Sticking to It: The Effect of Maximally Assisted Therapy on Antiretroviral Treatment Adherence Among Individuals Living with HIV Who are Unstably Housed

Surita Parashar,

BC Centre for Excellence in HIV/AIDS, St. Paul's Hospital, 608-1081 Burrard Street, Vancouver, BC V6Z 1Y6, Canada. Faculty of Health Sciences, Simon Fraser University, 8888 University Drive, Burnaby, BC V5A 1S6, Canada

Alexis K. Palmer,

BC Centre for Excellence in HIV/AIDS, St. Paul's Hospital, 608-1081 Burrard Street, Vancouver, BC V6Z 1Y6, Canada. Faculty of Health Sciences, Simon Fraser University, 8888 University Drive, Burnaby, BC V5A 1S6, Canada

Nadia O'Brien,

BC Centre for Excellence in HIV/AIDS, St. Paul's Hospital, 608-1081 Burrard Street, Vancouver, BC V6Z 1Y6, Canada

Keith Chan,

BC Centre for Excellence in HIV/AIDS, St. Paul's Hospital, 608-1081 Burrard Street, Vancouver, BC V6Z 1Y6, Canada

Anya Shen,

BC Centre for Excellence in HIV/AIDS, St. Paul's Hospital, 608-1081 Burrard Street, Vancouver, BC V6Z 1Y6, Canada

Suzy Coulter,

Maximally Assisted Therapy Program, Vancouver Coastal Health Authority/BC Centre for Excellence in HIV/AIDS, Downtown Community Health Centre, 569 Powell Street, Vancouver, BC V6A 1G8, Canada

Julio S. G. Montaner, and

BC Centre for Excellence in HIV/AIDS, St. Paul's Hospital, 608-1081 Burrard Street, Vancouver, BC V6Z 1Y6, Canada. Department of Medicine, University of British Columbia, 3300-950 West 10th Avenue, Vancouver, BC V5Z 4E3, Canada

Robert S. Hogg

BC Centre for Excellence in HIV/AIDS, St. Paul's Hospital, 608-1081 Burrard Street, Vancouver, BC V6Z 1Y6, Canada. Faculty of Health Sciences, Simon Fraser University, 8888 University Drive, Burnaby, BC V5A 1S6, Canada

Abstract

Housing is a known determinant of health behaviors, which includes adherence to Antiretroviral Therapy (ART). Within the Longitudinal Investigations into Supportive and Ancillary Health Services (LISA) study, unstable housing is inversely associated with adherence. Several comprehensive adherence support services have emerged to improve adherence for unstably housed or otherwise vulnerable populations. The Maximally Assisted Therapy (MAT) program in Vancouver, British Columbia uses a multidisciplinary approach to support HIV-positive clients with a history of addictions or mental illness, many of whom also experience episodic homelessness. This study investigated the association between antiretroviral adherence and use of support services, including the MAT program, amongst people living with HIV and AIDS who are unstably housed in the LISA sample. Of the 212 unstably housed participants, those who attended the MAT program were 4.76 times more likely to be 95% adherent (95% CI 1.72–13.13; $P=0.003$) than those who did not. The findings suggest that in the absence of sustainable housing solutions, programs such as MAT play an important role in supporting treatment adherence in this population.

Keywords

HIV; Antiretroviral Therapy; Adherence; Housing; Community health services

Introduction

There is now unequivocal empirical evidence of the powerful role of housing in shaping vulnerability to HIV infection and influencing health trajectories of those already infected [1]. In addition to the day-to-day challenges of living with HIV and AIDS, homeless and unstably housed positive individuals face a myriad of barriers to achieving optimal therapeutic outcomes. Stable housing has been associated with superior virological and immunological status [2, 3], a decreased likelihood of reporting opportunistic infections, as well as better mental health [4]. Unstable housing is associated with co-infection with hepatitis C [5, 6] and has an independent effect on mortality [7–9].

The stress associated with homelessness or unaffordable and inadequate housing may exacerbate health issues and interfere with disease management and self care. Unstably housed individuals often lack the sense of order, security and continuity that is requisite to managing one's HIV diagnosis, including regularly attending health and ancillary care appointments [8], fully benefiting from prophylaxis for opportunistic illness [10–13], having a safe space to refrigerate medications and adhering to instructions to take medication with food [14]. Stable housing is particularly important in ensuring optimal adherence to Antiretroviral Therapy (ART), defined as adhering to 95% of prescribed treatment [15].

Better adherence is associated with more sustainable treatment responses, which are essential to prevent disease progression and reduces AIDS-related mortality [16, 17]. Recent studies have demonstrated that homeless and unstably housed individuals can achieve similar rates of adherence compared to other populations [18] and viral suppression is still possible with less than perfect levels of adherence [19]. In spite of this, there is extensive evidence of reduced access to therapy amongst homeless and unstably housed populations

[7, 20, 21]. These individuals may not be offered life-saving treatment because of concerns among some health providers regarding patient non-adherence and the possibility of promoting the emergence and transmission of drug resistant HIV [13, 22–24].

Such concerns are not entirely unfounded. A number of studies conducted in the United States and Europe have provided compelling evidence that unstable housing is an independent predictor of sub-optimal adherence [7, 10, 25–31]. Still other investigations of homeless and unstably housed populations have suggested that housing status interacts with a constellation of other clinically relevant covariates. These factors include, but are not limited to, depression, psychological stress and substance use [3, 32–41]. This complex matrix of social determinants of health influencing adherence calls for a comprehensive approach to ensure optimal outcomes for patients who are coping with a range of structural, social and psychological issues [36, 41–43].

Numerous multidisciplinary programs and services have emerged to improve ART adherence for unstably housed and otherwise vulnerable populations [44–47]. Adherence support programs are known by various labels depending upon the extent of the support offered: Directly Administered Antiretroviral Therapy (DAART), Directly Observed Therapy (DOT), Modified Directly Observed Therapy (MDOT), Intensive Adherence Case Management (IACM) and Maximally Assisted Therapy (MAT). These programs vary in the degree and nature of service provision, from dispensing medication to patients who come to the program, to actively reaching out to patients in the community in order to directly administer their medication. Depending on the particular needs of the client base and the capacity of the program, case management and other supports are also offered. Such programs have been shown to increase adherence, retention and viral load suppression [48–51].

The MAT program at the Downtown Community Health Centre (DCHC), located in Vancouver, British Columbia (BC), uses a comprehensive, multidisciplinary approach to support HIV-positive clients with a history of heavy substance use or mental illness, many of whom also experience episodic homelessness. The MAT program's multidisciplinary team of nurses, social workers, community liaison workers, pharmacists and clinical coordinator work alongside clients to support adherence, as well as other components of complex HIV primary care. This includes providing a simple meal everyday, arranging and accompanying members to specialist appointments and providing assistance around ART side effect management. MAT staff also provide advocacy and a range of legal, social and emotional support, including helping to secure stable housing, providing referrals to other agencies and offering mental health and addictions counseling. When clients do not present at the clinic as scheduled, outreach workers go into the community to hand deliver medication and other necessary support [52, 53].

With one exception [43], there are no published studies evaluating the DCHC MAT program. Unstable housing has been examined as part of a number of variables in studies with people who inject drugs in Vancouver's Downtown Eastside; however, to our knowledge, no study to date has investigated factors associated with adherence specifically amongst homeless and unstably housed positive individuals in the province of BC. We therefore sought to describe

the demographic characteristics, clinical indicators and support service utilization patterns of unstably housed individuals compared to their stably housed counterparts in a study of people accessing ART in BC. We then investigated the association between antiretroviral adherence and use of support services, including the DCHC MAT program, amongst unstably housed individuals.

Methods

Study Design and Participant Enrollment

The Drug Treatment Program (DTP) at the BC Centre for Excellence in HIV/AIDS is mandated by the government of BC to distribute antiretroviral medications free of charge to all eligible people living with HIV and AIDS. The DTP distributes medications in accordance with the BC Therapeutic Guideline Committee, which have remained consistent with those from the International AIDS Society-USA between 1996 and the last revision in 2010 [54].

The distribution of antiretroviral medications through the DTP has been previously described in detail [16]. In brief, physicians enroll individuals into the DTP when they are first prescribed ART. The enrolling physician must complete a drug request form, which acts as a legal prescription and is used to compile baseline information including past HIV-specific drug history, CD4 cell counts, plasma HIV RNA levels, current drug requests, and physician data. Physicians typically monitor persons receiving ART at intervals no longer than 3 months, at which time prescriptions are renewed or modified. For all DTP patients, a complete prospective profile of ART is maintained, including the medications prescribed, the amount dispensed, the dose and the prescription-fill dates [55].

Individuals enrolled in the DTP are eligible to participate in the Longitudinal Investigations into Supportive and Ancillary health services (LISA) study. With the aim of better understanding the experiences of people who have accessed ART in BC, this study enrolled 1,000 participants across the province between July 2007 and January 2010. LISA integrates cross-sectional sociodemographic information, based on an interviewer-administered survey, with clinical data obtained through longitudinal linkages with the DTP. Frequency of clinical assessments is informed by clinical care guidelines, which suggest physicians monitor persons receiving ART at intervals no longer than 3 months, although patients are often monitored more closely for the first few months after initiating therapy or during periods of viral rebound and regimen change. Clinical data is then transferred to the DTP through a combination of periodic, batched data transfers, real-time electronic data linkages and direct physician reporting. The DTP's clinical data is updated on a daily basis for those cases where a real-time linkage is available or as new data is received in cases of physician report or batched data transfers. Once incorporated into the DTP database, clinical data can be linked to the LISA study.

To be considered eligible for the LISA study, participants must be 19 years of age or older at the time of study enrollment and able to provide informed consent. Study participants were actively recruited through letters distributed via ART-prescribing physicians, by word-of-mouth and through advertisements at HIV/AIDS service organizations throughout the

province. Prior to conducting the survey, interviewers explained to potential participants the aims, procedures and the potential risks and benefits of participating in the study.

The LISA study is closely representative of people on treatment by health authority in British Columbia, meaning that the sample has representation from various parts of the province, similar in proportion to those accessing treatment. However, particular sub-populations were deliberately oversampled in order to sufficiently power sub-analyses. Consequently, women, people who inject drugs and people identifying as Aboriginal are overrepresented in the LISA study.

Study Instrument and Ethical Approval

Cross-sectional socio-demographic data on LISA study participants were collected through a comprehensive interviewer-administered survey which captures a range of variables including: basic demographic data, information about housing, income, social support networks, mental health disorders, drug and alcohol use and quality of life measures. Clinical variables were obtained through longitudinal linkages with the DTP administrative database and integrated with the interview data. The survey took approximately 60 min to complete and participants were offered a \$20 honorarium upon completion of the interview as compensation for their time. The LISA study has been granted ethical approval from the Research Ethics Boards of: the University of British Columbia/Providence Health Care, Simon Fraser University, and the University of Victoria. The study is funded by the Canadian Institutes of Health Research (CIHR).

Inclusion Criteria

In order to be included in this analysis, participants were required to have initiated ART at least one year prior to their interview date. This is necessary to obtain a measure of treatment adherence in the year prior to enrollment. The multivariate analysis was restricted to individuals who reported being unstably housed at the time of interview. Housing stability was assessed based on the participant's reported place of residence. Unstable housing was defined as living in a single room occupancy (SRO) hotel, shelter, hostel, treatment centre, prison or having no fixed address at the time of interview; stable housing was defined as living in an apartment or house. People who resided in a dwelling that did not fall into the above categories were asked where they live and whether they considered their housing to be stable or unstable.

Outcome Variable

The main outcome variable in this analysis is adherence to ART. As previously described [56, 57], we estimated adherence to ART based on refill compliance, calculated as the number of days of antiretroviral medications dispensed, divided by the number of days of follow-up during the 12 months prior to interview date, and expressed as a percent. Refill compliance measures are known to be a reliable source of adherence information in population-based studies when direct measurement of medication consumption is not feasible [58].

Explanatory Variables

A number of covariates were identified for inclusion in this analysis. Socio-demographic variables included: age (continuous, years), gender (male vs. female vs. transgendered), sexual orientation (straight vs. gay, lesbian, bisexual or other), Aboriginal ancestry, education (<high school vs. high school), current employment status and provincial income assistance.

This analysis also considered a number of self-reported variables, including history of mental health disorder, lifetime violence/abuse and incarceration in the 6 months prior to the interview date. Participants also reported current illicit drug use, defined as having used cocaine, crack, heroin, speedball (cocaine and heroin), crystal meth, steroids, ecstasy, hallucinogens, FHB, Special K and Poppers in the 3 months preceding the interview date. Depressive symptoms were measured using the 10-item Center for Epidemiological Studies Depression (CES-D 10) scale [59], food insecurity was measured using a modified version of the Radimer and Cornell questionnaire [60, 61] and alcohol dependency was defined using the CAGE questionnaire [62].

Participants reported their use of a range of general and HIV-specific supportive services (see Table 1). Medication support was defined as having used medication support programs or services in the 3 months preceding the interview date (e.g. dispensing HIV medications, methadone, adherence assistance). Those participants whose pharmacy pick-up site in the DTP database is listed as MAT in the 3 months prior to interview date were categorized as MAT participants in this analysis.

Clinical variables included in the analysis include CD4 count (cells/mm³) and HIV viral load at time of interview (Log10 copies/mL).

Statistical Analysis

Preliminary bivariate analyses were conducted to determine factors associated with adherence within LISA overall, obtain baseline characteristics of unstably housed participants in relation to others in the sample and determine factors associated with adherence amongst unstably housed LISA participants. A multivariable logistic regression model was used to investigate the association between adherence and various baseline characteristics, including utilization of services. Variables which were significant at $P < 0.05$ in the bivariate analyses were candidates for inclusion in the multivariate model. A logistic regression with a backward-selection procedure based on the Akaike Information Criterion (AIC) was used to select the variables to be included in the final model. All data were analyzed using SAS software version 9.1.3. [63].

Results

Between July 2007 and January 2010, interviews were conducted with over 1,000 participants, of which 917 had complete clinical data within the DTP. In order to assess the generalizability of the LISA sample, a comparison was conducted of LISA participants and DTP patients who were eligible for the study but were not sampled. Of note, the LISA study oversampled people with a history of injection drug use (71.3% LISA vs. 34.8% DTP),

women (27.4% LISA vs. 17.7% DTP) and people reporting Aboriginal ancestry (31.5% LISA vs. 10.5% DTP). Differences were statistically significant at $P < 0.001$. This suggests that our study participants may experience more vulnerability in various spheres of their lives than the general population of HIV-positive individuals on treatment in BC.

The analysis presented herein is based on 644 participants who met the inclusion criteria. The mean age at enrollment was 46, 475 (73.7%) were male, 196 (30.4%) reported having Aboriginal ancestry and 212 (32.9%) reported being homeless or residing in unstable conditions at the time of interview. The mean number of years on therapy was 5.13 [Standard Deviation (SD) 3.19] for unstably housed participants and 4.64 (SD 2.78) for stably housed participants.

As shown in Table 1, participants who were unstably housed were more likely than their stably housed counterparts to identify as Aboriginal, rely on provincial income assistance, have been incarcerated in the 6 months prior to their interview date, currently use illicit drugs, currently inject drugs, display depressive symptoms and report alcohol dependency. Unstably housed participants were also less likely to have completed high school and to be food secure.

In terms of differences in support service utilization (Table 1), unstably housed participants were more likely to use outreach worker services, count on a social worker, counselor/therapist or medical doctor/healthcare worker as their most reliable support, have accessed methadone treatment, pick up their HIV medications daily, use medication support and be enrolled in the MAT program. Unstably housed participants were also less likely to have had a private teaching session or consultation with their pharmacist prior to initiating treatment and have optimal adherence (95%) in the 12 months preceding the interview date. Unstably housed participants were half as likely to achieve optimal adherence as those with stable housing [OR = 0.49 (95% confidence interval (CI) 0.35–0.69)] (data not shown).

The analysis in Table 2, restricted to the 212 unstably housed participants, displays the bivariate relationships between a range of salient covariates and optimal adherence (95%). The demographic characteristics of the adherent and non-adherent unstably housed participants were comparable with the exception of age and recent incarceration. Adherent unstably housed participants were more likely to be older [median age 47 (IQR 42–52) vs. 44 (IQR 37–48), $P < 0.001$] and less likely to have been incarcerated in the 6 months prior to the interview date (4.2 vs. 18.1%, $P = 0.002$).

Support service utilization and clinical markers associated with adherence in this subset of the sample included picking up medication daily (74 vs. 54.9%, $P = 0.006$), attending the MAT program (33.3 vs. 8.6%, $P < 0.001$), having a higher CD4 count [median 355 (IQR 235–500) vs. 220 (IQR 120–315), $P < 0.001$] and having a lower viral load at the time of interview [median 1.7 (IQR 1.7–1.7) vs. 1.9 (IQR 1.7–4.1), $P < 0.001$].

Multivariable logistic regression was used to model the probability of adherence with demographic, support service utilization and clinical variables. The final adjusted model in Table 3 shows that unstably housed participants who attended the MAT program were 4.76 times more likely to have optimal adherence (95%) (95% CI 1.72–13.13) than those who

did not. Age was also significantly associated with optimal adherence [aOR = 1.07 per year (95% CI 1.01–1.13)]. Factors negatively associated with adherence included being incarcerated in the past 6 months [aOR = 0.20 (95% CI 0.05–0.80)], current use of illicit drugs [aOR = 0.40 (95% CI 0.16–0.99)] and having a lower viral load at time of interview [aOR = 0.16 per Log10 (95% CI 0.06–0.44)].

Discussion

As demonstrated in this analysis, unstably housed LISA participants display considerably lower rates of treatment adherence than their stably housed counterparts, resulting in correspondingly lower CD4 counts and higher viral loads. When we explored the impact of various adherence support programs through the use of multivariate analysis, we found that enrollment in the MAT program was significantly associated with better adherence.

In British Columbia, despite a universal healthcare system that includes the provision of ART free of charge, marginalized individuals continue to bear a disproportionate burden of HIV/AIDS-related morbidity and mortality due to lower rates of treatment access [41, 64, 65]. Consistent with previous studies, our findings show the pivotal role housing in shaping these trends. Unstably housed LISA participants are disproportionately burdened with a myriad of challenges that compromise adherence, including depression, food insecurity and addictions. To cope with these challenges, they are more reliant on outreach workers and social workers, and access low threshold services such as MAT at higher rates. The MAT model targets the aforementioned factors associated with poor adherence among LISA participants while providing a sense of community, a safe and non-judgmental space and highly individualized psychosocial support. We suggest that these characteristics of MAT, taken together, bridge the housing gap for individuals who are unstably housed and lacking the sense of order, security and continuity that is requisite to focusing on disease management and self care.

Our results have important policy and programming implications regarding the unmet housing and supportive service needs of marginalized people living with HIV and AIDS. Our findings suggest first and foremost the need for subsidized housing for all low-income people. A number of studies have found the receipt of housing assistance is associated with regular use of primary care [66], ancillary services [67] and HIV-specific medical care [1]. Evidence of the role of housing stability in improving health outcomes of people living with HIV and AIDS [10, 68, 69] has informed service models such as ‘housing first,’ and ‘low demand housing’ [70, 71]. These models view housing as a structural intervention for both the prevention and treatment of HIV and AIDS. Clients are neither required to demonstrate sobriety nor access treatment services as a condition to secure shelter. This type of low-barrier housing is provided to people with mental health and addictions issues as part of the City’s Supportive Housing strategies for Vancouver Coastal Health Authority’s (VCHA) Mental Health and Addictions Supported Housing Framework. Additional supportive housing units are needed to meet the demand [72].

The number of unstably housed people in the LISA sample points to the need to incorporate a strong outreach component in low-threshold treatment models. Transient populations have

different patterns of uptake and access to standard medical care, which necessitates the development of adaptations to this model. In particular, structured collaborations between pharmacies and transitional housing services are necessary to coordinate daily medication dispensation and other medical service provision for unstably housed people living with HIV and AIDS. The Clinical Tenant Support Team, Clinical Outreach Team, Clinical Housing Team and Community Transition Care Team are prime examples. Through these programs, the VCHA provides mental health and addictions support in SRO hotels and shelters in Vancouver's Downtown East-side [72]. Supporting these outreach services is crucial, considering 157 (83.9%) of unstably housed LISA participants frequent the metro Vancouver area.

As recent incarceration emerged as a factor significantly associated with sub-optimal adherence, there is also a pressing need for ongoing outreach in prisons done in collaboration with the Correctional Service of Canada. Our findings suggest the need for a review of how medication is dispensed to positive prison inmates and how newly released individuals are assisted in reconnecting to social support and healthcare services. Further research on the needs of this population will inform the Federal Initiative to Address HIV/AIDS in Canada, which highlights prison inmates as an at-risk population [73].

The present analysis suggests that the MAT program plays a critical role in identifying and ameliorating adherence barriers amongst the most vulnerable populations. However, we must be diligent in monitoring and evaluating these programs. A recent randomized control trial comparing individuals receiving the standard of care to patients enrolled in IACM and DAART showed no difference in clinical outcomes between the three study arms [74]. This trial, which failed to control for certain means of adherence support, points to the need for rigorous program evaluation. As part of these evaluations, there is a continued need to generate evidence of the association between housing and health outcomes, and to do so in a collaborative fashion. The MAT program staff is an invaluable resource, both in terms of their access to longitudinal clinical data and their unique understanding of the complexities of their clients' situations. This knowledge should be leveraged to inform evidence-based policy and programming.

Limitations of Our Assessment and Directions for Future Research

There are several limitations to this study that must be taken into account, some of which we hope to address in future studies. All demographic and socio-economic variables were self-reported and thus subject to socially desirable responding and recall bias. The MAT variable must be analyzed with caution as the selection criteria and uptake interview for the MAT program may lead to the selection of clients who are more likely to succeed at adhering to their medication regimen. The housing status variable, dichotomized as stable versus unstable, may not adequately capture the nuances and realities of all participants' situations.

Another important limitation of this study is that LISA is a non-probability sample, which limits the generalizability of our results. Specifically, this study is subject to selection bias, as the modest honorarium provided to participants might have led to over-sampling of individuals in need of financial gain. We employ a diverse range of recruitment strategies in

an effort to attenuate the effect of this sampling bias. Specifically, by distributing letters to every eligible participant enrolled in the DTP, as well as every practicing ART-prescribing physician in the province of BC, our sampling frame theoretically captures every person in the true population of interest. We suggest that this inclusivity makes our sample as representative as possible given the scope of our study and the parameters of this type of research.

The LISA sample is comprised of individuals who access a universal, publicly funded health care system where medically necessary services, including ART, are provided free of charge. Prior to initiating treatment, all participants would have undergone an assessment by their healthcare provider, evaluating needs, readiness, skills and medical and emotional resources. Thus, even the most marginalized participants in our study sample are within reach of medical and social services, and were deemed adequately prepared to adhere to their medication regimen. To address this shortcoming, in future work the LISA study will endeavor to include individuals clinically eligible for ART but who are not fully benefiting from the availability of treatment and health services. We hope that such a sample will better speak to the perspectives of people who are not within reach of medical services and social support programs and help identify barriers to uptake among those most marginalized. Finally, because of the cross-sectional study design, we were unable to determine causality or map the biological and social pathways linking housing and adherence.

Conclusion

Within the matrix of social determinants of health, stable housing plays an integral role in influencing health trajectories and shaping health outcomes. Alongside advocating for secure, affordable, safe, clean housing for all, we must encourage the development and expansion of adherence support programs that have been proven to help unstably housed people access and adhere to treatment. The MAT program at the DCHC in Vancouver's downtown eastside provides a model for other urban centers dealing with concurrent and interrelated adherence barriers: high-risk drug use, mental health disorders, food insecurity and homelessness. In the absence of sustainable housing solutions, programs such as MAT play an important role in supporting treatment adherence in this population.

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Table 1

Socio-demographic characteristics and clinical markers of LISA study participants by housing status in 6 months preceding interview date (N = 644)

	Unstably housed N = 212, n (%)	Stably housed N = 432, n (%)	P-value
<i>Demographic characteristics</i>			
Age			
Median (IQR)	45 (40–50)	46 (41–53)	< 0.001
Missing values = 1			
Gender			
Male vs. female	144 (67.9)	331 (76.6)	0.022
Sexual identity			
Straight vs. gay, lesbian, bisexual, other	176 (83.0)	221 (51.2)	< 0.001
Aboriginal ancestry	87 (41.0)	109 (25.2)	< 0.001
Education past high school	81 (38.4)	289 (66.9)	< 0.001
Missing values = 1			
Currently employed	11 (5.2)	142 (32.9)	< 0.001
Provincial income assistance	205 (96.7)	268 (62.0)	< 0.001
Ever diagnosed with a mental health disorder	135 (63.7)	255 (59.0)	0.266
Attacked ever	162 (76.4)	313 (73.0)	0.389
Missing values = 3			
Incarcerated in past 6 months	25 (11.8)	13 (3.0)	< 0.001
Missing values = 3			
Current injection drug use	93 (43.9)	58 (13.4)	< 0.001
Current illicit drug use	162 (76.4)	143 (33.1)	< 0.001
Depressive symptoms	149 (70.3)	219 (50.8)	< 0.001
Missing values = 1			
Food secure	34 (16.0)	175 (40.7)	< 0.001
Missing values = 2			
Heavy alcohol use	132 (62.3)	200 (46.6)	< 0.001
Missing values = 3			
<i>Support service utilization</i>			
Used case management, counseling or social support group	67 (31.6)	127 (29.4)	0.584
Used outreach worker services	85 (40.1)	102 (23.6)	< 0.001
Count on social workers	80 (37.7)	123 (28.5)	0.019
Count on counselors/therapists	76 (35.8)	139 (32.2)	0.374
Count on medical doctor/health care worker	120 (56.6)	283 (65.5)	0.030
Most reliable support: social workers, counselors/ therapists or medical doctor	53 (25.0)	56 (13.0)	< 0.001
Methadone treatment ever	111 (52.6)	95 (22.1)	< 0.001
Missing values = 4			
Private teaching session or consultation	95 (45.2)	292 (67.7)	< 0.001
Pick up HIV meds daily	133 (63.6)	52 (12.1)	< 0.001
Missing values = 5			

	Unstably housed N = 212, n (%)	Stably housed N = 432, n (%)	P-value
Used medication support	148 (69.8)	160 (37.1)	< 0.001
Missing values = 1			
Enrolled in MAT program	42 (19.8)	21 (4.9)	< 0.001
<i>Clinical indicators</i>			
CD4 per 100 cells (at time of interview)			
Median (IQR)	275 (150–430)	410 (270–590)	< 0.001
Missing values = 101			
Log10 viral load (at time of interview)			
Median (IQR)	1.7 (1.7–2.4)	1.7 (1.7–1.7)	0.017
Missing values = 17			
Adherence during the 12 months prior to interview 95%	96 (45.3)	271 (62.7)	< 0.001

Table 2

Adherence amongst unstably housed participants (N = 212)

	Adherent n (%)	Not adherent n (%)	P-value
<i>Demographic characteristics</i>			
Age			
Median (IQR)	47 (37–48)	44 (37–48)	< 0.001
Gender			
Male vs. female	73 (76.0)	71 (61.2)	0.026
Sexual identity			
Straight vs. gay, lesbian, bisexual, other	80 (83.3)	96 (82.8)	0.999
Aboriginal ancestry	34 (35.4)	53 (45.7)	0.161
Education past high school	43 (45.3)	38 (32.8)	0.066
Missing values = 1			
Currently employed	6 (6.3)	5 (4.3)	0.551
Provincial income assistance	91 (94.8)	114 (98.3)	0.249
Ever diagnosed with a mental health disorder	58 (60.4)	77 (66.4)	0.392
Attacked ever	74 (77.1)	88 (75.9)	0.872
Incarcerated in past 6 months	4 (4.2)	21 (18.1)	0.002
Current injection drug use	37 (38.5)	56 (48.3)	0.167
Current illicit drug use	66 (68.8)	96 (82.8)	0.022
Depressive symptoms	65 (67.7)	84 (72.4)	0.546
Food secure	17 (17.7)	17 (14.7)	0.577
Heavy alcohol use	57 (59.4)	75 (64.7)	0.478
<i>Support service utilization</i>			
Used case management, counseling or social support group	25 (26.0)	42 (36.2)	0.138
Used outreach worker services	34 (35.4)	51 (44.0)	0.260
Count on social workers	37 (38.5)	43 (37.1)	0.887
Count on counselors/therapists	31 (32.3)	45 (38.8)	0.388
Count on medical doctor/health care worker	54 (56.3)	66 (56.9)	0.999
Most reliable support: social workers, counselors/ therapists or Medical doctor	28 (29.2)	25 (21.6)	0.208
Methadone treatment ever	49 (51.0)	62 (53.9)	0.681
Missing values = 1			
Private teaching session or consultation	41 (43.6)	54 (46.6)	0.679
Pick up HIV meds daily	71 (74.0)	62 (54.9)	0.006
Missing values = 3			
Used medication support	72 (75.0)	76 (65.5)	0.176
Enrolled in MAT program	32 (33.3)	10 (8.6)	< 0.001
<i>Clinical indicators</i>			
CD4 per 100 cells (at time of interview)			
Median (IQR)	355 (235–500)	220 (120–315)	< 0.001
Missing values = 36			
Log10 viral load (at time of interview)			

	Adherent n (%)	Not adherent n (%)	P-value
Median (IQR)	1.7 (1.7–1.7)	1.9 (1.7–4.1)	< 0.001
Missing values = 8			

Table 3

Logistic regression for adherence amongst unstably housed LISA participants (n = 212)

Demographic and clinical characteristics	Unadjusted odds ratio (95% confidence interval)	P-value	Adjusted odds ratio (95% confidence interval)	P-value
Age	1.08 (1.04–1.12)	< 0.001	1.07 (1.01–1.13)	0.013
Gender	2.01 (1.10–3.66)	0.022	2.29 (1.00–5.22)	0.050
Incarcerated in past 6 months	0.20 (0.07–0.60)	0.004	0.20 (0.05–0.80)	0.023
Current illicit drug use	0.46 (0.24–0.88)	0.018	0.40 (0.16–0.99)	0.047
Pick up HIV meds daily	2.34 (1.30–4.20)	0.005	2.13 (0.90–5.06)	0.087
Enrolled in MAT program	5.30 (2.44–11.50)	< 0.001	4.76 (1.72–13.13)	0.003
CD4 per 100 cells (at time of interview)	1.30 (1.11–1.52)	< 0.001		
Log10 viral load (at time of interview)	0.16 (0.06–0.38)	< 0.001	0.16 (0.06–0.44)	< 0.001