adherence was observed, except homelessness and MMT, which referred to current status at the time of the interview, and physician experience, which was time-fixed.

We compared the characteristics of the study sample at the baseline interview by level of adherence to ART (≥95% vs. <95%) in order to present the study sample and identify clinical, structural, and social differences between optimally adherent and non-adherent individuals. This comparison was conducted using the χ^2 test for categorical variables and the Wilcoxon rank-sum test for continuous variables.

We constructed multivariate models of factors associated with transitioning into or out of optimal adherence using generalized linear mixed-effects modeling. This method was used as it accounts for the correlation inherent in serial measures from the same individual. To prepare the models, we used an *a priori*-defined backwards stepwise procedure. First, we fit a full model including all explanatory variables with p-values < 0.4 in bivariable analyses. After noting the value of the Akaike Information Criterion (AIC) for the full model, we dropped the covariate associated with the largest *p*-value and fit a reduced model. We continued this procedure until zero explanatory variables were left in the model, and chose the final model that minimized the AIC. To account for HIV disease progression and clinical eligibility for ART, we included CD4+ cell count as an explanatory covariate in all multivariable models.

Results

Between May, 1996 and March, 2012, 1036 PLWH who use illicit drugs were recruited and provided informed consent for the ACCESS study. Of these, 703 had at least two interviews following ART initiation and at least one CD4+ cell count within 180 days of the baseline interview. These 703 individuals were included in this study and contributed 5422 interviews during the study period, or a median of 5 (Interquartile Range [IQR] = 3 – 10) per

participant. For the analysis of transitioning into optimal adherence, 1813 observation periods among 509 individuals met our inclusion criteria of containing < 95% adherence in the previous follow-up. For the analysis of transitioning out of optimal adherence, 2674 observation periods among 436 individuals met our inclusion criteria of containing ≥ 95% adherence in the previous follow-up.

Select socio-demographic, behavioural, structural, and clinical characteristics of the participants at baseline interview stratified by level of adherence to ART (≥95% vs. <95%) are presented in Table 1. Of the 703 individuals included in our analyses, 190 (27.0%) participants had optimal adherence to ART at baseline. Individuals exhibiting optimal adherence were older (Odds Ratio [OR] = 1.02, 95% Confidence Interval [95% CI]: 1.01 – 1.02), more likely to be engaged in MMT (OR = 1.56, 95% CI: 1.12 – 2.19), more likely to have a high school diploma (OR = 1.51, 95% CI: 1.08 - 2.10,), and had higher CD4+ cell counts (OR = 1.27, 95% CI: 1.17 – 1.38). In contrast, individuals exhibiting non-adherence were more likely to be female (OR = 0.44, 95% CI: 0.30 – 0.65), non-Caucasian (OR = 2.17, 95% CI: 1.52 – 3.10), binge drug users (OR = 0.42, 95% CI: 0.28 – 0.64), injection drug users (OR = 0.52, 95% CI: 0.36 – 0.77), and were more likely to have been recently incarcerated (OR = 0.57, 95% CI: 0.34 – 0.94) and involved in sex work (OR = 0.33, 95% CI: 0.17 – 0.63).

The crude and adjusted longitudinal estimates of the odds of transitioning out of optimal adherence to ART are presented in Table 2. In an adjusted model, individuals who transitioned out of optimal adherence tended to be younger (Adjusted Odds Ratio [AOR] = 0.95, 95% CI: 0.94 – 0.97) with lower CD4+ cell counts (AOR = 0.87, 95% CI: 0.82 – 0.97), and were likely to have been homeless (AOR = 2.52, 95% CI: 1.56 – 4.07) or incarcerated (AOR = 1.54, 95% CI: 1.10 – 2.17) during the period of the transition. Those individuals reporting injection drug use (AOR = 1.25, 95% CI: 1.01 – 1.56) during this period were also likely to transition out of optimal adherence. Of special note, engagement in MMT (AOR = 0.52, 95% CI: 0.41 – 0.65) was the sole factor protective against the loss of optimal adherence in the model.

Table 3 shows the crude and adjusted longitudinal estimates of the odds of transitioning into optimal adherence to ART. Individuals who transitioned into optimal adherence were older (AOR = 1.08, 95% CI: 1.06 – 1.09) with higher CD4+ cell counts (AOR = 1.25, 95% CI: 1.19 – 1.32), and were more likely to be male (AOR = 0.69, 95% CI: 0.51 – 0.93). Injection drug use (AOR = 0.62, 95% CI: 0.50 – 0.77), and involvement in sex work (AOR = 0.51, 95% CI: 0.34 – 0.75) were significant barriers to becoming optimally adherent to ART. Engagement in MMT (AOR = 1.87, 95% CI: 1.50 – 2.33) was the sole factor facilitating attaining optimal adherence in the model.

Discussion

In this longitudinal study of factors associated with transitioning into or out of optimal adherence to ART among PLWH who use illicit drugs, we observed a high level of non-adherence, with over 70% of individuals exhibiting non-adherence at baseline. In multivariate models adjusted for illicit drug use patterns, sex work was a barrier to becoming

optimally adherent while homelessness and incarceration were both risk factors for becoming non-adherent. Engagement in MMT was predictive of optimal adherence at baseline and was the sole protective factor against becoming non-adherent as well as the sole facilitating factor for becoming optimally adherent in multivariate models.

Recent studies have revealed strong links between incarceration and non-adherence to ART in many settings (Chen et al., 2011; Milloy et al., 2011). Several barriers to treatment within correctional systems have been described, such as sub-standard healthcare facilities, a lack of care for HIV-related co-morbidities such as addiction, and an emphasis on public security over public health (Fazel & Baillargeon, 2011; Flanigan & Beckwith, 2011; Jürgens, Nowak, & Day, 2011). In addition, studies have shown how poor continuity of care between correctional and non-correctional care settings is a barrier to maintenance of treatment (Baillargeon et al., 2009; Small, Wood, Betteridge, Montaner, & Kerr, 2009). Elimination of these barriers may be key to maintaining optimal adherence levels among HIV-infected PWUD involved in the criminal justice system.

Sex workers have been well described as a highly marginalized population with elevated rates of drug use, unstable housing, and elevated risk of HIV infection (Kral et al., 2001; Rekart, 2005; Vanwesenbeeck, 2001). Given the established vulnerabilities in this group, it is not surprising that sex work involvement was a significant barrier to becoming optimally adherent in our analyses. Sex workers carry an elevated HIV risk burden due to a complex structure of interacting sex and drug related risk behaviours (Miller et al., 2002; Spittal et al., 2003) and are a hard-to-reach group facing multiple barriers to accessing health care and treatment, including social stigma, incompatible service office hours, and mental health issues (Kurtz, Surratt, Kiley, & Inciardi, 2005). Effective interventions for the promotion of ART adherence and elimination of barriers to care in this group are urgently needed.

Research has revealed strong associations between unstable housing and deleterious adherence patterns (Bangsberg et al., 2000; Kidder, Wolitski, Campsmith, & Nakamura, 2007; Kushel et al., 2006; Moss et al., 2004). Compared to housed individuals, the unstably housed or homeless have increased rates of drug and alcohol abuse, as well as higher rates of HIV infection and HIV/AIDS-related morbidity and mortality (Milloy et al., 2012; Palepu et al., 2006). ART adherence may be negatively affected through stigma, poor physical and mental health, or a lack of routine, privacy, and storage for medications (Palepu et al., 2006). Our analyses show that homeless individuals are at risk of becoming non-adherent, emphasizing an already established need for housing interventions.

Our findings show clear adherence benefits from MMT engagement in both facilitating and maintaining optimal ART adherence. Although this study sample is marked by prevalent poly-drug use, including high levels of opioid (heroin, prescription opioid) and stimulant (cocaine, methamphetamine) use, we should note that we did not screen participants for opioid or stimulant dependence. Nevertheless, for opioid users, MMT has been shown to be associated with lower frequency of heroin injection drug use (Caplehorn, Bell, Kleinbaum, & Gebski, 1993; Joseph, Stancliff, & Langrod, 2000) and positive clinical outcomes in association with ART, including viral load suppression (Palepu et al., 2006; Uhlmann et al., 2010).

Current medication regimes for HIV infection require at least daily adherence over the long term to promote virologic non-detectability, stall disease progression and prolong survival. However, there are very few studies among HIV-positive drug users assessing adherence over the long term using longitudinal observations (Malta et al., 2010). In this study, the use of repeated measures every six months has allowed us to isolate periods characterized by loss or gain of ≥ 95% adherence. Our findings echo previous cross-sectional work which, for example, identified the important effects of incarceration and engagement in opioid substitution therapy on adherence (Palepu et al, 2011; Milloy et al., 2011). This study reveals their impact on adherence dynamics over time and identifies factors relevant to efforts to retain individuals in HIV treatment.

This research has several limitations. First, our analytic sample cannot be seen as representative of all PLWH who use illicit drugs due to non-random participant recruitment and the free availability of ART in our setting. Secondly, the possibility of confounding variable influence cannot be excluded. To minimize the effects of confounding variables, we used multivariate modeling of data from a long standing cohort of HIV-infected PWUD. Thirdly, several explanatory variables such as injection drug use, sex work involvement, and incarceration were derived from participant self-report, which might be susceptible to bias. For example, a social desirability bias might engender the under-reporting of participant incarceration or sex work involvement, potentially diminishing an observed relationship to ART adherence. Lastly, the MMT explanatory variable refers to a maintenance therapy undertaken to treat opioid dependence specifically, and may therefore be biased towards opioid users within the study group. Despite these potential limitations, within the context of BC's free healthcare and universal access to ART, confounding due to financial barriers to healthcare access has been reduced.

Within the context of an ongoing prospective cohort of PLWH who use illicit drugs, we have identified several factors associated with transitions between optimal adherence and non-adherence. Active injection drug use and sex work were found to be barriers to becoming optimally adherent, whereas homelessness, incarceration, and injection drug use were risk factors for becoming non-adherent. MMT was the sole protective factor against becoming non-adherent as well as the sole facilitating factor of becoming optimally adherent. Our findings emphasize the importance of considering social and structural determinants of ART adherence dynamics and highlight the role of MMT in the protection and maintenance of optimal adherence to ART among opioid-dependent PWUD. Given the high levels of non-adherence among PWUD, more research is urgently needed to better understand ART adherence dynamics, to investigate possible protective factors among non-opiate using PWUD, and to develop effective strategies against threats to optimal ART adherence.

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Table 1

Characteristics of 703 PLWH who use illicit drugs stratified by ≥95% adherence to ART in the six-month period prior to the baseline interview.

Characteristic	<95% adherence n (%) 513 (73.0)	≥95% adherence n (%) 190 (27.0)	OR[1]	95% CI[2]	*p*-value
Age					
Per year older	38.9 (33.1 – 44.6)	46.0 (39.6 – 51.4)	1.02	1.01 - 1.02	< 0.001
Gender					
Male	302 (58.9)	145 (76.3)	1.00		
Female	211 (41.1)	45 (23.7)	0.44	0.30 - 0.65	0.001
Caucasian					
No	244 (47.6)	56 (29.5)	1.00		
Yes	269 (52.4)	134 (70.5)	2.17	1.52 - 3.10	< 0.001
Binge drug use					
No	342 (66.7)	157 (82.6)			
Yes	171 (33.3)	33 (17.4)	0.42	0.28 - 0.64	< 0.001
Non-injection drug use					
No	154 (30.0)	28 (14.7)	1.00		
Yes	359 (70.0)	162 (85.3)	2.48	1.59 - 3.87	< 0.001
Sex work					
No	432 (84.2)	179 (94.2)	1.00		
Yes	81 (15.8)	11 (5.8)	0.33	0.17 - 0.63	< 0.001
Injection drug use					
No	98 (19.1)	59 (31.1)	1.00		
Yes	415 (80.9)	131 (68.9)	0.52	0.36 - 0.77	0.001
MMT[4,5]					
No	328 (63.9)	101 (53.2)	1.00		
Yes	185 (36.1)	89 (46.8)	1.56	1.12 - 2.19	0.011
Education					
< High school diploma	316 (61.6)	98 (51.6)			
≥ High school diploma	197 (38.4)	92 (48.4)	1.51	1.08 - 2.10	0.020
Incarceration					
No	421 (82.1)	169 (88.9)	1.00		
Yes	92 (17.9)	21 (11.1)	0.57	0.34 - 0.94	0.029
Homeless[5]					
No	465 (90.6)	180 (94.7)			
Yes	48 (9.4)	10 (5.3)	0.54	0.27 - 1.09	0.090
HIV MD experience					
≥ 6 patients	425 (82.8)	160 (84.2)	1.00		
< 6 patients	88 (17.2)	30 (15.8)	0.91	0.58 - 1.42	0.734
Employment					
None or non-formal	498 (97.1)	184 (96.8)			

Characteristic	<95% adherence n (%) 513 (73.0)	≥95% adherence n (%) 190 (27.0)	OR[1]	95% CI[2]	*p*-value
Formal	15 (2.9)	6 (3.2)	1.09	0.41 - 2.83	0.808
CD4+ cell count					
Per 100 cells/ml	2.7 (1.7 – 4.0)	3.8 (2.6 – 5.1)	1.27	1.17 - 1.38	< 0.001

3. Refers to 180 day period prior to the baseline interview

[1] Odds Ratio

[2] 95% Confidence Interval

[4] Methadone maintenance therapy

[5] Refers to current status

Table 2

Bivariate and multivariate factors associated with transitioning out of optimal (≥95%) adherence during a six-month period among 436 PLWH who use illicit drugs

Characteristic	OR[1]	95% CI[2]	*p*-value	AOR[3]	95% CI[2]	*p*-value
Age						
Per year older	0.94	0.93 - 0.96	< 0.001	0.95	0.94 - 0.97	< 0.001
Gender						
Female vs. male	1.27	0.96 - 1.69	0.099			
Caucasian						
Yes vs. no	0.88	0.67 - 1.15	0.353			
MMT[4,5]						
Yes vs. no	0.54	0.43 - 0.67	< 0.001	0.52	0.41 - 0.65	< 0.001
Homeless[5]						
Yes vs. no	3.62	2.29 - 5.74	< 0.001	2.52	1.56 - 4.07	< 0.001
Incarceration						
Yes vs. no	2.12	1.53 - 2.94	< 0.001	1.54	1.10 - 2.17	0.013
Injection drug use						
Yes vs. no	1.47	1.19 - 1.82	< 0.001	1.25	1.01 - 1.56	0.045
Sex work						
Yes vs. no	1.83	1.28 - 2.63	0.001	1.44	0.98 - 2.10	0.060
HIV MD experience						
<6 patients vs. ≥6	1.38	0.96 - 1.99	0.081	1.37	0.96 - 1.95	0.084
Non-injection drug use						
Yes vs. no	1.08	0.86 - 1.35	0.518			
Employment						
Yes vs. no	0.76	0.45 - 1.29	0.31			
Education						
≥HS[6] vs. <HS	0.84	0.66 - 1.06	0.149			
Binge drug use						
Yes vs. no	1.21	0.94 - 1.55	0.146			
CD4+ cell count						
Per 100 cells/ml	0.85	0.8 - 0.9	< 0.001	0.87	0.82 - 0.92	< 0.001

[1] Odds Ratio

[2] 95% Confidence Interval

[3] Adjusted Odds Ratio

[4] Methadone maintenance therapy

[5] Refers to current status

[6] High School

Table 3

Bivariate and multivariate factors associated with transitioning into optimal (≥95%) adherence during a six-month period among 509 PLWH who use illicit drugs

Characteristic	OR[1]	95% CI[2]	*p*-value	AOR[3]	95% CI[2]	*p*-value
Age						
Per year older	1.1	1.08 - 1.11	< 0.001	1.08	1.06 - 1.09	< 0.001
Gender						
Female vs. male	0.53	0.4 - 0.7	< 0.001	0.69	0.51 - 0.93	0.017
Caucasian						
Yes vs. no	1.34	1.02 - 1.76	0.034	1.30	0.97 - 1.76	0.079
MMT[4,5]						
Yes vs. no	1.77	1.44 - 2.19	< 0.001	1.87	1.50 - 2.33	< 0.001
Injection drug use						
Yes vs. no	0.51	0.42 - 0.62	< 0.001	0.62	0.50 - 0.77	< 0.001
Sex work						
Yes vs. no	0.31	0.21 - 0.45	< 0.001	0.51	0.34 - 0.75	0.001
Homeless[5]						
Yes vs. no	0.42	0.27 - 0.66	< 0.001	0.63	0.40 - 1.01	0.054
Incarceration						
Yes vs. no	0.52	0.39 - 0.71	< 0.001	0.78	0.57 - 1.07	0.126
Non-injection drug use						
Yes vs. no	0.94	0.76 - 1.16	0.553			
Employment						
Yes vs. no	1.21	0.75 - 1.96	0.432			
Education						
≥HS[6] vs. <HS	1.13	0.91 - 1.40	0.271			
HIV MD experience						
<6 patients vs. ≥6	0.74	0.52 - 1.07	0.113			
Binge drug use						
Yes vs. no	0.74	0.59 - 0.93	0.011			
CD4+ cell count						
Per 100 cells/ml	1.27	1.20 - 1.33	< 0.001	1.25	1.19 - 1.32	< 0.001

[1] Odds Ratio

[2] 95% Confidence Interval

[3] Adjusted Odds Ratio

[4] Methadone maintenance therapy

[5] Refers to current status

[6] High School