

**INJECTION DRUG USE AMONG HOMELESS ADULTS
WITH MENTAL ILLNESS:
A GENDER-BASED ANALYSIS**

by

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Abstract

Increasing evidence suggests that women are disproportionately vulnerable to the serious health and social harms associated with injection drug use (IDU). This research examines the prevalence and health correlates of IDU, by gender, among a cohort of homeless adults with mental illness. The Vancouver At Home study is a research demonstration project investigating interventions for people who are homeless and living with mental illness. Participants completed a baseline questionnaire eliciting information on a detailed set of clinical, health, social and substance use measures. In multivariable models adjusting for severity of homelessness, and additionally sex work among females, IDU was positively associated with infectious disease and less severe mental illness. In addition, IDU was associated with the increased use of health and social services, but only among men. These findings suggest that gender-specific harm reduction, prevention and treatment strategies for IDU women should be prioritised as an important public health issue.

Keywords: Homelessness; Mental illness; Injection drug use; Addiction; Gender; Health care utilisation

For Evie and Margaret

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1. Introduction

1.1. Background

Injection drug use is associated with substantial health and social harms and continues to pose a significant public health challenge. Injection drug users (IDUs) suffer an increased burden of infectious disease, co-morbid health conditions and elevated mortality rates in comparison to the general population (Fischer, Firestone-Cruz, & Rehm, 2006; Spittal, Hogg, Li, Craib, Recsky, Johnston et al., 2007). Further, IDU is linked to a multitude of vulnerabilities and social disadvantages (e.g., poverty, homelessness, mental illness), involvement in high-risk illegal income generating activities (e.g., sex work, drug dealing), and public disorder behaviours (e.g., public injecting), that also contribute to compromised health and well-being (Galea & Vlahov, 2002; Fischer et al., 2006; DeBeck, Shannon, Wood, Li, Montaner, & Kerr, 2007; DeBeck, Small, Wood, Li, Montaner, & Kerr, 2009; Miller, Pearce, Moniruzzaman, Thomas, Christian, Schechter et al., 2011). Consequently, IDUs are a highly marginalised and stigmatised population with multiple and complex needs, yet are hard to reach with mainstream health care services (Ahern, Stuber, & Galea, 2006; Simmonds & Coomber, 2007). IDUs are known to delay seeking treatment, face numerous barriers to accessing essential health and social services, and more often present in acute care settings (Chitwood, McBride, French, & Comerford, 1999; Kerr, Wood Grafstein, Ishida, Shannon, Lai et al., 2004; Palepu, Tyndall, Leon, Muller, O'Shaughnessy, Schechter, & Anis, 2001; Small, Van Borek, Fairbairn, Wood, & Kerr, 2009).

Previous research has established the association of injection drug use with homelessness and mental health problems. IDU is prevalent among homeless and street-involved individuals (Kerr, Marshall, Miller, Shannon, Zhang, Montaner et al., 2009; Miller et al., 2011), and high rates of co-occurring mental disorders among IDU are well documented (Fischer et al., 2006; Aitken, Wain, Lubman, Hides, & Hellard, 2008). Studies have demonstrated strong links between homelessness and unstable housing,

ie., single-room occupancy (SRO) hotel units, with high intensity drug use, high-risk public injecting practices, increased emergency room (ER) utilisation and adverse health outcomes among IDUs – particularly the contraction of infectious diseases including HIV, hepatitis C (HCV), and hepatitis B (HBV) (Aidala, Cross, Stall, Harre, & Sumartojo, 2005; Shannon, Ishida, Lai, & Tyndall, 2006; Kim, Kerr, Li, Zhang, Tyndall, Montaner et al., 2009; DeBeck et al., 2009). Further, illicit drug use is a precipitating factor for housing loss and residential instability (Brunette, Mueser, & Drake, 2004; Wood, Kerr, Werb, DeBeck, Graham, Lai et al., 2009). Recent evidence suggests that daily illicit drug use is positively associated with longer durations of homelessness among homeless adults with concurrent mental disorders (Patterson, Somers, & Moniruzzaman, 2011). Major depression, anxiety and post-traumatic stress disorder (PTSD) are widely observed amongst IDU populations (Braitstein, Tyndall, Spittal, O’Shaughnessy, Schilder, Johnston et al., 2003; Fischer et al., 2006; Aitken et al., 2008).

However, only three studies to date have examined IDU among homeless adults with mental illness (Susser, Miller, Valencia, Colson, Roche, & Conover, 1996; Susser, Betne, Valencia, Goldfinger, & Lehman, 1997; Linn, Brown, & Kendrick 2005). Of these, only one has examined gender-related differences, despite increasing evidence that women are more vulnerable to the risks and harms associated with injection drug use (Issues, 2001; Dell & Poole, 2005; Spittal, Craib, Wood, Laliberté, Li, Tyndall et al., 2002; Spittal et al., 2007). As such, the prevalence, characteristics and implications of active IDU amongst the homeless mentally ill is currently unclear.

Women who inject drugs have substantially different health needs and patterns of risk than IDU men. Women IDUs are often younger, at greater risk of suffering from trauma-related mental health problems (e.g., PTSD), and are more likely to participate in high-risk injecting practices (Evans, Hahn, Page-Shafer, Lum, Stein, Davidson et al., 2003; Bratstein et al., 2003). Young women are over-represented as IDUs in some populations, for example, among urban Aboriginal youth in BC (Miller et al., 2011). IDU women are also more likely to engage in sex work in exchange for money, drugs or other essential items such as food and shelter, placing them at greater risk of exploitation, violence, high-risk sexual practices and associated infectious diseases (Bratstein et al., 2003; Spittal et al., 2007; Hoda, Kerr, Li., Montaner, & Wood, 2008). Street-entrenched women face daily threats of violence in a male-dominated street and

drug culture. Mortality rates are grossly elevated among IDU women in comparison to the general female population, a serious indication of heightened vulnerability among this population (Spittal et al., 2007).

The social and public health impacts of IDU on individuals, neighbourhoods and communities are substantial. The role of gender and illicit drug use remains an under-researched area that is important for the planning and delivery of gender-specific health and social services that can meet the needs of homeless women with mental illness.

1.2. Study Setting

Reducing the harms of injection drug use is a priority health concern in British Columbia. In Vancouver, the Downtown Eastside (DTES) is home to approximately 5,000 active IDUs (Buxton, 2003). The DTES is one of Vancouver's oldest urban neighbourhoods characterised by high poverty and unemployment rates, inadequate housing conditions, and a disproportionate number of homeless individuals concentrated within a 12 block radius. Many DTES residents are also burdened with mental health and/or addiction challenges. The DTES has gained international attention for its open drug use scene and public disorder related to illicit drug use. In the late 1990s, a public health emergency was declared in the DTES in response to an epidemic of fatal overdose and infectious disease related to injection drug use (Vancouver/Richmond Health Board, 1997). Public health initiatives credited with reducing the serious harms associated with IDU included needle exchange programs (NEP), methadone maintenance therapy (MMT), and the pilot opening of *InSite*, North America's first medically supervised Safe Injection Facility (SIF) in Vancouver (Marshall, Milloy, Wood, Montaner, & Kerr, 2011). There are over 12,000 drug users currently registered at InSite, and approximately 26% of participants are women (supervisedinjection.vch.ca).

Alternative services and harm reduction approaches are important for reaching IDUs, and significant public health gains have been demonstrated when these approaches are available (supervisedinjection.vch.ca; Small, Wood, Lloyd-Smith, Tyndall, & Kerr, 2008; Small et al., 2009). InSite remains an important point of contact for IDUs to access basic health care needs (Small et al., 2008; Small et al., 2009), and

has been shown to provide an important place of refuge against threats and violence associated with drug consumption practices, particularly amongst street-involved IDU women (Fairbairn, Small, Shannon, Wood, & Kerr, 2008). A recent landmark Supreme Court decision enables InSite to continue operating and provide essential health care services to IDUs in the DTES. However, significant gaps in access to primary and preventive care, addiction services, mental health treatment and other structural factors remain, particularly the unresolved and contentious issue of affordable housing in the area.

1.3. Study Design

The Vancouver *At Home* study is a research demonstration project investigating mental health and homelessness – part of a complex intervention trial with individual projects in five Canadian cities comparing different models of supported housing to ‘care as usual’ among homeless individuals with mental disorders. Each study site shares core methodological components based on a Housing First philosophy, and a randomised controlled trial design. Housing First is a harm reduction approach to housing centering on consumer choice and self-determination, in which individuals are provided housing without requiring treatment or sobriety as a precondition. Clinical and support services are offered but are not mandatory, although participants are required to meet regularly with a case worker or member of the treatment team. Vancouver *At Home* has several unique research components, including a specific focus on homeless individuals with concurrent mental illness and addictions.

In Vancouver, 497 persons who were homeless and living with mental illness were recruited for the study between October 2009 and June 2011. Participants were eligible for recruitment based on the presence of a mental disorder, current absolute or precarious housing, and legal adult status (≥ 19 years of age). Recruitment was conducted by referral through drop-in centres, shelters, institutional settings and community agencies, as well as through direct street outreach. Eligibility was established using a structured screening protocol. Participants met with a trained research interviewer who explained study procedures, obtained informed consent, and confirmed study eligibility. At baseline, participants completed a detailed interviewer-administered

questionnaire on demographic, clinical, health, substance use and social measures. Follow-up interviews are scheduled every three months for a minimum of two years in order to assess a number of outcomes related to health, housing stability, community integration, and substance use. Data for the present study are drawn exclusively from the baseline assessment, collected between October 2009 and June 2011. The Vancouver *At Home* study was reviewed and granted ethical approval by the Research Ethics Board of Simon Fraser University.

1.4. Study Objectives

Very few studies have investigated injection drug use among homeless adults with mental illness. Given that homeless mentally ill women who inject drugs have been neglected in the homelessness and substance use literature to date, the primary objectives of the present study are to fully characterise injection drug use among a population of homeless adults with mental illness, focusing on gender, and examining associations between IDU and health, mental health, and use of health care services. Analyses adjust for severity of homelessness, and sex work among females, as previously established correlates of IDU and adverse health outcomes. By examining the prevalence and health correlates of IDU in a Canadian population-based study of homeless adults with mental illness, this research can fill an important knowledge gap to inform the gender-specific housing and health-related needs of this vulnerable population.

The present study aims to address three primary objectives:

- 1) To document the prevalence and characteristics of IDU among a cohort of homeless adults with mental illness, by gender;
- 2) To examine associations of IDU with mental and physical health problems among homeless adults with mental illness after adjusting for severity of homelessness, and sex work among females, by gender; and

3) To test whether IDU is associated with the increased use of health and social services among homeless adults with mental illness after adjusting for severity of homelessness, and sex work among females, by gender.

2. Literature Review

2.1. Convergence: Homelessness, Mental Illness, Substance Use

The homeless are disproportionately affected by mental health and substance use problems. The prevalence of mental disorders is estimated at three to four times higher among homeless populations, with some study estimates suggesting upwards of 50% (Hwang, 2001; Shelton, Taylor, Bonner, & van den Bree, 2009). Further, the prevalence of alcohol and drug abuse amongst the homeless is estimated at six to seven times greater than the general population (Sullivan, Burnam, & Koegel, 2000; Hwang, 2001). Substance dependence is the most common co-occurring disorder associated with severe mental illness, and is recognized as a key contributing factor of homelessness among those with concurrent disorders (Brunette et al., 2004). Substance use is also recognized as a precipitating factor for subsequent housing loss and poor housing outcomes once re-housed (Schutt & Goldfinger, 2011; Kertesz, Crouch, Milby, Cusimano, & Schumacher, 2009).

Drug abuse and concurrent disorders are more prevalent among homeless women, particularly depression with co-occurring substance abuse (Beijer & Andreasson, 2010; Kirst, Erickson, & Strike, 2011; Torchalla, Strehlau, Li, & Krausz, 2011). Rates of drug abuse have been estimated up to 17 times greater among the female homeless in comparison to the general population, in contrast to 10 times greater for homeless males (Whitbeck, Johnson, Hoyt, & Cauce, 2004). Evidence suggests that women differ from men in their biological response to drugs, finding that women have an accelerated progression from first use to substance dependence, particularly with opiates (Lynch, Roth, & Carroll, 2002; Zilberman, Tavares, & El-Guebaly, 2004).

Women who are homeless frequently present with much more significant distress and higher rates of major depression than homeless men (Rich & Clark, 2005; Sacks,

McKendrick, & Banks, 2008). In particular, homeless women are observed to be at greater risk for trauma-related mental health issues, i.e., childhood sexual abuse, domestic violence, and often resort to drug use as a means of coping with emotional and psychological distress (Nyamathi et al., 1998; Sacks et al, 2008). Although not as well-documented, evidence suggests that homeless men also commonly experience traumatic events and have high rates of lifetime trauma in comparison to the general population (Buhrich, Hodder, & Teeson, 2008; Christensen, Hodgkins, Garces, Estlund, Miller, & Touchton, 2005). Homeless men's experiences of trauma are primarily related to assault, robbery and sudden injury (Buhrich et al., 2008). Depression and PTSD are associated with a history of trauma, and are common to homeless men with co-occurring disorders and increased substance use (Christensen et al., 2005).

The profile of substance use amongst the homeless has shifted in recent decades with the increasing availability and accessibility of illicit drugs. While the use of alcohol and cannabis is still very prevalent, rates of illicit drug use and the use of multiple substances have steadily grown amongst homeless populations. Polysubstance use and daily illicit drug use place individuals at greater risk for substance dependence, injection drug use, co-morbid physical and mental health conditions, infectious disease, drug overdose, sex work involvement, violence and victimization, and chronic homelessness (Des Jarlais, Braine, & Friedmann, 2007; Kirst et al., 2009). Although patterns and trends in illicit drug use have fluctuated over time, injection opiates, cocaine, crystal methamphetamines and crack-cocaine continue to dominate street drug markets (Wood et al., 2009).

Evidence consistently links chronic homelessness and unstable housing to increased engagement in illicit drug use, IDU, higher intensity drug use, high-risk injection behaviours, poor physical and mental health, and compromised service utilisation (Des Jarlais et al., 2007; Neale, Tompkins, & Sheard, 2008; Patterson et al., 2011). The temporal relationship between drug use and homelessness is complex, but is understood to be mutually reinforcing. Drug use is recognized as an antecedent of homelessness, although homelessness may induce and/or exacerbate existing drug use. Together, homelessness and drug use interact with other risk factors to initiate, or exacerbate, mental illness and other co-morbid physical conditions (Kemp, Neale, & Robertson, 2006; Johnson & Fendrich, 2007). This is of particular concern in Vancouver,

where the population of absolutely homeless individuals with severe addiction and/or mental illness has been estimated at 1,800, with a further 2,280 individuals at risk of homelessness (Somers, 2008).

The most recent Metro Vancouver Homeless Count (MVHC) identified a total of 2,623 homeless people in the Vancouver region – comparable to 2,660 homeless persons identified in 2008 (SPARC BC 2008; City of Vancouver, 2011). However, between 2005 and 2008, an increasing number of persons reported experiencing longer durations of homelessness (65% for ≥ 1 year homeless), and self-reported rates of mental illness and addiction were observed to have increased significantly (86% and 63%, respectively) (SPARC BC, 2008). Further, the number of homeless women increased disproportionately to homeless men since 2005, and represented 27% of the homeless population (SPARC BC, 2008). The convergence of chronic homelessness, substance use and mental health problems can disproportionately affect women with the interplay of other risk factors, such as involvement in survival sex work. Among a sample of homeless women in three BC cities, current drug dependence was associated with homelessness, engaging in sex work and suicide attempts (Torchalla et al., 2011).

2.2. Current State of Knowledge: Prevalence and Characteristics of Injection Drug Use

Of the 125,000 Canadians estimated to inject illicit drugs, approximately one-third are women (Canada, 2004). However, accurately estimating the prevalence and composition of active injection drug users is a challenge because it is an illegal activity and many IDUs are unstably housed. In Vancouver, an estimated 12,000 IDUs reside across the Vancouver region, with approximately 5,000 concentrated in Vancouver's Downtown Eastside (DTES) (Buxton, 2003). A growing body of literature on illicit drug using populations has focused on the DTES neighbourhood of Vancouver, the well-known 'epicentre' of a large open street drug market. Several ongoing cohort studies are tracking the drug use, behaviours and health-related trends of people who inject illicit drugs in the area, although there is a paucity of research documenting patterns of risk and drug use amongst the homeless mentally ill.

The prevalence and correlates of IDU varies by sub-population however, reflecting the heterogeneity of individuals who inject drugs. Among a cohort of street-involved youth (aged 14-26) in Vancouver, the lifetime prevalence of IDU was 41.1% and was significantly associated with older age (≥ 22), sex work involvement, non-fatal overdose and hepatitis C infection (Kerr, et al., 2009). Among a population of female prisoners, the lifetime prevalence of IDU was assessed at 29% (Jackson, Cropsey, Weaver, Villalobos, Edridge, & Stitzer, 2010). Being Caucasian, being a problem drinker, having a prior history of substance use treatment, and having a prior drug-related charge were identified as significant risk factors for IDU among this population. Young women are over-represented as IDU among urban Aboriginal youth in BC, with a lifetime prevalence of 65% in comparison to young men 47% ($p = 0.001$) (Miller et al., 2011). And among a cohort of female sex workers in Vancouver, the lifetime prevalence of IDU was among the highest, at 74% (Shannon, Strathdee, Shoveller, Rusch, Kerr, & Tyndall, 2009).

Among ongoing cohort studies of IDU, unstable housing has been consistently found to exacerbate the harms associated with illicit drug use, often through risky public injecting practices. Frequent injectors who are homeless have been found to be six times more likely to publicly inject (Debeck et al., 2009). Injecting in public spaces places individuals at an increased risk for bacterial infections, fatal overdose, and infectious disease due to rushing, unsterile conditions, and syringe sharing (Stoltz, Wood, Small, Li, Tyndall, Montaner, & Kerr, 2007; Aidaila et al., 2005; DeBeck et al., 2009). Mental illness is implicated in high-risk drug behaviours and injection practices, placing IDUs with psychiatric problems at greater risk for infectious disease exposure and transmission (Fitzgerald, Lundgren, & Chassler, 2007; Fischer et al. 2006).

Only three studies examining IDU among homeless mentally ill persons were identified in the literature to date. Among these, lifetime prevalence of IDU ranged between 16-26% among men, and 6-8% among women (Susser et al., 1996; Susser et al., 1997; Linn et al., 2005). The majority of participants were characterised by psychiatric diagnoses of schizophrenia/schizoaffective disorders, as well as by engaging in multiple high-risk HIV behaviours (i.e., sharing needles, using shooting galleries), and participating in few appropriate risk reduction activities (i.e., cleaning needles with bleach, using needle exchange programs). Taken together, these studies suggest that

homeless mentally ill individuals who inject drugs may have distinct characteristics which require tailored treatment and services to address severe psychiatric symptoms and cognitive impairments.

2.3. Injection Drug Use: Gender

Patterns of illicit drug use are documented to vary by gender. Although the literature to date indicates that men are more frequent and heavier users of illicit drugs than women, increasing evidence suggests that women who use drugs are particularly vulnerable to the risks and harms associated with IDU (Issues, 2001; Neale, 2004; Dell & Poole, 2005). In particular, women IDU are often younger and more likely to need help injecting, placing them in a position of vulnerability. Loss of control over injecting creates a power imbalance in relationships with drug-injecting men. Needing help injecting has been identified as a strong risk factor for needle sharing and an independent predictor of HIV seroconversion among IDU women (Spittal et al., 2002; O'Connell, Kerr, Li, Tyndall, Hogg, Montaner et al., 2005). The HIV incidence rate among female injectors has shown to be 40% higher than male injection drug users (Spittal, et al., 2002). Jugular injecting is another high-risk injecting practice associated with younger age, female gender, and requiring help injecting (Hoda et al., 2008). Jugular injecting carries substantial health risks and complications and has been found to be significantly more prevalent among IDU women in comparison to IDU men (56.6% vs. 43.4%, respectively, $p < 0.001$) (Hoda et al., 2008). Jugular injecting is also strongly associated with involvement in the sex trade industry and high-intensity drug use.

Illicit drug use is increasingly prevalent among homeless women and is linked to an increased risk of premature mortality. In a recent study investigating risk factors for transition to injection drug use, young women were nearly 2.5 times (OR 2.44, CI: 1.48-4.01) more likely than young men to inject drugs among a cohort of urban Aboriginal youth who use street drugs in BC (Miller et al., 2011). The mortality rate among IDU women was recently estimated at 47 times greater in comparison to the general female population (Spittal et al., 2007). Factors strongly related to elevated mortality rates among IDU women included HIV-positive status, unstable housing and involvement in the sex trade.

Women who use injection drugs are more likely to suffer from childhood trauma and abuse, interpersonal violence, and have higher rates of post-traumatic stress (PTSD) and depressive disorders, often with serious consequences (Braitstein et al., 2003; Neale, 2004; Semple, Zions, Strathdee, & Patterson, 2007). In particular, female injectors with concurrent mental disorders exhibit higher rates of suicidal behaviours in comparison to IDU men (Darke & Ross, 2002; Backmund, Meyer, Schutz, & Reimer, 2011). Increasing evidence also suggests a growing epidemic of PTSD among IDU women in Vancouver. An alarmingly high prevalence of sexual abuse has been documented among local IDU women (68% of women versus 19% of men, $p < 0.001$), with strong links to involvement in the sex trade, sharing equipment, suicide attempts, accidental overdoses and a previously diagnosed mental disorder – factors which link to a growing body of PTSD literature (Braitstein et al., 2003). Street-involved women who inject drugs have also expressed that threats of everyday violence by intimates and ‘street-predators’ related to street-based drug-consumption practices is a ‘primary concern’ in the male-dominated street and drug culture (Fairbairn et al., 2008).

2.4. Injection Drug Use as a Health Issue

Public health responses to injection drug use have shown to improve the health and social integration of IDUs, and improve public safety. Significant public health gains have been made with the implementation of alternative harm reduction approaches for IDUs, such as needle exchange programs, and InSite, the medically supervised injection facility in Vancouver (supervisedinjection.vch.ca; Small et al., 2008; Small et al., 2009). Further, public health and harm reduction approaches that recognise the multiple and complex needs of IDUs aim to target the drug users ‘risk environment’, for example, through policy responses that improve access to affordable housing, or alleviate poverty through employment initiatives (Rhodes, 2009). Research evaluating housing interventions among the homeless has shown positive reductions in substance use, high risk drug practices and unsafe sexual behaviours (Aidala et al., 2005). Together, micro- and macro-level interventions play an important role in addressing the multiple and complex health needs of people who inject drugs.

However, injection drug use is often approached as a criminal issue with law-enforcement responses. Injection drug use is often viewed as a threat to public safety and the public health of communities, e.g., public disorder, discarded injection equipment in city streets and parks. However, police responses have resulted in negative, unintended consequences. Police crack-downs and the intensified police presence in illicit drug user environments have contributed to high-risk drug practices among IDUs, particularly during the administration of drugs in street-based settings (i.e., rushing, sharing syringes, overdose and soft-tissue damage) (Small, Kerr, Charett, Schechter, & Spittal, 2006; Fairbairn et al., 2008). Law enforcement responses have also adversely impacted health outcomes and HIV prevention initiatives by displacing IDUs into high-risk settings and away from essential services (Small et al., 2006).

Public health approaches to IDU are important as the health costs are significant. HIV infection and mortality rates are substantially elevated among IDUs in comparison to the general population. Among young male and female IDUs, mortality rates were found to be 12 and 51 times higher, respectively, than the general Canadian population in a recent cohort study of street-involved youth in Vancouver (Miller, Kerr, Strathdee, Li, & Wood, 2007). As noted, similar rates have been found among a cohort of IDU women, finding rates of mortality nearly 50 times greater than the general female population (Spittal et al., 2007). These deaths are preventable, being primarily related to drug overdose, homicide, and HIV/AIDS. Further, there are many other damaging physical health conditions specific to IDUs: overdose, soft-tissue damage, bacterial infections, for example. Women IDUs are more susceptible to injection-related complications, having more difficulties injecting due to smaller veins (Topp, Iverson, Conroy, Salmon, & Maher, 2008). Left untreated, drug-related infections can progress to more serious life threatening conditions (Rachlis, Kerr, Montaner, & Wood, 2009).

2.5. Health Care Access and Utilisation among Injection Drug Users

It is well-documented that IDUs face numerous barriers to primary and preventive care. Commonly cited barriers include stigma and negative attitudes of service providers, difficulties attending appointments, the burden of travel, wait times and

restrictive operating hours, and a lack of appropriate services (CHASE Report, 2005; Small, Van Borek, Fairbairn, Wood, & Kerr, 2009; Neale et al., 2009). Homeless IDUs are also challenged with meeting the essentials of daily living, such as securing food and shelter, which may compete with seeking health care. Further, the under-utilisation of mental health services by this population may be due to a lack of perceived need for treatment – studies have indicated that many homeless persons with serious psychiatric illness do not recognise their mental health problems (North & Smith, 1993). Consequently, IDUs frequently present for services in urgent care settings, often for preventable injection-related complications and other drug-related harms such as overdose (Kerr et al., 2004; Rachlis et al., 2009).

There is conflicting evidence regarding the utilisation of health care services by women drug users. Evidence has shown that IDU women are more likely to utilise care in comparison to IDU men. In particular, female IDUs have been found to be more frequent users of emergency and hospital services in comparison to male IDUs (Chitwood et al., 1999; Palepu, Strathdee, Hogg, Anis, Rae, Cornelisse et al., 1999; Palepu, et al., 2001). However, evidence suggests that drug-using women are more highly stigmatised and marginalised by the community, as well as by health care workers (CHASE Report, 2005; Salmon, 2009; Dell & Poole, 2005). Women who use drugs in Vancouver's DTES have expressed being denied care, having their health concerns dismissed, and that experiences in hospitals have been particularly 'harsh and traumatising' (Salmon, 2009). The daily victimization and violence IDU women commonly experience on the streets also serve to inhibit women from accessing co-ed services (CHASE Report, 2005; Fairbairn et al., 2008; Salmon, 2009). Consequently, women may be less likely to engage in services with treatment models and services that are predominantly designed and geared towards men (Neale, 2004; Cheng & Kelly, 2008).

2.6. Summary

Gender clearly shapes the experiences, behaviours, risks and implications of illicit drug use. Homeless women who inject drugs have substantially different health needs and patterns of risk than men, which are amplified by the dynamics of gender

marginalisation. Despite the concentration of health and social services that are currently located in the DTES, high health care utilisation rates in the area, and a publicly funded health care system, barriers to care are cited with few gender-specific services available for women who use illicit drugs in Vancouver. There remains a need for gender-specific research to better understand the role of gender and illicit drug use among homeless populations and the implications for health, mental health, and health care services.

3. Established Correlates of Injection Drug Use

3.1. Severity of Homelessness

Chronic homelessness is linked to increased substance use and poorer health outcomes among homeless individuals. Longer durations of homelessness have been positively associated with illicit daily drug use, high-risk sexual behaviours and transmission of infectious disease (Stein, Nyamathi, & Zane, 2009; Patterson et al., 2011). Recent studies have also linked severity of homelessness to injection drug use, as well as greater alcohol use, greater emotional distress and less positive coping among homeless men (Stein, Dixon, & Nyamathi, 2008). Among homeless women, homelessness severity has also been linked to IV drug use, increased drug and alcohol use, greater psychological distress, and less health care utilisation (Stein, Andersen, & Gelberg, 2007; Stein et al., 2009).

Chronic homelessness is a significant problem among IDUs, impacting access to health care and treatment services, increased risk of infectious disease exposure and transmission, and exacerbating mental health and co-morbid conditions. As such, to determine independent associations of IDU with physical and mental health conditions, and health and social service utilisation, the present study will control for severity of homelessness using the following two indicators: 1) length of homelessness over the lifetime (in months) grouped into the following three levels: < 12 months; 13-60 months; > 60 months, and 2) age of first homeless (in years).

3.2. Sex Work

There is a strong link between IDU, sex work, and adverse health outcomes. Sex work has been identified as an independent risk factor for HIV infection among female IDU (Roberts, Mathers, & Degenhardt, 2010). Similarly, IDU is an independent risk factor

for HIV acquisition, according to BC surveillance data and as evidenced by the dramatic outbreak in HIV infections in Vancouver's DTES in the 1990s (Buxton, 2003; Spittal et al., 2002). Further, involvement in sex work has been identified as a marker of risk for physical and mental health problems, and increased use of acute care services (Burnette, Lucas, Ilgen, Frayne, Mayo, & Weitlauf, 2008). IDU is similarly associated with multiple physical and mental health conditions, increased acute care service utilization, and barriers to care (Kerr et al. 2004; Roberts et al., 2010). IDU and sex work are high-risk activities linked to younger age, homelessness and unstable housing, high-risk sexual and injection practices which increases vulnerability to HIV infection (Spittal et al., 2007; Hoda et al., 2008; Roberts et al., 2010). It is suggested that IDU and sex work may mutually reinforce each other. IDUs may initially engaging in sex work to support drug use, and then subsequently increase their use of drugs to cope with the psychological distress of sex work (Roberts et al, 2010; Young, Boyd, & Hubbell, 2000).

IDU is prevalent among female survival sex workers, with estimates ranging between 15-66% in North America (Roberts et al., 2010; Shannon et al., 2009). Among the women recruited for a large cohort of IDU in Vancouver, approximately 72% had ever engaged in sex work at baseline, and 30% were HIV-positive (Spittal et al., 2007). Involvement in sex work and IDU demonstrate overlapping risks linked to physical and mental health problems, violence and exploitation, unsafe sexual practices, high-risk drug use practices, stigma and marginalisation, and barriers to care – particularly amongst women. As such, sex work is controlled for in addition to homeless severity in a supplementary analysis of female participants in the present study.

4. Methods

4.1. Data Source

The primary data source for the present research draws from the Vancouver *At Home* study. Vancouver *At Home* is part of the *At Home/Chez Soi* National Research Demonstration project investigating homelessness and mental health in five Canadian cities. A detailed set of demographic, clinical, health and social measures were collected at enrolment by trained interviewers using structured, computer-assisted survey instruments. Each interview lasted approximately 2-hours in length. Questions covered self-reported socio-demographic information, homelessness history, mental illness symptoms, physical health status, substance use and risk behaviours, health care and social services access and utilisation, justice service involvement, and quality of life. Participants received a cash honorarium (\$35) upon completion of the interview. Data for the present study are drawn exclusively from the baseline assessment, collected between October 2009 and June 2011.

4.2. Study Population

A total of 497 individuals were recruited into the Vancouver *At Home* study between October 2009 and June 2011. A screening interview determined eligibility for entry into the study based on the following criteria: residing in Vancouver, BC at the time of enrolment; legal adult status (greater than 19 years of age); the presence of mental illness as assessed through the administration of the MINI Neuropsychiatric Interview (Sheehan, Lecrubier, Sheehan, Amorim, Janavs, Weiller et al., 1998); for the past four weeks, must not have been a client of a case management or ACT program that is helping to meet basic needs and link to housing and support services; and absolute homelessness or precarious housing status.

4.3. Measures

4.3.1. *Dependent Variable*

The primary outcome variable, injection drug use, was self-reported and assessed by asking, “At any time in the past month, did you inject drugs?” Response options included: yes, no, and declined; participants that declined to respond were excluded from all analyses. As such, IDU is examined as a dichotomous variable (IDU versus non-IDU) and is defined as having injected drugs at least once in the last month (30 days), regardless of the drug(s) injected.

4.3.2. *Independent Variables*

To fully characterise IDU and establish health correlates among this sample, factors across several domains were elicited from participants on socio-demographic information, housing status and homelessness history, mental health symptoms, physical health status, substance use patterns, justice service involvement and health care access and utilisation. All items are based on self-report.

4.3.2.1. *Socio-demographic Characteristics*

The demographic questionnaire elicited responses from participants related to socio-demographic information and included age at enrolment, country of birth (Canada/ other), ethnicity (Caucasian; Aboriginal; mixed/other), educational attainment (grade 8 or less; incomplete high school; high school or higher), employment status (unemployed; employed; other/student/ housewife), marital status (single (never married); married; separated/widowed/divorced), and having children under the age of 18 (yes vs.no).

4.3.2.2. *Housing Status and Homelessness History*

Participants' housing status was elicited upon enrolment in the study and categorised as absolutely homeless or precariously housed. Absolute homelessness is defined as having no fixed accommodation for more than seven nights. Precarious housing status is defined as living in a rooming house, single room occupancy (SRO) hotel, or transitional housing with at least two short episodes, or one long episode of homelessness in the past year.

Homelessness history is assessed by three indicators: age of first homeless on a continuous scale (in years), length of homelessness over the lifetime (in months) and longest single period of homelessness (in months) as continuous variables. Length of homelessness over the lifetime (in months) and longest single period of homelessness (in months) are also grouped as categorical variables using the following three levels: < 12 months; 13-60 months; > 60 months.

4.3.2.3. Mental Health Status

Mental health status was documented by physician diagnosis or as assessed using the MINI International Neuropsychiatric Interview (Sheehan et al., 1998). The MINI is a short diagnostic interview with high reliability and validity for assessing current DSM-IV Axis I and ICD-10 psychiatric disorders in non-clinical settings (Sheehan et al., 1998). Self-reported information on current major depressive episode, manic episode or hypomanic episode, PTSD, panic disorder, mood disorder with psychotic feature, psychotic disorder, substance use disorders, and current suicidality was included in the study. The Mental Illness-Less severe cluster variable includes at least one current episode of major depression, PTSD, or panic disorder; the Mental Illness-Severe cluster of mental disorder includes at least one of current mood disorder with psychotic feature, psychosis, psychotic features, and hypomanic or manic episode. Number of mental disorders is a dichotomized variable split into two levels: single mental disorder, and two or more mental disorders.

4.3.2.4. Physical Health Status

Information on co-morbid health conditions was elicited by participants (yes vs. no) and included the following respiratory, circulatory, internal organ, neurological conditions and infectious diseases: tuberculosis (TB), Hepatitis C (HCV), Hepatitis B (HBV), HIV/AIDS, any other sexually transmitted disease (STD), asthma, chronic bronchitis/emphysema, migraine, epilepsy/seizure, stroke, Alzheimer, high blood pressure, thyroid, heart disease, diabetes, liver disease, cancer and anemia. Females were asked if they had any gynecological problems (yes vs. no), and if they were pregnant (yes vs. no). Traumatic brain injuries were surveyed with the following two questions: "Have you ever had an injury to the head which knocked you out or left you dazed, confused or disoriented?" (yes vs. no), and, "Were you, in fact, knocked out or

unconscious after any of these head injuries?” (yes vs. no). The infectious disease variable includes at least one co-morbid condition of Hepatitis C (HCV), Hepatitis B (HBV) and HIV/AIDS.

4.3.2.5. Substance Use and Risk Behaviours

Substance use was assessed using the Maudsley Addiction Profile (MAP) (Marsden Gossop, Stewart, Best, Farrell, Lehmann et al., 1998), a self-report measure used to assess the use, amount, frequency and route of administration of illicit substances in the past month (30 days). The MAP is a reliable and valid instrument as used in previous studies (Marsden, Nizzoli, Corbelli, Margaron, Torres, Prada et al., 2000). Participants were asked about their use (yes vs. no) of: heroin, illicit methadone, benzodiazepines, cocaine, cocaine-crack base, amphetamine and cannabis. In addition, participants were asked about their first time use of substances measured on a continuous age scale (in years) which included: “How old were you when you first used drugs?” and “How old were you when you first got drunk?”

Use of all drugs in the past month, both smoking/injection (no alcohol), is dichotomized into two levels: none/single drug, and two or more drugs. Frequency of use of any drug in the past month (no alcohol) is similarly grouped into two levels: none/less than daily, and daily. Problems related to drug use measured as continuous variables included the questions: “How much money would you say you spent during the past 30 days on drugs?” (Canadian dollars, not counting prescription drugs), and “How many days in the past 30 have you experienced drug problems?” (i.e., craving, withdrawal symptoms, disturbing effects of use, or wanting to stop and being unable to).

Risk behaviours related to drug use included the questions: “In the past month, have you had a drug overdose?” (yes vs. no), and “In the past month, did you ever use a needle or syringe which had been used by someone else?” (yes vs. no). An indicator of high-risk sexual behaviour/practice was elicited with the question: “In the past month, have you had penetrative sex without using a condom at any time?” (yes vs. no).

4.3.2.6. Health and Social Services Access and Utilisation

The following health and social service utilisation variables were self-reported (yes vs. no): “Do you have a regular medical doctor?” (i.e., a family doctor or General

Practitioner); “Is there a place that you usually go to when you are sick or need advice about your health?”; and, “In the past 6 months, was there ever a time when you felt that you needed health care but you didn’t receive it?” The following health and social service variables considered refer to the past month and included: Seen by a health or social service provider (yes vs. no), visited an addictions counselor (yes vs. no), visited health service providers (except psychiatrist) (yes vs. no), visited a psychiatrist (yes vs. no), visited social service providers (yes vs. no), talked with a health or social service provider (yes vs. no), visited by a health or social service provider (yes vs. no). The following variables refer to emergency or urgent health care services in the past 6 months: called a crisis line or 911 or other (yes vs. no), visited by a crisis team (yes vs. no), visited an Emergency Room (yes vs. no) and taken by ambulance to hospital (yes vs. no).

Access to addictions treatment, counseling or harm reduction was defined broadly to include any detoxification programs, alcohol or illicit drug treatment, recovery houses, substance use services (e.g., methadone maintenance therapy, MMT), peer-based recovery programs, needle exchange programs (NEP), or the use of a safe injection facility (SIF) (e.g., Insite), and was based on the question: “Have you ever received treatment, counseling, or harm reduction services in the past 6 months?” (yes vs. no).

4.3.2.7. Justice Service Involvement, Victimization, and Offending Behaviours

The following justice services variables of interest refer to the past 6 months unless otherwise stated: contacts with police only (no arrests) (yes vs. no), contacts with other authorities (eg., security staff, not police) (yes vs. no), detained or taken by police (yes vs. no), held in a police cell for 24 hours (yes vs. no), been arrested (yes vs. no), court appearance (yes vs. no), participated in justice service program (yes vs. no). An indicator of victimization was elicited with the question: “During the past 6 months, has anyone forced you or attempted to force you into any unwanted sexual activity, by threatening you, holding you down or hurting you in some way?” (yes vs. no). Other measures of previous criminal activity and institutionalisation include: “In the past six months, have you been arrested for criminal activity more than once, imprisoned, or served probation or other community sanction?” (yes vs. no) and “In the past 6 months,

did you spend one or more nights in a hospital, detox centre, or jail?” (yes vs. no). Offending behaviours have been found to be associated with illicit drug use. Variables examined for illegal activities and as high risk behaviours established in the literature included: “Have you participated in soliciting in the past month?” (yes vs. no), and “Have you sold drugs in the past month?” (yes vs. no).

4.4. Data Analyses

Data were analysed using both univariable and multivariable statistical techniques using SPSS, version 19.0.

4.4.1. Univariable Analyses

Univariable analyses of baseline categorical data between participants who did and did not report injecting drugs in the last month were compared using Pearson’s Chi-square tests. Fisher’s exact test was used when one or more of the cells contained values less than or equal to five. Continuous variables were analysed using Student’s *t*-tests. All reported *p*-values are two-sided. Univariable logistic regression was used to determine factors that were independently associated with IDU in the past month at a significance level of $p < 0.05$.

4.4.2. Multivariable Analyses

Multivariable analyses were carried out to model odds ratios (ORs) for associations between independent variables and the likelihood of using injection drugs at baseline. Results of univariable contrasts were used to build multivariable models in order to take likely confounders into account. Variables related to health service use and variables considered most salient in the substance use literature associated with IDU that were significant at $p \leq 0.05$ in univariable analyses were force entered into multivariable logistic regression models. Analyses were conducted independently for females and males. Associations between reported injection drug use in the last 30 days and likelihood of various outcome measures described above are expressed in adjusted odds ratios (AORs).

5. Results

5.1. Descriptive Analyses of Injection Drug Use

Of 497 participants enrolled in the study, 12 declined to respond to the question on injection drug use. Consequently, a total of 485 homeless adults with mental illness are included in this analysis. Of 485 participants, 133 (27.4%) were women, and 352 (72.6%) were men. Participants were asked to report their gender at baseline. Descriptive analyses were conducted for the entire study sample to determine the overall proportion of individuals' self-report of using injection drugs in the past month, 86 (17.7%), and to test substance use variables by gender. Analyses revealed significant differences in the prevalence of IDU among females and males (24.8% women vs. 15.1% men, $p = 0.012$) (data not shown). Consequently, all further analyses were performed separately by gender and stratified by injection drug use to fully characterise IDUs from non-IDUs, by gender. Gender in this study is defined as female or male.

The results of the univariable analyses are presented in tabular form to illustrate comparisons of IDU and non-IDU groups (Tables 1-7). A number of contrasts are presented that go beyond the hypotheses of the present research and are presented for context and completeness, but not all are discussed in text.

5.1.1. Socio-demographic Characteristics

Table 1 shows the socio-demographic characteristics associated with IDU. Participants reporting IDU at baseline were more likely to be younger. The median age at enrolment among female participants was 36 years among IDUs (Interquartile range [IQR] = 31-44) and 43 years among non-IDUs (IQR = 32-50), $p = 0.109$. For males, the median age at enrolment was 28 years among IDUs (IQR = 20-41) in comparison to 42 years among non-IDUs (IQR = 32-49), $p = 0.142$. By age group, 78.8% of IDU women were between the ages of 25-44 and 21.2% were aged 44+, compared to 48% of non-

IDU women aged 25-44 and 41% aged 44+ ($p = 0.005$). By age group among men, 73.6% of IDUs were between the ages of 25-44 and 24.5% were aged 44+, and 53.5% of non-IDUs were aged 25-44 and 38.8% were aged 44+ ($p = 0.019$). Of youth-aged participants, (ages 19-24), only one male reported IDU (1.9%).

Among males, significant differences in country of birth, employment status and marital status were observed between IDU and non-IDU participants. Male IDUs were more likely to be born in Canada (98.1% vs. 82.6%, $p = 0.004$), less likely to be unemployed (83% vs. 92.6%, $p = 0.048$), and less likely to be single (59.6% vs. 75.6% $p = 0.029$). Among females, a greater proportion of IDUs self-reported as Aboriginal (36.4% vs. 17%, $p = 0.064$), and none reported having employment, but these differences were not significant. There were no other significant differences in socio-demographic variables between female and male IDU and non-IDU groups.

5.1.2. *Housing Status and Homelessness History*

Table 2 shows the housing status and homelessness history of IDUs. Both IDU women and IDU men were significantly more likely to be homeless at a younger age. The median age of first homeless among IDU women was 27 (IQR = 15-33) compared to 35 (IQR = 20-45) non-IDU women ($p = 0.004$). Among IDU men, the median age of first homeless was 23 (IQR = 17-34) compared to 28 (IQR = 20-41) among non-IDU men ($p = 0.012$). Median length of homelessness over the lifetime and the longest single period of homelessness among IDU women was more than double that of non-IDU women: 60 months (IQR = 36-104) versus 24 months (IQR = 7-48), $p < 0.001$, and 30 months (IQR = 12-48) versus 6 months (IQR = 12-24) $p = 0.005$, respectively. Among IDU men, the median length of homelessness experienced over the lifetime was also greater than non-IDU men, 64 months (IQR = 36-120) versus 36 months (IQR = 12-84) $p = 0.041$. There was no significant difference in the median longest single period of homelessness between IDU and non-IDU males.

5.1.3. *Mental Health Status*

The mental health status of participants is presented in Table 3. Among women, IDU were more likely to report having a major depressive episode (Unadjusted odds ratio [UOR] = 3.54, 95% Confidence interval [CI]: 1.49-8.37) and to have PTSD (UOR =

2.29, 95% CI: 1.03-5.11) in comparison to non-IDU women. IDU women were also more likely to have mental illness-less severe form (major depression/PTSD/panic disorder) in comparison to non-IDU women (UOR = 3.89, 95% CI: 1.39-10.92). Among men, IDU were more likely to report panic disorder (UOR = 1.92, 95% CI: 0.99-3.70), half as likely to have a psychotic disorder such as schizophrenia (UOR = 0.53, 95% CI: 0.29-0.96), and more likely to suffer from two or more mental disorders (UOR 2.42, 95% CI: 1.28-4.56). IDU men were significantly more likely to have mental illness-less severe form (i.e., major depression/PTSD/panic disorder) in comparison to non-IDU men (OR 2.93, 95% CI: 1.56-5.49). There were no significant differences observed between female or male IDU and non-IDU groups on manic or hypomanic episodes, mood disorder with psychotic feature, current suicidality or mental illness-severe form (i.e., manic/mood disorder with psychosis, schizophrenia).

5.1.4. Physical Health Status

Self-reported physical health status largely revealed significant differences in infectious disease as presented in Table 4. Among women, IDUs showed a significantly greater likelihood of tuberculosis (UOR = 14.14, 95% CI: 1.52-131.67), hepatitis C virus (HCV) (UOR = 21.40, 95% CI: 7.58-60.39), hepatitis B virus (HBV) (UOR = 6.55, 95% CI: 1.14-37.61), HIV/AIDS (UOR = 6.65, 95% CI: 1.80-24.53), and greater likelihood of overall infectious disease (HIV/HCV/HBV) (UOR 19.268, 95% CI: 7.15-51.93). There were no other significant differences in respiratory (e.g., asthma, bronchitis), circulatory (e.g., heart disease, high blood pressure), internal organ (e.g., diabetes, liver disease, female problems) neurological (e.g., epilepsy, migraines) or sexually transmitted diseases among women. Among men, IDUs revealed a greater likelihood of hepatitis C virus (HCV) (UOR = 17.58, 95% CI: 8.03–38.50), HIV/AIDS (UOR = 2.62, 95% CI: 1.13-6.09), and overall infectious disease (HIV/HCV/HBV) (UOR = 10.98, 95% CI: 5.47-22.05). IDU men were also more likely to have Alzheimer's disease (UOR = 5.8, 95% CI: 1.40-23.95). There were no other significant differences in respiratory (e.g., asthma, bronchitis), circulatory (e.g., heart disease, high blood pressure), internal organ (e.g., diabetes, liver disease), other neurological conditions (e.g., epilepsy, migraines) or other infectious disease including tuberculosis, hepatitis B (HBV) or any other sexually transmitted diseases among men.

Notably, both female and male participants showed a high prevalence of head injuries (59.4% IDU vs. 55.2% non-IDU women, $p = 0.681$; 80.8% IDU vs. 68.4% non-IDU men, $p = 0.071$) and having been knocked unconscious from head injuries (50.0% IDU vs. 44.8% non-IDU women, $p = 0.609$; 71.2% IDU vs. 58.3% non-IDU men, $p = 0.081$), although these findings were only approaching significance among men.

5.1.5. Substance Use and Risk Behaviours

Comparisons in substance use (Table 5) revealed a younger age of first drunk and first drug use among IDU women and IDU men in comparison to non-IDUs. Among IDU women, first drunk occurred at median age 12 (IQR = 12-14) versus 14 (IQR = 12-17) among non-IDU ($p < 0.001$), and median age of first drug use was 13 (IQR = 12-14) versus 15 (IQR = 13-19) non-IDU, $p = 0.005$. Among IDU men, the median age of first drunk was 12 (IQR = 10-14) compared to 15 (IQR = 12-17) among non-IDU ($p < 0.001$), and 13 (IQR = 11-14) versus 15 (IQR = 13-18) non-IDU ($p = 0.004$) for first drug use. Both IDU women and IDU men had a significantly greater likelihood to be currently substance dependent at enrolment (UOR = 14.89, 95% CI: 3.38-65.60 and UOR = 16.78, 95% CI: 5.12-54.98, respectively).

Substance use patterns which characterised IDU women included being more likely to use heroin (UOR = 22.9, 95% CI: 8.44-62.22), illicit methadone (UOR = 5.8, 95% CI: 1.30-25.67), benzodiazepines (UOR = 5.88, 95% CI: 1.91-18.12), cocaine (UOR = 16.6, 95% CI: 5.70-48.58), crack-cocaine (UOR = 4.9, 95% CI: 2.12-11.38), and amphetamines (UOR = 3.7, 95% CI: 1.19-11.60). IDU women were also significantly more likely to use two or more drugs (smoking and/or injection, combined) (UOR = 34.5, 95% CI: 7.77-153.29), and use drugs on a daily basis (UOR = 6.2, 95% CI: 2.62-14.59). In addition, IDU women were observed to have more days with a drug problem in the past month (30 days [median] IQR = 20-30 versus 20 days, IQR = 5-30 among non-IDU women, $p = 0.011$), and indicated spending a significantly greater amount of money on drugs per month in comparison to non-IDU women (\$550 [median] IQR = \$150-1,050 versus 0, IQR = 0-\$300, $p < 0.001$). Of IDU women, 2 (6.3%) reported using a *used* needle or syringe in the past month ($p = 0.013$). In addition, IDU women were more likely to report a non-fatal overdose in the past month, although this was a marginally significant finding (UOR = 5.07, 95% CI: 0.81-31.81).

The following substance use patterns characterised IDU men and included being more likely to use heroin (UOR = 28.03, 95% CI: 13.54-58.03), to use illicit methadone (UOR = 10.5, 95% CI: 3.28-33.36), to use cocaine (UOR = 8.7, 95% CI: 4.52-16.62), crack-cocaine (UOR = 7.2, 95% CI: 3.79-13.79), amphetamines (UOR = 4.6, 95% CI: 2.27-9.13) and cannabis (UOR = 2.2, 95% CI: 1.13-4.30). IDU men were also significantly more likely to use two or more drugs (UOR = 28.7, 95% CI: 11.01-74.69) and to use drugs daily (UOR = 2.87, 95% CI: 1.56-5.29). In addition, IDU men reported spending a significantly greater amount of money on drugs per month in comparison to non-IDU (median \$300, IQR = \$100-750 versus \$10, IQR = 0-\$200, $p = 0.003$, respectively), and were nearly six times more likely to have non-fatal overdose in the past month (UOR = 5.92, 95% CI: 1.16-30.16). A total of 2 (3.8%) IDU men reported using a *used* needle or syringe in the past month ($p = 0.001$). There were no significant differences on the use of benzodiazepines or days with a drug problem among males. Further, there were no significant differences among both female and male groups on the indicator of high-risk sexual behaviour, having sex without a condom in the past month. However, approximately one-third (31.3%) of IDU women reported this behaviour in the past month in contrast to 14.3% of IDU men.

5.1.6. Health and Social Service Access and Utilisation

IDU women were characterised by being significantly more likely to need healthcare but not receive it (UOR = 2.33, 95% CI: 1.04-5.20), but also 4.5 times more likely to have received some form of treatment, counseling or harm reduction services in the past six months (95% CI: 1.60-12.56). However, obtaining psychiatric care in the past month was also significantly and inversely associated with IDU women (UOR = 0.15, 95% CI: 0.03-0.67). There were no other significant differences between IDU and non-IDU women on other health and social service related measures, including having a regular medical doctor, having a usual place to go when sick, or being seen by a health or social service provider, visiting an addictions counselor, health or social service provider, or talking with a health or social service provider in the past month.

IDU men's health and social services access and utilization were characterized by being significantly more likely to be seen by a health or social service provider (UOR = 2.86, 95% CI: 1.10-7.48) and to have talked with a health or social service provider

(UOR = 2.33, 95% CI: 1.22-4.43) in the past month. IDU men were also significantly more likely to have received some form of treatment, counseling or harm reductions services in the past six months (UOR 7.32, 95% CI: 3.03-17.64). There were no significant differences between IDU and non-IDU men on other health and social service related measures, including having a regular medical doctor, having a usual place to go when sick, needing health care but not receiving it in the past six months, or visiting an addictions counselor, psychiatrist, health or social service provider in the past month.

No significant differences in involvement with urgent care services in the past six months was observed among female or male IDU and non-IDU groups, which included calling a crisis line or 911, being visited by a crisis team, visiting the emergency room (ER), or being taken by ambulance to hospital. However, up to two-thirds of IDU participants had accessed ER services in the past month, although this was not a significant finding (women: 62.5% IDU versus 54.1% non-IDU, $p=0.405$; men: 67.9% IDU versus 56.5% non-IDU, $p=0.121$). In addition, very few participants overall, either IDU or non-IDU, visited an addictions counselor in the past month (women: 3(9.1%) IDU versus 2 (2%) non-IDU, $p=0.063$; men: 3 (5.7%) IDU versus 10 (3.3%) non-IDU, $p=0.410$).

5.1.7. Justice Service Involvement, Victimization, and Offending Behaviours

Among women, IDUs were more likely to have a court appearance in the past six months (UOR = 2.40, 95% CI: 1.04-5.53) and to have been arrested for criminal activity more than once in the past six months (UOR = 2.57, 95% CI: 1.14-5.82). No other significant differences between IDU and non-IDU on justice service variables were observed, including contacts with police, contacts with other authorities, being detained or taken by police, being held in a police cell for 24 hours, being arrested, participating in a justice service program, or spending one or more nights in a hospital. However, illegal activities significantly associated with IDU women included involvement in solicitation (UOR 8.12, 95% CI: 2.70-24.43) and selling drugs in the past month (UOR 8.0, 95% CI: 2.22-28.80). Although not statistically significant, IDU women were more likely to be forced into unwanted sexual activity in the previous six months (UOR 2.08, 95% CI:

0.81-5.33). In contrast, no IDU men reported participating in solicitation in the past month or being forced into unwanted sexual activity in the previous six months.

Among men, IDU were more likely to have contacts with police (UOR 2.40, 95% CI: 1.26-4.55), to be arrested (UOR 2.01, 95% CI: 1.11-3.65) and to have a court appearance (OR 2.30, 95% CI: 1.27-4.18) in the past six months. In contrast, non-IDU men were more likely to have participated in a justice service program (UOR = 2.62, 95% CI: 1.08-6.35). No other significant differences in justice service utilization variables were revealed, including contacts with other authorities, being detained or taken by police, being held in a police cell for 24 hours, being arrested for criminal activity more than once, or spending one or more nights in a hospital, detox centre, jail or shelter in the previous six months. However, IDU men were significantly more likely to sell drugs in the past month (UOR = 3.50, 95% CI: 1.67-7.44).

5.2. Multivariable Analyses

In multivariable analyses, variables that were significant at the $p \leq 0.05$ cut-off in univariable analyses and considered most salient to health, mental health and health service utilisation were entered into independent models, by gender. Adjusted odds ratios and confidence intervals for variables included in the multivariable analyses are presented in Tables 8, 9, and 10. Variables in multivariable analyses are considered significant at $p < 0.10$ due to small sample sizes. All analyses controlled for severity of homelessness using two indicators: 1) age of first homeless (in years), and 2) lifetime length of homelessness (in months) grouped as a categorical variable into the following three levels: < 12 months; 13-60 months; > 60 months.

Among females, after controlling for age of first homeless, in years (UOR = 0.956, 95% CI: 0.93-0.99) and length of homeless over the lifetime, in months (13-60 months: UOR = 3.25, 95% CI: 0.98-10.79; > 60 months: UOR = 9.84, 95% CI: 2.84-34.16), IDU was associated with infectious disease (HIV/HCV/HBV) (Adjusted odds ratio [AOR] = 20.44, 95% CI: 5.97-70.0) and not seeing a psychiatrist in the past month (AOR = 0.17, 95% CI: 0.03-1.06).

To examine whether the associations between IDU and health, mental health and health service use were accounted for by the increased prevalence of sex work among females, a second multivariable model was built including participation in soliciting in the last month (UOR = 8.12, 95% CI: 2.70-24.43) as a covariate in addition to homeless severity variables. After adjustment (Table 9), IDU remained associated with infectious disease (HIV/HCV/HBV) (AOR = 24.87, 95% CI: 6.26-98.81), mental illness-less severe form (i.e., major depression/PTSD/panic disorder) became marginally associated with IDU (AOR = 3.83, 95% CI: 0.81-18.18), and not seeing a psychiatrist in the past month remained marginally significant (AOR = 0.18, 95% CI: 0.03-1.31).

Among males, after controlling for age of first homeless, in years (UOR = 0.97, 95% CI: 0.95-0.99) and length of homeless over the lifetime, in months (13-60 months: UOR = 1.68, 95% CI: 0.67-4.20; > 60 months: UOR = 3.60, 95% CI: 1.49-8.69, $p = 0.004$), IDU was independently associated with infectious disease (HIV/HCV/HBV) (AOR = 9.07, 95% CI: 4.33-19.01), mental illness-less severe form (i.e., major depression, PTSD, panic disorder) (AOR = 1.96, 95% CI: 0.09-4.10) and having ever received treatment, counseling or harm reduction services in the past six months (AOR = 5.66, 95% CI: 2.13-15.05).

Table 1. Socio-demographic characteristics associated with injection drug use at baseline among Vancouver *At Home* participants, by gender

Characteristic	Females				Males			
	Non-IDU n=100, n (%)	IDU n=33, n (%)	p-value	UOR (95% CI)	Non-IDU n=299, n (%)	IDU n=53, n (%)	p-value	UOR (95% CI)
Median age at enrolment [IQR]	43 (32-50)	36 (31-44)	0.109	0.97 (0.94, 1.01)	42 (32-49)	28 (20-41)	0.142	0.98 (0.96, 1.01)
Age at enrolment								
- Youth 19-24 Years	11 (11.0)	0	0.005	- Reference -	23 (7.7)	1 (1.9)	0.019	- Reference -
- 25-44 Years	48 (48.0)	26 (78.8)		-	160 (53.5)	39 (73.6)		5.61 (0.73, 42.79)
- 44+ Years	41 (41.0)	7 (21.2)		-	116 (38.8)	13 (24.5)		2.58 (0.32, 20.69)
Country of Birth								
- Canada	89 (89.9)	32 (97.0)	0.203	- Reference -	247 (82.6)	52 (98.1)	0.004	- Reference -
- Other	10 (10.1)	1 (3.0)		0.28 (0.03, 2.26)	52 (17.4)	1 (1.9)		0.09 (0.01, 0.68)
Ethnicity								
- Aboriginal	17 (17.0)	12 (36.4)	0.064	- Reference -	35 (11.7)	9 (17.0)	0.228	- Reference -
- Caucasian	57 (57.0)	15 (45.5)		2.68 (1.06, 6.82)	170 (56.9)	33 (62.3)		1.33 (0.58, 3.01)
- Mixed / Other	26 (26.0)	6 (18.2)		0.88 (0.31, 2.52)	94 (31.4)	11 (20.8)		0.60 (0.29, 1.25)
Education								
- Grade 8 or less	13 (13.0)	7 (21.2)	0.397	- Reference -	42 (14.2)	11 (20.8)	0.191	- Reference -
- Incomplete High School	33 (33.0)	12 (36.4)		2.08 (0.70, 6.18)	128 (43.2)	26 (49.1)		2.06 (0.89, 4.80)
- High School or Higher	54 (54.0)	14 (42.4)		1.40 (0.58, 3.40)	126 (42.6)	16 (30.2)		1.60 (0.82, 3.13)
Employment status								
- Unemployed	92 (93.9)	32 (97.0)	0.743	- Reference -	277 (92.6)	44 (83.0)	0.048	- Reference -
- Employed	1 (1.0)	0		1.74 (0.20, 15.45)	13 (4.3)	4 (7.5)		0.29 (0.09, 0.89)
- Other/Student/Housewife	5 (5.1)	1 (3.0)		-	9 (3.0)	5 (9.4)		0.55 (0.12, 2.65)
Marital status								
- Single (never married)	54 (55.1)	21 (65.6)	0.554	- Reference -	226 (75.6)	31 (59.6)	0.029	- Reference -
- Married	10 (10.2)	3 (9.4)		1.65 (0.66, 4.15)	8 (2.7)	4 (7.7)		0.52 (0.27, 1.01)
- Sep/Widowed/Divorced	34 (34.7)	8 (25.0)		1.28 (0.28, 5.73)	65 (21.7)	17 (32.7)		1.91 (0.51, 7.11)
Have children (under 18)	33 (33.3)	17 (51.5)	0.062	2.13 (0.95, 4.73)	55 (18.9)	15 (28.8)	0.101	1.74 (0.89, 3.39)

Note: IDU = Injection Drug Use; UOR = Unadjusted Odds Ratio; 95% CI = 95% Confidence Interval; IQR = Interquartile Range

Table 2: Housing status and homelessness history associated with injection drug use among Vancouver *At Home* participants, by gender

Characteristic	Females			Males			
	Non-IDU n=100, n (%)	IDU n=33, n (%)	p-value	Non-IDU n=299, n (%)	IDU n=53, n (%)	p-value	UOR (95% CI)
Housing status at enrolment							
- Absolutely Homeless	78 (78.0)	24 (72.7)	0.534	235 (78.6)	45 (84.9)	0.294	- Reference - 1.53 (0.69, 3.41)
- Precariously Housed	22 (22.0)	9 (27.3)		64 (21.4)	8 (15.1)		
Median age of first homeless [IQR]	35 (20-45)	27 (15-33)	0.004	28 (20-41)	23 (17-34)	0.012	0.97 (0.95, 1.00)
Length of homelessness – Lifetime							
- 12 months homeless	42 (42.0)	4 (12.5)	<.001	81 (27.5)	7 (13.2)	0.004	- Reference - 1.68 (0.67, 4.20)
- 13-60 months homeless	42 (42.0)	13 (40.6)		124 (42.0)	18 (34.0)		3.25 (0.98, 10.79)
- 60+ months homeless	16 (16.0)	15 (48.4)		90 (30.5)	28 (52.8)		9.84 (2.84, 34.16)
Length of homelessness – Longest single period							
- 12 months homeless	62 (62.0)	8 (25.0)	0.001	154 (52.2)	19 (35.8)	0.045	- Reference - 2.21 (1.17, 4.19)
- 13-60 months homeless	31 (31.0)	19 (59.4)		99 (33.6)	27 (50.9)		4.75 (1.87, 12.06)
- 60+ months homeless	7 (7.0)	5 (15.6)		42 (14.2)	7 (13.2)		5.54 (1.42, 21.64)
Length of homelessness [IQR] – Lifetime (in months)	24 (7-48)	60 (36-104)	<.001	36 (12-84)	64 (36-120)	0.041	1.02 (1.01, 1.03)
Length of homelessness [IQR] – Longest single period (in months)	6 (12-24)	30 (12-48)	0.005	12 (6-36)	23 (6-48)	0.850	1.01 (1.00, 1.03)

Note: IDU = Injection Drug Use; UOR = Unadjusted Odds Ratio; 95% CI = 95% Confidence Interval; IQR = Interquartile Range

Table 3: Mental health associations with injection drug use at baseline among Vancouver *At Home* participants, by gender

Characteristic	Females				Males			
	Non-IDU n= 100, n (%)	IDU n= 33, n (%)	p-value	UOR (95% CI)	Non-IDU n= 299, n (%)	IDU n= 53, n (%)	p-value	UOR (95% CI)
Major Depressive Episode	43 (43.0)	24 (72.7)	0.003	3.54 (1.49, 8.37)	106 (35.5)	22 (41.5)	0.398	1.29 (0.71, 2.34)
Manic or Hypomanic Episode	20 (20.0)	9 (27.3)	0.380	1.50 (0.60, 3.72)	55 (18.4)	12 (22.6)	0.468	1.30 (0.64, 2.63)
PTSD	34 (34.3)	18 (54.5)	0.040	2.29 (1.03, 5.11)	57 (19.1)	16 (30.2)	0.066	1.84 (0.96, 3.53)
Panic Disorder	22 (22.0)	6 (18.2)	0.641	0.79 (0.29, 2.15)	55 (18.4)	16 (30.2)	0.049	1.92 (1.00, 3.70)
Mood Disorder with Psychotic Feature	18 (18.0)	10 (31.3)	0.111	2.07 (0.84, 5.12)	42 (14.0)	12 (22.6)	0.110	1.79 (0.87, 3.68)
Psychotic Disorder	50 (50.0)	12 (36.4)	0.173	0.57 (0.25, 1.29)	171 (57.2)	22 (41.5)	0.034	0.53 (0.29, 0.96)
Current Suicidality*	35 (35.0)	17 (51.5)	0.092	1.97 (0.82, 4.94)	90 (30.1)	22 (41.5)	0.100	1.65 (0.91, 3.00)
Number of mental disorders								
- Single disorder	36 (39.1)	8 (24.2)	0.124	- Reference -	154 (56.2)	17 (34.7)	0.005	- Reference -
- Two or more disorders	56 (60.9)	25 (75.8)		2.01 (0.89, 4.38)	120 (43.8)	32 (65.3)		2.42 (1.28, 4.56)
Mental Illness – Less severe form: (Major depression/PTSD/Panic disorder)	59 (59.0)	28 (84.8)	0.007	3.89 (1.39, 10.92)	132 (44.1)	37 (69.8)	0.001	2.93 (1.56, 5.49)
Mental Illness – Severe form: (Manic/Mood disorder with psychosis/Schizophrenia)	72 (72.0)	22 (66.7)	0.560	0.78 (0.33, 1.81)	225 (75.3)	35 (66.0)	0.159	0.64 (0.34, 1.20)

Note: IDU = Injection Drug Use; UOR = Unadjusted Odds Ratio; 95% CI = 95% Confidence Interval; PTSD = Post-traumatic stress disorder; HIV/AIDS = Human Immunodeficiency Virus/Acquired Immune Deficiency Syndrome; HCV = Hepatitis C Virus; HBV = Hepatitis B Virus; STD = Sexually Transmitted Disease
* denotes categorised as no/low vs. moderate/high

Table 4: Physical health associations with injection drug use at baseline among Vancouver *At Home* participants, by gender

Characteristic	Females				Males			
	Non-IDU n=100, n (%)	IDU n=33, n (%)	p-value	UOR (95% CI)	Non-IDU n=299, n (%)	IDU n=53, n (%)	p-value	UOR (95% CI)
Tuberculosis	1 (1.0)	4 (12.5)	0.003	14.14 (1.52, 131.67)	6 (2.1)	1 (1.9)	0.945	0.93 (0.11, 7.87)
Hepatitis C Virus	16 (16.8)	26 (81.3)	<.001	21.40 (7.58, 60.39)	55 (19.4)	38 (80.9)	<.001	17.58 (8.03, 38.50)
Hepatitis B Virus	2 (2.1)	4 (12.1)	0.017	6.55 (1.14, 37.61)	15 (5.3)	3 (6.5)	0.727	1.26 (0.35, 4.52)
HIV/AIDS	4 (4.0)	7 (21.9)	0.002	6.65 (1.80, 24.53)	21 (7.2)	9 (17.0)	0.021	2.62 (1.13, 6.09)
Infectious disease – HIV/HCV/HSV	16 (16.2)	26 (78.8)	<.001	19.27 (7.15, 51.93)	70 (23.7)	41 (77.4)	<.001	10.98 (5.47, 22.05)
Any other STD	9 (9.1)	2 (6.1)	0.585	0.65 (0.13, 3.15)	13 (4.4)	3 (5.7)	0.684	1.31 (0.36, 4.75)
Chronic Bronchitis/Emphysema	24 (24.5)	7 (21.2)	0.702	0.83 (0.32, 2.15)	43 (15.1)	11 (21.2)	0.278	1.50 (0.72, 3.15)
Migraine	34 (34.0)	10 (30.3)	0.696	0.84 (0.36, 1.97)	90 (30.5)	19 (36.5)	0.388	1.31 (0.71, 2.43)
Epilepsy/Seizure	13 (13.1)	7 (21.9)	0.232	1.85 (0.67, 5.14)	36 (12.5)	8 (15.1)	0.605	1.24 (0.54, 2.85)
Stroke	8 (8.3)	2 (6.1)	0.674	0.71 (0.14, 3.52)	15 (5.2)	2 (3.8)	0.663	0.72 (0.16, 3.23)
High Blood Pressure	12 (12.4)	5 (16.1)	0.591	1.36 (0.44, 4.23)	51 (18.6)	9 (17.3)	0.824	0.92 (0.42, 2.00)
Alzheimer	2 (2.0)	2 (6.3)	0.231	3.20 (0.43, 23.70)	4 (1.4)	4 (7.5)	0.006	5.80 (1.40, 23.95)
Asthma	28 (28.0)	10 (30.3)	0.800	1.12 (0.47, 2.65)	50 (17.0)	13 (24.5)	0.191	1.59 (0.79, 3.18)
Thyroid	7 (7.3)	2 (6.1)	0.811	0.82 (0.16, 4.16)	8 (2.9)	1 (2.0)	0.739	0.70 (0.09, 5.73)
Heart Disease	6 (6.1)	5 (15.2)	0.102	2.77 (0.79, 9.76)	18 (6.3)	3 (6.0)	0.946	0.96 (0.27, 3.38)
Diabetes	10 (10.4)	3 (9.4)	0.866	0.89 (0.23, 3.46)	13 (4.5)	3 (5.9)	0.671	1.33 (0.36, 4.81)
Liver Disease	5 (5.1)	2 (6.7)	0.732	1.34 (0.25, 7.30)	8 (2.8)	4 (8.0)	0.066	3.03 (0.88, 10.48)
Cancer	8 (8.1)	4 (12.9)	0.418	1.69 (0.47, 6.03)	6 (2.1)	0	0.229	0.00 (0.00, 0.00)
Anemia	27 (28.1)	7 (21.9)	0.488	0.72 (0.28, 1.85)	29 (10.9)	3 (6.5)	0.362	0.57 (0.17, 1.95)
Gynecological Problems	14 (15.2)	4 (12.1)	0.664	0.77 (0.23, 2.53)	-	-	-	-
Currently pregnant	4 (4.2)	0	0.248	0.00 (0.00, 0.00)	-	-	-	-
Head Injury	53 (55.2)	19 (59.4)	0.681	1.19 (0.53, 2.67)	203 (68.4)	42 (80.8)	0.071	1.95 (0.94, 4.04)
Knocked out or unconscious by any of these head injuries	43 (44.8)	16 (50.0)	0.609	1.23 (0.55, 2.75)	169 (58.3)	37 (71.2)	0.081	1.77 (0.93-3.36)

Note: IDU = Injection Drug Use; UOR = Unadjusted Odds Ratio; 95% CI = 95% Confidence Interval; HIV/AIDS = Human Immunodeficiency Virus/Acquired Immune Deficiency Syndrome; HCV = Hepatitis C Virus; HBV = Hepatitis B Virus; STD = Sexually Transmitted Disease

Table 5: Substance use associations with injection drug use at baseline among Vancouver *At Home* participants, by gender

Characteristic	Females				Males			
	Non-IDU n=100, n (%)	IDU n=33, n (%)	p-value	UOR (95% CI)	Non-IDU n=299, n (%)	IDU n=53, n (%)	p-value	UOR (95% CI)
Median age of first drunk [IQR]	14 (12-17)	12 (12-14)	<.001	0.87 (0.77, 0.97)	15 (12-17)	12 (10-14)	<.001	0.84 (0.78, 0.91)
Median age of first drug use [IQR]	15 (13-19)	13 (12-14)	0.005	0.92 (0.84, 1.00)	15 (13-18)	13 (11-14)	0.004	0.89 (0.83, 0.96)
Current substance dependence	51 (51.0)	31 (93.9)	<.001	14.89 (3.38, 65.60)	149 (49.8)	50 (94.3)	<.001	16.78 (5.12, 54.98)
Use of heroin ^a	12 (12.0)	25 (75.8)	<.001	22.92 (8.44, 62.22)	21 (7.0)	36 (67.9)	<.001	28.03 (13.54, 58.03)
Use of illicit methadone ^a	3 (3.0)	5 (15.2)	0.011	5.77 (1.30, 25.67)	5 (1.7)	8 (15.1)	<.001	10.45 (3.28, 33.36)
Use of benzol ^a	6 (6.0)	9 (27.3)	0.001	5.88 (1.91, 18.12)	20 (6.7)	6 (11.3)	0.238	1.77 (0.68, 4.65)
Use of benzoz ^a	0	3 (9.1)	0.002	-	3 (1.0)	1 (1.9)	0.580	1.89 (0.19, 18.47)
Use of cocaine ^a	6 (6.0)	17 (51.5)	<.001	16.65 (5.70, 48.58)	32 (10.7)	27 (50.9)	<.001	8.67 (4.52, 16.62)
Use of cocaine-crack base ^a	29 (29.0)	22 (66.7)	<.001	4.90 (2.11, 11.38)	71 (23.7)	36 (69.2)	<.001	7.23 (3.79, 13.79)
Use of amphetamine ^a	7 (7.0)	7 (21.9)	0.017	3.72 (1.19, 11.60)	28 (9.4)	17 (32.1)	<.001	4.55 (2.27, 9.13)
Use of cannabis ^a	28 (30.1)	13 (44.8)	0.143	1.89 (0.80, 4.44)	128 (45.9)	28 (65.1)	0.019	2.20 (1.13, 4.30)
Use of all drugs-smoking/injection ^{a,b}								
- None/Single drug	69 (12.0)	2 (6.1)	<.001	- Reference -	224 (75.0)	5 (9.4)	<.001	- Reference -
- Two or more drugs	31 (31.0)	31 (93.9)		34.50 (7.77, 153.29)	75 (25.1)	48 (90.6)		28.67 (11.01, 74.69)
Frequency of use of any drug ^{a,b}								
- None/Less than daily	82 (82.0)	14 (42.4)	<.001	- Reference -	236 (78.9)	30 (56.6)	<.001	- Reference -
- Daily	18 (18.0)	19 (57.6)		6.18 (2.62, 14.59)	63 (21.1)	23 (43.4)		2.87 (1.56, 5.29)
Drug overdose ^a	2 (2.0)	3 (9.4)	0.057	5.07 (0.81, 31.81)	3 (1.0)	3 (5.7)	0.016	5.92 (1.16, 30.16)
Median money spent on drugs [IQR] ^a	0 (0-300)	550 (150-1050)	<.001	1.00 (1.00, 1.00)	10 (0-200)	300 (100-750)	0.003	1.00 (1.00, 1.00)
Median days with drug problem [IQR] ^a	20 (5-30)	30 (20-30)	0.011	1.06 (1.01, 1.12)	13 (4-30)	15 (5-30)	0.565	1.01 (0.98, 1.04)
Used previously used syringe ^a	0	2 (6.3)	0.013	-	0	2 (3.8)	0.001	-
Sex without condom ^a	24 (27.0)	10 (31.3)	0.644	1.23 (0.51, 2.97)	38 (13.6)	7 (14.3)	0.901	1.06 (0.44, 2.52)

Note: IDU = Injection Drug Use; UOR = Unadjusted Odds Ratio; 95% CI = 95% Confidence Interval; IQR = Interquartile Range

^a denotes activities in the past month

^b denotes does not include alcohol

Table 6: Health and social service use associations with injection drug use at baseline among Vancouver *At Home* participants, by gender

Characteristic	Females				Males			
	Non-IDU n=100, n (%)	IDU n=33, n (%)	p-value	UOR (95% CI)	Non-IDU n=299, n (%)	IDU n=53, n (%)	p-value	UOR (95% CI)
Have a regular medical doctor ^a	75 (75.0)	27 (81.8)	0.422	1.50 (0.56, 4.05)	180 (60.4)	31 (58.5)	0.793	0.92 (0.51, 1.67)
Place you usually go when you are sick or need advice about your health	85 (86.7)	28 (84.8)	0.785	0.86 (0.28, 2.62)	230 (78.0)	42 (80.8)	0.651	1.19 (0.57, 2.49)
Needed health care, but did not receive it ^b	33 (34.0)	18 (54.5)	0.037	2.33 (1.04, 5.20)	130 (44.4)	23 (44.2)	0.985	0.99 (0.55, 1.80)
Seen by a health or social service provider ^c	73 (73.0)	25 (75.8)	0.755	1.16 (0.47, 2.87)	228 (77.0)	48 (90.6)	0.026	2.86 (1.10, 7.48)
Visited addictions counselor ^c	2 (2.0)	3 (9.1)	0.063	4.90 (0.78, 30.71)	10 (3.3)	3 (5.7)	0.410	1.73 (0.46, 6.52)
Visited health service providers ^{cd}	49 (49.0)	19 (57.6)	0.393	1.41 (0.64, 3.13)	140 (46.8)	30 (56.6)	0.189	1.48 (0.82, 2.67)
Visited psychiatrist ^c	30 (30.0)	2 (6.1)	0.005	0.15 (0.03, 0.67)	88 (29.4)	11 (20.8)	0.195	0.63 (0.31, 1.28)
Visited social service providers ^c	48 (48.0)	16 (48.5)	0.961	1.02 (0.46, 2.24)	118 (39.5)	28 (52.8)	0.069	1.47 (0.92, 2.33)
Talked with a health or social service provider ^c	28 (28.3)	9 (27.3)	0.911	0.95 (0.39, 2.30)	56 (19.0)	18 (35.3)	0.009	2.33 (1.22, 4.43)
Called crisis line or 911 or other ^b	24 (24.5)	4 (12.5)	0.152	0.44 (0.14, 1.38)	45 (15.3)	9 (17.0)	0.749	1.14 (0.52, 2.50)
Visited by a crisis team ^b	11 (11.2)	3 (9.4)	0.769	0.82 (0.21, 3.14)	24 (8.2)	6 (11.3)	0.452	1.44 (0.56, 3.70)
Visited ER ^b	53 (54.1)	20 (62.5)	0.405	1.42 (0.62, 3.21)	165 (56.5)	36 (67.9)	0.121	1.63 (0.88, 3.03)
Taken by ambulance to hospital ^b	45 (45.5)	11 (33.3)	0.222	0.60 (0.26, 1.37)	119 (40.2)	17 (32.1)	0.264	0.70 (0.38, 1.31)
Ever received treatment/counseling/harm reduction services ^{be}	55 (55.6)	28 (84.8)	0.003	4.48 (1.60, 12.56)	151 (51.7)	47 (88.7)	<.001	7.32 (3.03, 17.64)

Note: IDU = Injection Drug Use; UOR = Unadjusted Odds Ratio; 95% CI = 95% Confidence Interval; ER = Emergency Room

^a denotes General Practitioner or Family Doctor

^b denotes activities in the previous 6 months

^c denotes activities in the past month

^d denotes excluding psychiatrist

^e denotes for use of alcohol or any drug, not including cigarettes

Table 7: Justice involvement, victimisation and offending behaviours associated with injection drug use at baseline among Vancouver *At Home* participants, by gender

Characteristic	Females				Males			
	Non-IDU n=100, n (%)	IDU n=33, n (%)	p-value	UOR (95% CI)	Non-IDU n=299, n (%)	IDU n=53, n (%)	p-value	UOR (95% CI)
<u>Justice services</u>								
Contacts with police only (no arrests) ^a	39 (39.0)	17 (51.5)	0.207	1.66 (0.75, 3.67)	149 (51.4)	38 (71.7)	0.006	2.40 (1.26, 4.55)
Contacts with other authorities (eg. security staff, not police) ^a	14 (15.2)	8 (29.6)	0.090	2.35 (0.86, 6.40)	48 (18.6)	7 (18.4)	0.978	0.99 (0.41, 2.38)
Detained or taken by police ^a	15 (16.7)	5 (18.5)	0.823	1.14 (0.37, 3.48)	52 (20.2)	8 (20.0)	0.973	0.98 (0.51, 1.89)
Held in a police cell for 24 hours ^a	18 (18.0)	10 (31.3)	0.111	2.07 (0.84, 5.12)	66 (23.2)	16 (30.2)	0.273	1.44 (0.75, 2.74)
Been arrested ^a	24 (24.2)	12 (36.4)	0.176	1.79 (0.77, 4.16)	106 (36.7)	28 (53.8)	0.020	2.01 (1.11, 3.65)
Court appearance ^a	23 (23.5)	14 (42.4)	0.036	2.40 (1.04, 5.53)	103 (35.4)	29 (55.8)	0.005	2.30 (1.27, 4.18)
Participated in justice service program ^a	83 (90.2)	21 (77.8)	0.087	2.64 (0.84, 8.23)	241 (91.3)	32 (80.0)	0.028	2.62 (1.08, 6.35)
Arrested for criminal activity more than once ^{a,b}	26 (26.8)	16 (48.5)	0.021	2.57 (1.14, 5.82)	147 (50.0)	29 (54.7)	0.527	1.21 (0.67, 2.17)
Spend one or more nights in a hospital, detox centre, jail or shelter ^a	86 (86.0)	30 (90.9)	0.464	1.63 (0.44, 6.06)	264 (88.6)	45 (84.9)	0.446	0.72 (0.32, 1.67)
<u>Victimisation</u>								
Forced (or attempted force) into unwanted sexual activity ^a	15 (15.3)	9 (27.3)	0.124	2.08 (0.81, 5.33)	5 (1.7)	0	0.341	-
<u>Illegal activities</u>								
Participation in soliciting ^c	6 (6.1)	11 (34.4)	<.001	8.12 (2.70, 24.43)	10 (3.4)	0	0.175	-
Sold drugs ^c	4 (4.0)	8 (25.0)	<.001	8.00 (2.22, 28.80)	25 (8.4)	13 (24.5)	0.001	3.52 (1.67, 7.44)

Note: IDU = Injection Drug Use; UOR = Unadjusted Odds Ratio; 95% CI = 95% Confidence Interval

^a denotes activities in the previous 6 months

^b denotes or been imprisoned at least once, or served probation or other community sanction

^c denotes activities in the past month

**Table 8: Multivariable logistic regression analyses of factors associated with injection drug use among female Vancouver At Home participants (n= 133)
Adjusting for severity of homelessness**

Characteristic	AOR	(95% CI)	p-value
<u>IDU (n = 33) versus non-IDU (n = 100):</u>			
<u>Infectious Disease</u>			
Infectious disease – HIV/HCV/HBV	20.44	(5.97, 70.00)	<.001
<u>Mental Health Status</u>			
Mental Illness – Less severe form: (Major depression/PTSD/Panic disorder)	2.34	(0.60, 9.15)	0.221
<u>Health Service Utilisation</u>			
Visit Psychiatrist ^a	0.17	(0.03, 1.06)	0.057
Ever received treatment/counseling/ harm reduction services ^{b,c}	0.93	(0.20, 4.28)	0.922

Note: AOR =Adjusted Odds Ratio; 95% CI = 95% Confidence Interval; IDU = Injection Drug Use; HIV = Human Immunodeficiency Virus; HCV = Hepatitis C Virus; HBV = Hepatitis B Virus; PTSD = Post-traumatic stress disorder

^a denotes activities in the past month;

^b denotes activities in the past 6 months;

^c denotes for use of alcohol or any drug, not including cigarettes

**Table 9: Multivariable logistic regression analyses of factors associated with injection drug use among *male Vancouver At Home* participants (*n*= 352)
Adjusting for severity of homelessness**

Characteristic	AOR	(95% CI)	<i>p</i> -value
<u>IDU (<i>n</i> = 53) versus non-IDU (<i>n</i> = 299):</u>			
<u><i>Infectious Disease</i></u>			
Infectious disease – HIV/HCV/HBV	9.07	(4.33, 19.01)	<.001
<u><i>Mental Health Status</i></u>			
Mental Illness – Less severe form: (Major depression/PTSD/Panic disorder)	1.96	(0.94, 4.10)	0.075
<u><i>Health Service Utilisation</i></u>			
Seen by a health or social service provider ^{a,b}	1.51	(0.50, 4.58)	0.463
Ever received treatment/counseling/harm reduction services ^{c,d}	5.66	(2.13, 15.05)	0.001

Note: AOR =Adjusted Odds Ratio; 95% CI = 95% Confidence Interval; IDU = Injection Drug Use; HIV = Human Immunodeficiency Virus; HCV = Hepatitis C Virus; HBV = Hepatitis B Virus; PTSD = Post-traumatic stress disorder

^a denotes activities in the past month;

^b denotes except psychiatrist;

^c denotes activities in the past 6 months;

^d denotes for use of alcohol or any drug, not including cigarettes

**Table 10: Multivariable logistic regression analyses of factors associated with injection drug use among female Vancouver At Home participants (n= 133)
Adjusting for severity of homelessness AND sex work**

Characteristic	AOR	(95% CI)	p-value
<u>IDU (n = 33) versus non-IDU (n = 100):</u>			
<u>Infectious Disease</u>			
Infectious disease – HIV/HCV/HBV	24.87	(6.26, 98.81)	<.001
<u>Mental Health Status</u>			
Mental illness – Less severe form: (Major depression/PTSD/Panic disorder)	3.83	(0.81, 18.18)	0.091
<u>Health Service Utilisation</u>			
Visit Psychiatrist ^a	0.18	(0.03, 1.31)	0.090
Ever received treatment/counseling/ harm reduction services ^{b,c}	0.58	(0.11, 3.07)	0.521

Note: AOR =Adjusted Odds Ratio; 95% CI = 95% Confidence Interval; IDU = Injection Drug Use; HIV = Human Immunodeficiency Virus; HCV = Hepatitis C Virus; HBV = Hepatitis B Virus; PTSD = Post-traumatic stress disorder

^a denotes activities in the past month;

^b denotes activities in the past 6 months;

^c denotes for use of alcohol or any drug, not including cigarettes

6. Discussion

The results of this study confirm that among homeless mentally ill adults, IDU is associated with a number of distinguishing characteristics. In addition, after controlling for covariates, the results showed that IDU was associated with a number of important determinants of physical and mental health among IDUs. Finally, the results indicate that IDU was associated with the increased use of health and social services, but only among men.

This study is among the first to examine the prevalence and health correlates of IDU among homeless women and men with mental illness. Findings reveal a significantly higher prevalence of active IDU among homeless women with mental illness compared to homeless men in Vancouver. The overall prevalence of IDU was 17.7% at enrolment in the study, with 24.8% of women reporting injecting drugs in the past month compared to 15.1% of men. This represents a departure from previous research, which observed a lifetime prevalence of IDU among homeless women with mental illness to be much lower (6-8%) than that of homeless men (16-26%) (Susser et al., 1997). A number of factors could explain variation between samples, including drug availability, drug use norms, the availability of services and supports, and secular trends.

Overall, there were elevated rates of chronic homelessness, substance dependence and drug use patterns among IDU participants with few observed gender differences (see Tables 1-7). IDU participants became homeless for the first time at younger ages than non-IDU (median age 27 women, 23 men), and approximately half were homeless for more than 5 years over their lifetime. Approximately 94% of all IDUs were substance dependent upon enrolment in the study. Over 90% of IDUs were polysubstance users, although a greater proportion of IDU women were daily illicit drug users (57.6% women, 43.4% men). The median age of first drunk and first drug use was the same for both women and men IDUs (age 12 and 13, respectively). The most common drugs used among the population were heroin, crack-cocaine and cocaine, as

well as cannabis among IDU men. IDU women reported double the number of days (median) with a drug problem in the past month in comparison to IDU men (30 days and 15 days, respectively). That is, among IDU women, drug related problems are experienced on a continuous, daily basis. Approximately two-thirds of participants had used Emergency Room services in the previous six months, and a greater proportion of IDU women reported needing healthcare but had not received it in the past six months (54.5% IDU women, 44.2% IDU men). There was high involvement in justice services overall, but particularly among IDU men. Over half of IDU participants had past head injuries (59.4% women, 80.8% men). These characteristics reflect the transient and chaotic lifestyle patterns of this IDU population. In addition, women were more likely to be involved in sex work in the past month, 34.5% of IDU women in contrast to none of the IDU men. Further, approximately one-third of IDU women were of Aboriginal ancestry which is consistent with previous research identifying a large presence of female Aboriginal IDU in Vancouver's DTES, particularly as Aboriginal people represent only 4-5% of the BC population (Shannon, Bright, Duddy, & Tyndall, 2005).

Several important findings result from this study. In separate multivariable analyses by gender (Tables 8 and 9), and after adjusting for homeless severity, findings revealed a greater likelihood of infectious disease, i.e., HIV, hepatitis C (HCV) and hepatitis B (HBV), among IDU women and IDU men. Further, IDU men were more likely to have less severe mental illness, i.e., major depression, PTSD, panic disorder, and also be more likely to have received treatment, counseling or harm reduction services in the previous six months. In contrast, and of particular concern, IDU women were less likely to have seen a psychiatrist in the past month.

As expected, IDU was strongly and positively associated with blood-borne infectious diseases among both female and male IDU participants. IDU is a well-established risk factor for the transmission of infectious disease, as evidenced by the dramatic increase in HIV incidence in the DTES related to high frequency crack-cocaine IV drug use in the late 1990s (Spittal et al., 2002). However, the magnitude of the association between IDU and infectious disease in this analysis was much greater among women (AOR = 24.87, CI: 6.26-98.81) compared to men (AOR = 9.07, CI: 4.33-19.01). This is consistent with current evidence which suggests that women who use illicit drugs are at greater risk for HIV exposure and infection (Spittal et al., 2002; Hoda et

al., 2008). As such, this finding may be an important indication that IDU women in this population are participating in high-risk injecting behaviours and drug-related practices that lead to increased HIV transmission, such as needing help injecting and jugular injecting (Spittal et al., 2002; Hoda et al., 2008). Injection drug use is also a well-known risk factor for HCV infection. Studies indicate that HCV acquisition soon follows initiation into injection drug use, often within 2 years (Hagan, Des Jarlais, Stern Lelutiu-Weinberger, Scheinmann, Strauss et al., 2007; Miller, Johnston, Spittal, Li, Laliberte, Montaner, & Schechter, 2009). This is substantiated by the significantly higher prevalence of HCV observed among both female and male IDU participants, (81.3% and 80.9%, respectively, $p < 0.001$), in comparison to non-IDU participants in the present study.

Gender-specific multivariable modeling showed that IDU men were observed to be more likely to have less severe mental illness, i.e., major depression, PTSD, panic disorder in comparison to non-IDU men (Table 9). According to the literature, mood disorders have been found to be the most prevalent psychiatric disorder among IDU populations, particularly depression (Fischer et al., 2006). Homeless men are also documented to experience high rates of lifetime trauma, which is associated with PTSD and depression (Buhrich et al., 2008). The finding that IDU men are nearly twice as likely to have depression, PTSD or panic disorder is not unexpected, particularly as evidence suggests that IV drug use often accompany these disorders in contrast to more severe mental illness (Christensen et al., 2005; Fischer et al., 2006).

The multivariable model for males also showed that injection drug use was positively associated with having received treatment, counseling or harm reduction services in the previous six months. This finding was anticipated as a multitude of well-attended harm reduction and alternative services are concentrated in Vancouver's DTES which serve and support injection drug users. For example, fixed and mobile syringe exchange programs, peer-based education and support from other IV drug users (VANDU.org), and in particular InSite, the medically supervised safe injection site which connects drug users to basic health care services, addiction treatment and counseling.

In the corresponding multivariable model for women, the finding that IDU women were less likely to see a psychiatrist in the past month may have important implications

(Table 8). IDU women were 83% less likely than non-IDU women to see a psychiatrist, which may be an indication that this population of women are experiencing barriers to health care. Several factors may bear on this relationship. Studies indicate that women who have mental health problems and use illicit drugs face intense stigma and more social disapproval compared to men, which may impede access to services and interactions with health care providers (CHASE Report, 2005; Zilberman et al., 2004; Salmon, 2009). Women that use drugs have reported feeling disrespected by care givers, being refused health care by providers, and consequently resort to seeking care only in emergency situations (Salmon, 2009). Studies with drug using women in Vancouver's DTES highlight that negative health care experiences influence women's willingness to engage in future services, and in turn, can impact health outcomes (Salmon, 2009). Further, psychiatric care is increasingly difficult to access with wait times of up to several months (Goldner, Jones, & Fang, 2011). Additionally, IDU women may not actively seek care if they do not recognise their mental health needs (North & Smith, 1992). For illicit drug users who are homeless and with complex needs, treatment delays may result in lost opportunities for intervention (Goldner et al., 2011).

It is particularly worrisome that IDU women are disconnected from psychiatric care, considering IDU women's reports of near daily drug problems, and the high prevalence of head injuries among the sample – a marker of cognitive impairment. Homeless IDU women in this study are disproportionately burdened with major depression and PTSD, high rates of HIV and infectious disease, daily problematic drug use, and head injuries from assaults through the loss of consciousness. Taken together, these factors present a complex clinical profile that would most benefit from psychiatric attention.

An additional multivariable analysis examined whether the associations between IDU and mental health, health and service use were accounted for by sex work among women, in addition to homelessness severity (Table 10). The association of IDU with infectious disease and not seeing a psychiatrist persisted after adjustment, although less severe mental illness became positively associated with IDU women. In addition, controlling for sex work resulted in a non-significant but negative association between IDU women and treatment. Specifically, IDU women were 42% less likely to receive treatment, counseling or harm reduction services in the previous six months after

adjusting for sex work (AOR = 0.58, 95% CI: 0.11-3.07). Taken together, these findings suggest that IDU women are more likely to be HIV-positive, suffer from major depression and PTSD, and be less likely to obtain psychiatric care or other forms of treatment, counseling or harm reduction services. The association between IDU and less engagement with essential health care services among homeless women with mental illness is of immediate concern, given the evidence suggesting that illicit drug use and involvement in the sex trade are strong predictors of premature mortality among women in Vancouver (Spittal et al., 2007). Collectively, these findings highlight an observed health inequity across genders with implications for gender-specific health service planning and delivery.

In the supplemental female model, finding elevated rates of less severe mental illness among IDU women is consistent with previous research documenting the association of sexual violence with high rates of HIV among IDU women in Vancouver (Braitstein et al., 2003). Sexual violence among IDU women, particularly childhood sexual abuse, was strongly associated with mental illness (i.e., ever hospitalised for a mental disorder) and numerous high-risk HIV behaviours. The authors suggested that their findings link to an epidemic of PTSD that may be occurring among IDU women in Vancouver (Braitstein et al., 2003). The present research provides evidence to strengthen the authors' rationale by identifying elevated rates of major depression, PTSD and panic disorder among IDU women. IDU women in the present study were 3.8 times more likely to have less severe mental illness, i.e., major depression, PTSD and panic disorder (95% CI: 0.81-18.18). Further, a significantly higher prevalence of PTSD was found among IDU participants in comparison to non-IDUs (54.5% IDU vs. 34.3% non-IDU, $p = 0.040$).

These findings suggest that trauma-related treatment and prevention for IDU women should be prioritised as an important public health issue. Substance abuse and addiction commonly emerge from a history of complex traumatic stress, and can exacerbate existing mental illness (Nyamathi et al., 1998; Sacks et al., 2008). Considering the degree of PTSD and major depression among homeless injection drug users, there is a compelling argument for integrating the treatment of childhood sexual abuse and interpersonal trauma into existing services, particularly for women.

The finding that sex work attenuates the relationship between IDU and receiving treatment initially appears counterintuitive. Sex work is a highly marginalised, high-risk and illegal income-generating activity that is associated with multiple harms and vulnerabilities, e.g., IDU, violence, poverty, stigma, high-risk sexual and drug-related practices. It is documented that survival sex workers are less likely to access mainstream health services due to limited operating hours, the lack of gender-specific services, stigma and privacy and disclosure concerns (Shannon et al., 2007). However, among survival sex workers attending a drop-in centre that serves street-based sex workers in Vancouver's DTES, researchers found participants engaged with numerous health care services, harm reduction initiatives, and contact with frontline workers (Shannon et al., 2005). These findings suggest that low-threshold, gender-specific services are providing a safe point of contact and essential care to this vulnerable and marginalised group.

Structural and gendered power dynamics of a male-dominated street and drug culture may also be a contributing factor for the under-utilisation of services by IDU women. Street-entrenched women who inject drugs occupy a subordinate position in the street-based drug scene and face daily threats of violence, intimidation and exploitation for drugs and money (Fairbairn et al., 2008). Further, there is currently an absence of gender-specific health care and harm reduction services available to IDU women in Vancouver, despite the well-documented drug-related risks and harms associated with IV drug use (Shannon et al., 2007; Fairbairn et al., 2008). A supervised injection facility (InSite) has been shown to play an important role in providing a refuge from threats of violence from 'street-predators' and intimates around drug consumption practices, as well as from confrontations with police among IDU women (Fairbairn et al., 2008). However, women who use drugs have expressed discomfort in co-ed settings and with treatment and service models geared towards men, and may be avoiding existing services. Not accessing care is worrisome as the data suggest that IDU women face gross power imbalances in the street-based drug culture and have less control over high-risk injecting and drug-related practices (Fairbairn et al., 2008; Hoda et al., 2008).

6.1. Limitations

The present study has several important limitations that should be considered. The study was cross-sectional in nature which limits the ability to infer causality of the relationships observed. This study also relied on self-report data and participants' responses may be subject to social desirability bias, particularly data on sensitive topics related to illicit drug use, injecting, and sex work. Therefore, some sensitive behaviours and experiences may be underestimated. However, previous literature has provided validation of self-reported information among similar populations (Weatherby, Needle, Cesari, Booth, McCoy, Watters et al., 1994; Strathdee, Patrick, Currie, Cornelisse, Rekart, & Montaner, 1997). In addition, given that the sample was selected based on current mental illness, the impact of psychiatric symptoms may have compromised accuracy of recall. The findings of the study should also be interpreted with caution due to the small cell sizes in sub-group analyses and the marginal significance level of some findings. In addition, the analysis does not include a measure of early childhood trauma, violence or abuse, factors that are highly correlated with chronic homelessness, injection drug use and sex work involvement. Finally, findings may not generalise well to other homeless mentally ill populations given differences across settings, including types of drugs used in different urban environments, available services, and private versus public health care systems.

Despite its limitations, this research contributes new knowledge to a growing literature on illicit drug use. The use of a relatively large sample from a Canadian population-based study of homeless adults with mental illness, not selected for substance use, allows this study to estimate a prevalence of active IDU among this population and contribute new knowledge of illicit drug use in an urban Canadian context. The study was also able to control for homelessness severity among the whole sample, and additionally sex work among females, to determine independent associations with IDU. Finally, this study was able to examine IDU among and between women and men, which is particularly important as in-depth gender-based analyses have been absent in the existing literature to date.

6.2. Future Research

The results of this study point to several areas for further research. First, studies with larger representative sample sizes could provide opportunities to replicate the present findings. Second, this study showed that IDU was associated with a number of important determinants of physical and mental health among IDUs, but did not examine individual risk behaviours. Future studies could examine the individual risk and protective behaviours, (e.g., injection practices, social networks), of IDU among the homeless mentally ill, by gender, to better understand the mechanisms associated with these health outcomes. Thirdly, this study showed that IDU women were less engaged with essential health care services. Future research could identify and further examine barriers to care among this population. Finally, the efficacy of existing harm reduction initiatives among substance using women is currently unclear. Future studies could inventory and evaluate existing harm reduction services from a gender perspective to determine gaps in services and inform the development of effective low-threshold services specific to women.

In addition, the links between early childhood trauma and interpersonal violence are factors known to impact homeless populations, particularly women. These factors should be included in future studies to examine associations with homelessness, mental illness and substance use, while considering other important related factors (e.g., sex work), among this population. These associations could be explored longitudinally to examine the impact on housing stability and health-related outcomes.

6.3. Conclusion

This study contributes important new knowledge to understand health-related consequences of injection drug use among homeless mentally ill adults, and may be the first study to examine gender-specific effects. Results indicate the possibility of important gender-related differences with important implications for health, safety and the development of health and social responses.

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