

# Factors Linked to Transitions in Adherence to Antiretroviral Therapy Among HIV-Infected Illicit Drug Users in a Canadian Setting

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## Background

- Optimal adherence to antiretroviral therapy (ART) is associated with HIV-1 RNA viral load suppression and reduced risk of disease progression to AIDS, premature death, and onward HIV transmission.
- Compared to other HIV-infected populations, people living with HIV (PLWH) who use illicit drugs exhibit higher rates of ART non-adherence and correspondingly higher rates of HIV-related morbidity and mortality. However, this group has been shown to attain positive ART outcomes given adequate adherence.
- Research has revealed a range of risk factors for non-adherence, but these studies are cross-sectional and do not consider adherence dynamics over time.
- Using data from a long-running community-recruited cohort of PLWH who use illicit drugs, we sought to identify the behavioural, social, and structural factors associated with transitions into and out of optimal adherence to ART.

## Methods

- We used data from the ACCESS cohort, an ongoing prospective observational cohort of illicit drug users living with HIV/AIDS in Vancouver, Canada. Participants respond to biannual interviewer-administered questionnaires, are examined by study nurses and provide blood for serological analyses.
- We also used data from a confidential linkage with the provincial Drug Treatment Program (DTP) which provides ART free of charge to all PLWH in British Columbia (BC). This data provides a clinical profile for each participant including CD4+ cell counts, plasma viral load, and all ART dispensations.
- The primary outcomes of interest were transitions in adherence to ART. These were dichotomized as either out of optimal adherence or into optimal adherence. Optimal adherence was defined as ≥95%, meaning a participant had been dispensed enough ART for ≥95% since the previous follow-up.
- We constructed multivariate models of factors associated with transitioning into or out of optimal adherence using linear mixed-effects modeling. To account for HIV disease progression and clinical eligibility for ART, we included CD4+ cell count as an explanatory covariate in all models.

## Results

- The study sample included 703 individuals contributing 5422 interviews during the study period between May, 1996 and March, 2012. Of these 703 individuals, 190 (27.0%) participants had optimal adherence to ART at baseline. These participants were older, more likely to be engaged in MMT, more likely to have a high school diploma, and had higher CD4+ cell counts. In contrast, individuals exhibiting non-adherence at baseline were more likely to be female, non-Caucasian, involved in sex work, binge drug users, injection drug users, and were more likely to have been recently incarcerated.
- Adjusted longitudinal estimates of the odds of transitioning out of optimal adherence to ART are presented in Table 1. The estimates of the odds of transitioning into optimal adherence are presented in Table 2. All factors refer to the 180 day period prior to the baseline interview except methadone maintenance therapy (MMT) and homelessness which refer to current status at the time of follow-up interview.

**Table 1. Multivariate factors associated with transitioning out of optimal (≥95%) adherence during a six-month period among 695 PLWH who use illicit drugs**

Characteristic	AOR <sup>1</sup>	95% CI <sup>2</sup>	P-value	Characteristic	AOR <sup>1</sup>	95% CI <sup>2</sup>	P-value
<b>Age</b> (per year older)	0.95	0.94 – 0.97	<0.001	<b>MMT</b> (Yes vs. No)	0.52	0.41 – 0.65	<0.001
<b>Gender</b> (Female vs. Male)	-	-	-	<b>Education</b> (<HS vs. ≥HS) <sup>3</sup>	-	-	-
<b>Caucasian</b> (Yes vs. No)	-	-	-	<b>Incarceration</b> (Yes vs. No)	1.54	1.10 – 2.17	0.013
<b>Binge drug use</b> (Yes vs. No)	-	-	-	<b>Homelessness</b> (Yes vs. No)	2.52	1.56 – 4.07	<0.001
<b>Non-injection drug use</b> (Yes vs. No)	-	-	-	<b>HIV MD experience</b> (<6 vs. ≥6) <sup>4</sup>	1.37	0.96 – 1.95	0.084
<b>Sex work</b> (Yes vs. No)	1.44	0.98 – 2.10	0.060	<b>Employment</b> (F vs. N/NF) <sup>5</sup>	-	-	-
<b>Injection drug use</b> (Yes vs. No)	1.25	1.01 – 1.56	0.045	<b>CD4+ cell count</b> (per 100 cells/ml)	0.87	0.82 – 0.92	<0.001

1. Of 703 participants, data from 695 were used for this analysis; 2. AOR: Adjusted Odds Ratio; 3. 95% CI: 95% Confidence Interval; 4. HS: High School diploma; 5. 6 HIV positive patients; 6. F: Formal employment, N: None, NF: Non-formal employment

**Table 2. Multivariate factors associated with transitioning into optimal (≥95%) adherence during a six-month period among 691 PLWH who use illicit drugs**

Characteristic	AOR <sup>1</sup>	95% CI <sup>2</sup>	P-value	Characteristic	AOR <sup>1</sup>	95% CI <sup>2</sup>	P-value
<b>Age</b> (per year older)	1.08	1.06 – 1.09	<0.001	<b>MMT</b> (Yes vs. No)	1.87	1.50 – 2.33	<0.001
<b>Gender</b> (Female vs. Male)	0.69	0.51 – 0.93	0.017	<b>Education</b> (<HS vs. ≥HS) <sup>3</sup>	-	-	-
<b>Caucasian</b> (Yes vs. No)	1.30	0.97 – 1.76	0.079	<b>Incarceration</b> (Yes vs. No)	0.78	0.57 – 1.07	0.126
<b>Binge drug use</b> (Yes vs. No)	-	-	-	<b>Homelessness</b> (Yes vs. No)	0.63	0.40 – 1.01	0.054
<b>Non-injection drug use</b> (Yes vs. No)	-	-	-	<b>HIV MD experience</b> (<6 vs. ≥6) <sup>4</sup>	-	-	-
<b>Sex work</b> (Yes vs. No)	0.51	0.34 – 0.75	0.001	<b>Employment</b> (F vs. N/NF) <sup>5</sup>	-	-	-
<b>Injection drug use</b> (Yes vs. No)	0.62	0.50 – 0.77	<0.001	<b>CD4+ cell count</b> (per 100 cells/ml)	1.25	1.19 – 1.32	<0.001

1. Of 703 participants, data from 691 were used for this analysis; 2. AOR: Adjusted Odds Ratio; 3. 95% CI: 95% Confidence Interval; 4. HS: High School diploma; 5. 6 HIV positive patients; 6. F: Formal employment, N: None, NF: Non-formal employment

- In an adjusted model, individuals who transitioned out of optimal adherence tended to be younger with lower CD4+ cell counts, and were likely to have been homeless or incarcerated during the period of transition. Those individuals reporting injection drug use during this period were also likely to transition out of optimal adherence. Of special note, engagement in MMT was the sole factor protective against the loss of optimal adherence in the model.
- Individuals who transitioned into optimal adherence were older with higher CD4+ cell count, and were more likely to be male. Injection drug use and involvement in sex work were significant barriers to becoming optimally adherent to ART. Engagement in MMT was the sole factor facilitating attaining optimal adherence in the model.

## Conclusions

- Correctional systems exhibit several barriers to HIV treatment and adherence such as sub-standard healthcare facilities, a lack of HIV-related co-morbidities such as addiction, and emphasis on public security over public health. In addition, poor continuity of care between correctional and non-correctional care settings is a barrier to maintenance of treatment. Elimination of these barriers may be key to maintaining optimal adherence levels among PLWH who use illicit drugs involved in the criminal justice system.
- Sex workers are a highly marginalized population with elevated rates of drug use, unstable housing, and elevated risk of HIV infection. Since sex workers face multiple barriers to accessing healthcare and maintaining HIV treatment including social stigma, incompatible office hours, drug use and mental health issues, effective interventions for the promotion of ART adherence and elimination of barriers to care in this group are urgently needed.
- 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-related morbidity and mortality. ART adherence may be negatively affected through stigma, poor physical and mental health, or a lack of routine, privacy, and storage for medications. Our analyses emphasize an already established need for housing interventions.
- MMT has been shown to be associated with lower frequency of heroin injection drug use and positive health clinical outcomes in association with ART. This provides strong support for increased access to MMT among PLWH who use illicit drugs as a means to promote and maintain optimal ART adherence.
- Despite the fact that ART adherence is a dynamic phenomenon, there is a relative dearth of investigation into adherence patterns over time. 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 PLWH who use illicit drugs.

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