THE RELATIONSHIP BETWEEN SUBSTANCE USE AND HOUSING INSTABILITY

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RELATIONSHIP BETWEEN SUBSTANCE USE AND HOUSING STABILITY

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ABSTRACT

The relationship between substance use and housing instability is an understudied research area (Hudson & Nandy, 2012). This study aims to explore the relationship between substance use and the housing experiences of adults, using cross-sectional data from the Alberta Drug Use and Health Survey (n = 531). In Canada, patterns of illicit drug use are constantly changing, and the current opioid crisis invokes a need to re-examine the health behaviours and public health implications of individuals who use drugs (Zuckermann et al., 2020). Study findings provide insights into the nature of substance use and housing instability in this population and may elucidate potential interventions to reduce homeless rates in this group.

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LIST OF ABBREVIATIONS

ADUHS	Alberta Drug Use and Health Survey
EDUHS	Edmonton Drug Use and Health Survey
HIV	Human Immunodeficiency Virus
GHB	Gamma-hydroxybutyrate
HCV	Hepatitis C Virus
METH	Methamphetamine
RCT	Randomized Controlled Trial
RDS	Respondent Driven Sampling
PCP	Phencyclidine
USD	United States Dollars

CHAPTER 1: INTRODUCTION

The relationship between substance use and housing instability amongst adolescents and adults is an underreported phenomenon (Pasman et al., 2020). The public health implications of homelessness are significant and include interactions that exacerbate health problems, substance abuse, HIV risk, social problems, and mental health symptoms (Curtis et al., 2013). According to Polcin (2016) the mortality rate of Canada's homeless population is three times higher than housed populations. Furthermore, substance use and drug dependence among homeless groups are substantially higher than the general population's overall global prevalence rates (Degenhardt et al., 2016).

Divergent perspectives exist on homelessness and substance use. Some authors suggest that substance use precedes homeless (Thompson Jr et al., 2013; Tompsett et al., 2013), while others indicate that homelessness precedes substance use (Doran et al., 2018; Dunne et al., 2015). Others argue that both occur in tandem (McVicar et al., 2015). As a result, it is crucial to explore the nature of the relationship between homelessness and substance use, and if the findings are significant, to discover the magnitude and direction of this relationship. These vital questions are important to policymakers and service providers who design and deliver housing interventions for people using substances.

The current opioid crisis invokes a need to re-examine the public health implications and health behaviours of people who use substances (Butler et al., 2017). Scholarly literature insufficiently explores the relationship, frequency, and outcomes of substance use and its effects on the housing outcomes of Canadians (Collins & Curtis, 2011). In response to increasing opioid use (and resultant overdoses) in Alberta, Alberta Health tasked seven harm reduction agencies in Alberta with conducting a needs assessment of individuals who use drugs. The findings, titled

the *Edmonton Drug Use and Health Survey* (EDUHS) (Hyshka et al., 2016), were released in December 2016 and implemented in Alberta's capital city, Edmonton. Subsequently, Alberta Health sought to expand the scope of the study, so collaborated with the authors of EDUHS (Hyshka et al. 2016) to adapt it for use across Alberta in order to more broadly determine the needs of Albertans who engage in substance use. The resultant study was titled the *Alberta Drug Use and Health Survey* As a result, harm reduction agencies in four additional cities within Alberta opted to work with Dr. Em Pijl to operationalize this dictate from Alberta Health.

In this study I conducted a secondary analysis of the data from the four Alberta cities studied by Dr. Pijl (Edson, Fort McMurray, Grande Prairie, and Lethbridge) using the 2016 EDUHS model to examine substance use and housing experiences among individuals engaging in substance use in Alberta aged 15 years and older. The purpose of this study was to determine the trends and relationships between substance use and housing by analyzing findings from the 2016 ADUHS. The four cities studied represented different geographic sectors within Alberta. Several key variables from the survey were used to examine trends in substance use, polysubstance use, and housing experiences.

CHAPTER 2: LITERATURE REVIEW

A comprehensive database search on PubMed, PSychINFO Medline, EMBASE, and Cochrane Central Register of Controlled Trials generated several categorical themes related to substance use and the housing outcomes of adults. The themes discussed in this section include the intersection of housing and substance use, housing models for adults with substance use disorders, substance use patterns and health-related risks among homeless adults, substance use interventions, and substance use and housing within the Canadian context.

The Intersection of Housing and Substance Use

In a study exploring substance use among homeless and housed adults, Kirst et al. (2009) found that homeless adults engaged in earlier and heavier polysubstance use compared to adults who were housed. In addition, several studies explored health-related outcomes of specific combinations of polysubstance use in this population (Johnson & Chamberlain, 2008; McVicar et al., 2015; Tompsett et al., 2013). These studies revealed that irrespective of the combination of multiple substance use, individuals engaging in polysubstance use experienced more extended periods of homelessness as well as poorer concurrent medical health, mental health, and substance use outcomes than respondents engaged in single substance use.

Significantly higher rates of homelessness exist among adolescents and adults who use multiple substances compared with peers who use no substances (Winkleby et al., 1992). Several researchers extend this knowledge by exploring which comes first: substance use or homelessness. The literature commonly agrees that substance use and homelessness are linked, but it argues about which direction the relationship exists. For example, some authors indicate homelessness increases the risk of substance use and substance dependence (Stein et al., 2002; Tyler, 2006), while others indicate substance use precedes homelessness, as respondents

engaging in substance use report a higher prevalence of homelessness compared to respondents not engaged in illicit substance use (Thompson Jr et al., 2013; Winkleby et al., 1992).

A cohort study explored the prevalence of substance use among homeless adults (Greene et al. (1997)) and found that substance use increased the risk of homelessness. Similarly, in a retrospective case study investigating the pathways to homelessness, Mallett et al. (2005) found that most adults reported substance use only after becoming homeless; that is, they used substances to mitigate the stressful lifestyle of homelessness. In contrast, in a clinical study investigating the medical origins of homelessness, Johnson et al. (1997) suggested that most adults became homeless only after substance use had depleted their economic and social resources. Similarly, Johnson and Chamberlain (2008) found that adults with substance use dependency issues spent more prolonged periods homeless than individuals not using substances.

The literature also suggests that individuals engaging in polysubstance use experience more significant adverse outcomes than their peers who engage in single or no substance use (Connor et al., 2014). Polysubstance use has also been linked with higher rates of homelessness, unemployment, incarceration, and risky sexual behaviours. It is associated with poorer physical health, exacerbated and ongoing psychiatric symptoms, substance dependency, damage to socioeconomic standing, infectious diseases, overdoses, victimization, and long-term health consequences (Bhalla et al., 2017; Connor et al., 2014).

According to Ferguson et al. (2011) the most vulnerable group amongst polysubstance users are homeless, street-involved individuals. The transition out of homelessness can be incredibly challenging, and the biological, intellectual, and psychosocial implications of polysubstance use significantly increase the risk of homelessness (Kidd et al., 2016). In a clinical epidemiological study exploring single- versus poly-substance use, Bhalla et al. (2017) found it

difficult to pharmacologically and effectively treat polysubstance use disorders because treating one drug (i.e. heroin) could lead to adverse health effects from another substance (i.e. alcohol). International studies comparing substance use among high-income countries reported a higher prevalence and frequency of alcohol and marijuana use among Canadian adults than in other high-income countries (Galvan et al., 2007). Growing evidence also suggests substance use, polysubstance use, and homelessness have been steadily increasing in many countries over the past decade (Patra et al., 2009).

Housing Models for Adults Engaging in Substance Use

Housing models for adults engaging in substance use commonly revolve around the use of abstinence-based housing and supportive housing models (Collins et al., 2012). Abstinence-based housing programs typically require clients to completely abstain from substance use for the duration of their tenancy (Budney et al., 2006). Several studies indicate that abstinence-based housing models improved the housing outcomes of adults who previously engaged in substance use. In a 24-month randomized controlled trial (RCT) focusing on the effectiveness of housing interventions for adults diagnosed with substance abuse disorders, Jason et al. (2006) found that individuals assigned to abstinence contingent housing documented significantly lower rates of substance use (31.3% vs. 64.8%), significantly higher monthly incomes ($989 vs. $440 USD), and lower incarceration rates (3% vs. 9%) than adults assigned to a community care intervention. Slesnick and Erdem (2013) examined the efficacy of abstinence-based housing models among 60 homeless mothers with substance use disorders and found that mothers assigned to abstinence-based housing models exhibited a more significant decrease in alcohol use and housing instability compared with non-abstinence-based housing models.

On the other hand, supportive housing models provide housing interventions to people

engaging in substance use without making sobriety or treatment a requirement (Rog et al., 2014). For example, in Lethbridge, supportive housing models that do not make abstinence a condition for tenancy include the Pathways to Housing and Housing First programs (Belanger & Petryshyn, 2007). In a 48-month longitudinal study exploring the effectiveness of the Pathways to Housing program among adults engaging in mono-substance and polysubstance use, Padgett et al. (2006) found that respondents randomly assigned to the Pathways to Housing model reported a 66% decrease in days spent homeless and demonstrated less need for substance abuse treatment than the abstinent contingent housing group. Meanwhile, in a randomized control study, Stergiopoulos et al. (2015) examined the effectiveness of Housing First models among 378 street-involved adults with substance use disorders in Toronto and found that at 24 months post-intervention, Housing First respondents reported more time spent in a stable residence (75.1%) than adults randomly assigned to the treatment as usual group (39.3%).

Furthermore, Tsemberis and Eisenberg (2000) reported that only a small proportion of adults engaging in substance use and living on the street or at emergency shelters engaged with service providers, ultimately resulting in unmet needs. Rush (2010) found that housing programs were more effective when matching clients' housing needs with their degrees of psychiatric and substance use disorders. In a meta-analysis exploring the effectiveness of housing retention among homeless adults of recovery-based housing such as the Housing First and Pathways to Housing models, Johnsen and Teixeira (2010) found no difference between the models. All three types of housing intervention – requiring abstinence, not requiring abstinence, and matching housing to drug disorders – promoted housing accessibility among adults at risk or experiencing homelessness.

Substance Use Patterns and Health-Related Risks Among Homeless Adults

Several studies have reported a positive correlation between mono- and polysubstance use of adults and poor mental health, victimization, housing instability, poor social networks, and criminalization (Akbar et al., 2011; Booth et al., 2002; Connor et al., 2014; Patra et al., 2009). These studies discovered that substance use patterns among homeless adults were highly influenced by genetic predispositions as well as social and environmental determinants linked to drug use (i.e., availability to the substances or drug dealers).

In a longitudinal cohort study, Fergusson et al. (2006) reported that alcohol and cannabis use significantly increased the risk of engaging in other illicit polysubstance use in adults. In extension, Tzilos et al. (2009) studied the illicit use of opioids among street-involved people in Toronto and found that about 80% of adolescents and adults reported using heroin (or other opioids) in combination with other substances. Despite the disagreement regarding which single substance precedes polysubstance use (i.e., the "gateway drug"), the use of illicit substances such as cocaine, crack, opiates, and amphetamines is significantly greater among homeless adolescents and adults than those who are housed (Johnson et al., 2005).

Substance use and homelessness notably impact the short- and long-term health of adults worldwide (Moss et al., 2014). Individuals engaging in substance and polysubstance drug use experienced an increased risk of unemployment, lower educational attainment, more significant physical health problems, dysfunctional social relationships, suicidal tendencies, lower annual income, mental illness, higher involvement with the criminal justice system, lower life expectancies, and more acute medical complications in medical settings (Cerdá et al., 2018; Patrick et al., 2012; Traube et al., 2016).

In Canada, government policies have changed over the decades to address the issue of

homelessness, swinging from investing heavily in adequate housing for Canadians during the 1960s and 1970s to eliminating the national housing program in the 1980s by gradually reducing spending on affordable and social housing. In the 1990s, the federal government stopped constructing new social housing, and the responsibility for funding and building social housing was transferred to provincial governments. In the early 2000s, the Government of Canada launched a national homelessness initiative, which has been modified into a fusion policy over the past ten years. Fusion policies emphasize preventative factors contributing to homelessness, in Canada's case, during the previous decade (Gaetz, 2010). This type of policy can address problems arising across of variety of sectors to create a social challenge (Oudshoorn, 2020). For example, policies from various sectors such as the justice system, the health system, the income support system, and the housing system can all contribute to factors leading to homelessness. However, fusion policies can create gaps that increase rather than resolve homelessness.

Numerous studies have reported that specific combinations of substance use have different impacts on adolescent and adult health and housing outcomes. In a Latent Class Analysis, Monga et al. (2007) found that adults using non-injection heroin and crack reported the highest level of homelessness, while the highest levels of depression and poor physical health were observed among individuals concurrently using prescription opioids and benzodiazepine. In a cohort study, Fischer et al. (2005) investigated the key characteristics of adults engaging in crack and other illicit polysubstance use in a Canadian setting. They found that adolescents and adults who concurrently used opioids with cocaine or crack experienced significantly higher physical and mental health problems, a lack of permanent housing, and a higher involvement with crime than adults engaged in non-illicit opioid use.

Snow and Anderson (1993) studied the health outcomes of homeless street-involved

adults and found that the length of homelessness significantly influenced the risk of substance abuse and substance dependency in that group. Similarly, van Doorn (2005) found that adults with more days spent in homelessness remained homeless for longer periods and reported adapting to homelessness as a way of life. Grigsby et al. (1990) hypothesized that establishing social networks with other homeless individuals significantly initiated polysubstance dependence and substance use dependency among adults. In a longitudinal study investigating homelessness among adults, Toro et al. (1999) found that economic and social factors interacted with specific situations to influence adults to engage in polysubstance use and develop a dependency.

Betts et al. (2015) investigated whether specific combinations of substance use could explain the increased risk of non-fatal overdoses among injection users and found that adults who combined other substances with heroin, oxycodone, or methamphetamine ("meth") reported more non-fatal overdoses than other polysubstance use combinations. While there are distinct differences in the scholarly literature about the relationship between mono- and polysubstance use patterns and the health outcomes of adults, researchers agree that there has been a steady increase in single- and polysubstance use among homeless adolescents and adults (Gomez et al., 2010).

Conclusively, individuals engaging in single and polysubstance use experience direct and indirect health-related issues (Connor et al., 2014). The direct health effects of substance use are described as overdoses, hospitalizations, the transmission of infectious diseases such as HIV and hepatitis C, and premature death (Bhalla et al., 2017). Substance use can lead to other types of physical harm, including crime-related harm. In a study examining the social exclusion and criminal victimization of homeless adults, Gaetz (2004) found that within the preceding year, 92% of males and 77% of females who were homeless reported at least one incident where they

were the victim of a crime compared to the national rate of 40% adults. The indirect health effects of substance use are described as high-risk behaviour, criminalization to acquire payment for substances, chronic health issues and drug intoxication leading to unwanted sexual activity (Eiden et al., 2014). In short, substance use negatively impacts the health of those who use them.

Types of Interventions for Homeless Individuals Engaging in Substance Use

Interventions available to individuals engaging in single and concurrent drug use are typically clinically or socially driven (Waldron et al., 2007). Socially based substance use interventions commonly include case management, motivational interviewing, and family-based interventions (Griffin & Botvin, 2010). Clinically based interventions typically utilize pharmacological methods to mitigate the harmful consequences of polysubstance use and reduce the frequency of polysubstance use (Collins, 2019).

Souza et al. (2011) conducted an RCT to explore the relative efficacy of case management to reduce substance use among 400 homeless and street-involved adults. They found that case management resulted in lower rates of substance use at one- and two years post-intervention follow-ups as well as more significant improvements in internalizing behaviour than the control group not receiving case management. Through a quasi-experimental study, Clark and Rich (2003) compared substance use interventions and housing rates among two groups of homeless adults with severe mental health disorders. They found that those with more severe mental health impairments exhibited better housing outcomes under a housing with case management intervention than those receiving only a case management intervention.

Slesnick et al. (2015) compared the efficacy of family-based interventions and usual shelter services among homeless adults and found that at 15 months follow up, adults assigned to the family-based intervention group reported a more significant decrease in overall substance use

compared to the group receiving only normal shelter services. Barnett et al. (2012) studied the effectiveness of motivational interviewing among 285 adults engaging in polysubstance use and found that individuals assigned to the motivational interviewing group reported higher abstinence rates and reduced substance use when compared to the control group at the one month and three months post-intervention points.

Meanwhile, Suh et al. (2006) studied the effectiveness of treatment supports for homeless adults with alcohol, opioid, or cocaine dependency. They found that opioid agonist therapies provided the most favourable results for reducing concurrent opioid and cocaine use. However, in an RCT exploring the effectiveness of pharmacological interventions for substance misuse among adults, Haney et al. (2006) found that Disulfiram™, Baclofen™ and Tiagabine® provided the most favourable treatment results for homeless individuals with an alcohol and cocaine dependency. Morley et al. (2006) studied the efficacy of acamprosate and naltrexone therapy among homeless adults experiencing alcohol dependency and found that acamprosate significantly increased abstinence rates from alcohol while naltrexone significantly reduced the short-term relapse rates of alcohol-related problems. Although other interventions reduce substance use and dependence among adults, Slesnick et al. (2015) found that a community reinforcement approach, motivational enhancement therapy, and case management interventions significantly reduced substance use and homelessness among adults, and no one intervention was more superior than the others.

Substance Use and Housing in the Canadian Context

There is a need for a greater understanding of substance and polysubstance use in adults with housing challenges. Most Canadian data surveying substance use among individuals who use drugs focuses on tobacco, alcohol, and marijuana use (Griffin & Botvin, 2010). Furthermore,

housing interventions were shown to be ineffective for individuals engaging in polysubstance use because policy interventions target individuals engaging in non and single substance use (Kirst et al., 2014) and because homelessness and precarious housing are inherently unstable factors. All levels of government are more concerned about the combination of homelessness, opioid overdoses, and the public health implications of legalized cannabis on substance and polysubstance use among adults (Chang et al., 2018). Prevention strategies addressing problematic substance use among individuals who use drugs have documented a $15-18 savings on every dollar spent (Beardslee et al., 2011).

The legalization of cannabis in Canada and its impacts on the housing experinces of adults has been unexplored. Compared to earlier studies, the rates of cannabis use among Canadian adults are rapidly increasing, and Canadians between the ages of 25 to 34 consume the highest amount of cannabis within Canada (Bertram et al., 2020). Furthermore, homeless adults are more likely to engage in harmful marijuana use than other population groups in Canada (McKiernan & Fleming, 2017). Consequently, it is crucial to explore the concurrent use of cannabis with other substances in adult populations as polysubstance use leads to negative and unpredictable physical and psychological health consequences (Briere et al., 2011).

Several provincial and federal directives have been implemented in Canada to eliminate homelessness among adults experiencing substance use disorders. In 2008, the Canadian government initiated a $110 Million At Home/Chez Soi RCT in Vancouver, Winnipeg, Toronto, Montreal, and Moncton to help chronically homeless adults engaging in concurrent substance use to maintain stable housing (Macnaughton et al., 2013). This five-year demonstration project followed over 2,200 homeless individuals to determine the most appropriate services for individuals experiencing mental health disorders, substance use dependence disorders, and

homelessness. This project was the first trial to include a standardized definition of Housing First and to use a fidelity assessment over the first two years (Goering et al., 2011). According to O'Campo et al. (2016) in the At Home/Chez Soi trial, Housing First clients experienced significantly better outcomes on measures of housing stability, quality of life, and community functionality than individuals receiving treatment as usual.

Four years later, in 2012, the Government of Canada initiated a $40 Billion 10-year plan, titled *Reaching Home: Canada's Homelessness Strategy*, to provide a community-based intervention that would address the needs of individuals experiencing or at risk of homelessness (Gaetz et al., 2014). The National Housing Strategy was intended to support at-risk and vulnerable groups with concurrent and substance use disorders to maintain safe, stable, and affordable housing. Two years later, the Reaching Home Policy aimed to reduce national rates of chronic homelessness by 50% by the 2027-2028 fiscal year (Gaetz, 2014).

Significance

The rates of polysubstance use are higher among homeless adult minority groups than their non-minority peers (Ramo et al., 2012). In addition, there is a complex relationship between substance use and the physical, mental, legal, educational, and social consequences of adults engaged in it (Russell et al., 2015). Recently, the relationship between substance use and housing has attracted public health agencies, politicians, legislators, and the media, due to its medical, legal, social, and economic impacts (Trenz et al., 2012). In a social climate of increasing drug-related morbidity and mortality, combined with heightened housing precarity, certainly, the time to act is now.

Despite the various theoretical assumptions and approaches to substance use and some level of government commitment to addressing the issue, little is known about the relationship

between single-substance or polysubstance use and the housing experiences of adults. Furthermore, there is contrasting evidence about the effectiveness of clinically and socially orientated interventions in reducing the frequency of single- and poly-substance use among adults. Since numerous interventions are being implemented across Canada to reduce substance use among adults, it is vital to explore the impacts of these trends on housing instability.

This gap in knowledge warrants further exploration regarding how members of this demographic perceive the role of substance use in their housing experiences and ascertain whether specific combinations or frequencies of substances influence their housing experiences. Understanding the relationship between substance use and housing experience can inform researchers and clinicians of the factors that adults perceive as influencing their substance use and housing challenges.

CHAPTER 3: RESEARCH METHODS

Study Design

This study analyzed data from the 2016 Alberta Drug Use and Health Survey conducted in four Alberta communities: Edson, Fort McMurray, Grande Prairie, and Lethbridge. The survey was derived from the EDUHS and the Perceived Need for Care Questionnaire (Hyshka, 2016; Hyshka et al., 2016; Meadows & Burgess, 2009; Meadows et al., 2000). These surveys were developed to determine the health and service needs of individuals who use drugs in Alberta. In collaboration with Hyshka et al. (2016), the Alberta Community Council on HIV, along with the seven harm reduction agencies in Alberta, the form of the final survey was digitized and disseminated by Drs. Em Pijl and Cheryl Currie of the University of Lethbridge. The study was approved by the Health Research Ethics Board at the University of Alberta and funded by Alberta Health, Chief Medical Officer of Health's Office. Local harm reduction agencies provided administrative and operational approvals.

Respondents

The target population for the ADUHS survey was people who use drugs: those who were living with severe and chronic addictions, who were often homeless, whose drug use was chaotic, and who may or may not have been connected to mainstream health services (Hyshka et al., 2016). Respondents had to be aged 15 years or older, regularly use illegal drugs, and provide informed consent to participate in the survey. The decision to include respondents younger than 18 was based on provincial criteria and in collaboration with other survey sites. Individuals were excluded from the study if they were incarcerated, severely intoxicated, unable to consent, or had not used illicit substances (or had not abused prescription drugs) during the preceding six months. Also precluded from the survey were those who did not speak English (a

translator was not available).

Sample Size

In a secondary analysis, a sample size calculation is not required (Vartanian, 2010). In the original data collection, a sample size calculation for prevalence in respondent-driven sampling was conducted in each participating Alberta community to determine the minimum number of respondents required for the survey within each locale. A total of 531 respondents meeting the inclusion criteria completed this survey.

Recruitment

The data collection utilized respondent-driven sampling (RDS), a peer chain-recruitment method to sample hard-to-reach populations, including substance users for whom there are no reliable sampling frames (Salganik & Heckathorn, 2004). RDS combines snowball sampling with a mathematical model that weights the sample to compensate for the fact that the sample was collected in a non-uniform random way. In essence, respondents recruit their peers, as in network-based samples, and researchers keep track of who recruited whom as well as their numbers of social contacts. A mathematical model of the recruitment process then weights the sample to compensate for non-random recruitment patterns (Heckathorn, 2011). Individuals who engage in illicit substance use are well-suited for RDS methodology because their livelihoods depend on social networks to access drugs, garner income, and achieve safety (Kral et al., 2010), and because they are a largely hidden population that prefers concealment due to the illegal nature of substance use. In addition, through peer-to-peer recruitment of respondents, RDS fosters trust and promotes participation within a population who are challenging to access (Salganik & Heckathorn, 2004).

Research Questions

Three research questions guided the selection of variables of interest. The purpose of this study, therefore, was to answer the following questions:

1. Does the sleeping location of respondents during the six months preceding data collection influence their substance use?
2. Is the housing stability of respondents correlated to higher or lower substance use?
3. What is the relationship between polysubstance use and housing stability among respondents? How does this relationship compare to that of alcohol as well as to non-injection and injection drugs?

Variables of Interest

In this secondary analysis, the variables selected for analyses are displayed in the Appendix. They included all classes of substance use (e.g., opioid and non-opioid), all routes of administration (e.g., injection or non-injection), and all housing variables. The data collected focused on the prevalence of respondents' substance use for the six months preceding data collection.

Specific drugs considered for analysis were grouped as follows: 1) hallucinogens and inhalants, including glue, PCP/angel dust, LSD, gasoline, paint, ketamine (special K), mescaline, mushrooms and nitrous oxide; 2) opioids, including heroin, fentanyl, Percocet, carfentanil, hydrocodone, Demerol, goofball, codeine formulations, hydromorphone, morphine, oxycodone, OxyNEO, and speedballs; 3) stimulants, including cocaine, crack cocaine, ecstasy, non-prescribed methadone, Ritalin, Talwin, and crystal meth; 4) depressants, including GHB, barbiturates, poppers, tranquillizers, sedatives, and Wellbutrin; and 5) other drugs, such as marijuana/hash and cigarettes.

The first specific housing indicator considered for analysis was the places where the respondent had slept during the preceding six months. Responses could include any of the following: own apartment/house, hotel/furnished room/boarding house, transition housing, shelter/hostel, friend's place, with a family member, camps (squatting), working out of town (rigs, work camp), reserve or settlement, couch surfing, detox, jail/prison, hospital, street (sleeping rough), and no sleep (i.e., walking all night). The respondents also self-reported housing stability as very unstable, a little unstable, neither unstable nor stable, a little stable, or very stable. Non-drug use variables selected for analysis included age, gender, ethnicity, and city.

Data Collection

Trained research assistants collected data through interview-led surveys at the identified harm reduction agencies in Lethbridge, Fort McMurray, Edson, and Grande Prairie during the previous six months of 2016. Data were collected on tablets using Qualtrics® Research Suite (Qualtrics, 2020) and then downloaded to Statistical Package for the Social Sciences (IBM Corporation, 2017) for analysis. The ADUHS is a structured survey instrument encompassing five sections:

1. Sociodemographic information;
2. Substance use patterns, associated risk behaviours, and experiences of harm;
3. Respondents' health service utilization and unmet health care needs;
4. Acceptability of potential new interventions; and
5. Questions about network sizes (a requirement of RDS).

Data Analysis

The original investigators provided a quantitative codebook and coding schemes that

explained the variable definitions, contexts, and relationships. Having a pre-existing research paradigm enabled me, the secondary researcher, to quickly comprehend and conceptualize the data to match those of the primary researchers (Ruggiano & Perry, 2019). There was sufficient information about the variables of interest (polysubstance use and housing) to conduct a thorough quantitative data analysis. The data analysis was managed with IBM's SPSS Version 26.0 (IBM Corporation, 2017). The data was categorized as nominal and ordinal, with some scale measures. Several statistical tests were available for data analysis, contingent on the distribution of data and purpose of the analysis. These are described below. Descriptive statistics for measures of central tendency (measures of location) or measures of variability (measures of dispersion or spread) were used to quantify demographic frequencies (response rate, distribution, range, and an indication of whether statistical assumptions were met).

Expected and observed levels from the Likert data were compared using the Chi-Squared (χ^2) test. These tests were used to determine whether independent groups were significantly different from the population, (i.e.) to examine whether the usage of a particular drug differed significantly across cities. Logistic regression was utilized to determine which combination of variables maximally separated two or more groups (such as what differentiated those who use one drug versus another) and to predict the probability of group membership for new cases. Statistical analyses were conducted as dictated by the nature and distribution of the data to determine the significance and magnitude of differences in demographics, substance use patterns, and housing challenges.

Ethical Considerations

These data were anonymous and did not contain respondents' personal health or identifying information. As the data had already been collected, a new ethics application was not

required prior to further analysis. According to Ruggiano and Perry (2019), the secondary analysis of data is an ethical practice as it minimizes the burden on respondents, maximizes the value of any public investment in data collection, ensures replicability of study findings, and can lead to greater transparency and integrity of research work.

The guidelines of the *Tri-Council Policy Statement: Ethical Conduct for Research Involving Humans* (Canadian Institutes of Health Research et al., 2014) were followed to ensure the secondary analysis of data was conducted in a manner that respected and recognized human dignity, rights, and welfare. Individuals who are homeless are marginalized and vulnerable and, thus, commonly experience racism, sexism, homophobia, stigma, and discrimination (Norman & Pauly, 2013). Therefore, the primary researchers took all reasonable precautions to minimize the risk of harm, to avoid contributing to the marginalization and social exclusion of people using drugs or experiencing homelessness (Cloke et al., 2000). Furthermore, the researcher attempted to be conscious of issues related to diversity and its impact on homelessness as some groups are overrepresented among homeless individuals (i.e., Aboriginal First Nation and Métis individuals, LGTBQ+ respondents, and people with disabilities) (MacKenzie & Chamberlain, 2008). In addition, by constantly reviewing research information, the researcher was able to commit to a relational ethic perspective that views economically and socially disadvantaged individuals as experts on their own lived realities (Fisher, 2006). According to Wilson and Neville (2009), this approach is consistent with research studies involving at-risk ethnic and marginalized minority populations.

To protect respondents' anonymity, personal identifiers were not collected in the original data collection. Univariate outliers were neutralized; multivariate outliers were identified and excluded from analysis if they lay outside of the 99.9% confidence interval to avoid potentially

identifying respondents. All digital copies of the data were stored in an encrypted file on the researcher's computer. The data was safely discarded electronically after the analysis was completed, and the thesis was successfully defended.

CHAPTER 4: RESULTS

Demographics

Five hundred thirty-one (531) respondents in four Alberta cities – Edson, Fort McMurray, Grande Prairie, and Lethbridge – completed the Survey. Lethbridge respondents accounted for 39.9% of the sample, Grande Prairie 37.7%, Fort McMurray 11.9%, and Edson 10.5% (Table 1). In Lethbridge, Grande Prairie and Fort McMurray, most respondents (98.5%) reported living within city limits. More than half of the respondents in Grande Prairie (59.5%) and Fort McMurray (73.0%) reported spending most of their time in their respective city's downtown core, while less than half (43.5%) of the respondents in Lethbridge reported spending most of their time in the downtown core.

Table 1: Respondents' Location (City)

City:	N	%
Edson	56	10.5
Fort McMurray	63	11.9
Grand Prairie	200	37.7
Lethbridge	212	39.9
Total	531	100.0

Age

The age of respondents ranged from 15 to 75 years old, with a median range of 36-40 years old (Table 2). Over half the participants were male (60.6%) with a median age of 41-45, while female participants tended to be younger than male participants with a median age of 31-35 years.

Table 2: Respondents' Age

Age:	n	%
15-20	16	3.0
21-25	58	10.9
26-30	81	15.3
31-35	62	11.7
36-40	81	15.3
41-45	58	10.9
46-50	75	14.1
51-55	42	7.9
56-60	44	8.3
61-65	11	2.1
66-70	2	.4
71-75	1	.2
Total	531	100.0

Ethnicity

Over half (58.4%) of respondents self-identified as Indigenous (First Nations, Métis, or Inuit) (Table 3). Lethbridge had the highest percentage of respondents who self-identified as Indigenous (66.5%), followed by Grande Prairie (59.0%). Fort McMurray had the highest percentage of respondents who self-identified as Caucasian (54.0%), followed by Edson (50.0%).

Table 3: Respondents' Ethnicity

Ethnicity:	n	%
Caucasian	207	39.1
First Nations, Métis & Inuit	310	58.6
Chinese	2	0.2
Latin American	2	0.2
Middle Eastern	1	0.2
Black	6	1.1
Total	531	100.0

Housing

Sleeping location of respondents during the preceding six months

Respondents were asked to list the places they had slept during the six months preceding data collection (Table 4). Close to half of the respondents reported sleeping on the street (44.8%) or with family (41.4%). More than a quarter of respondents indicated they had slept in their own dwelling (32.0%) or a correctional institution (27.9%) at some point during the preceding six

months. Only a few respondents reported sleeping in an urban encampment (2.6%), couch surfing (3.8%) or in a transitional housing setting (3.6%) during the preceding six months.

For difference and associational statistical analyses, the respondents' sleeping locations were grouped into five new housing categories: permanent housing, corrections, institutional housing, homelessness, and temporary housing. These categories were not mutually exclusive as respondents experienced a range of accommodations over the preceding six months. In the new grouping, "permanent housing" included housing that was reliable and likely to remain available to them, i.e., rented accommodation, work camp accommodation, or, living in a home within a First Nation, Inuit, or Métis community. "Temporary housing" was defined as sleeping arrangements that were temporary by definition or in which the respondents were supernumerary to the household – couch surfing, sleeping at a friend's place, or staying with family. "Homelessness," in the new categorization, indicated the absolute lack of a fixed address: sleeping in a homeless shelter, living on the street, staying at an encampment, or walking around all night. (Staying in a homeless shelter was included in the "homeless," not temporary housing category despite the shelter itself representing a fixed address and housing guests for a temporary period. This decision was made because the homeless shelter, by definition, houses individuals who are currently homeless.) "Institutional" accommodation included sleeping in a detoxification center, a hospital, or transitional housing; these places are health care or social institutions. Finally, "correctional facility" remained its own category, instead of being subsumed under "institutional" accommodation, because inmates have limited control in the decision or duration of time spent in correctional settings.

Table 4: Sleeping Location of Respondents During the Preceding Six Months

New Category of Housing	Previous Category	N	%	New Category n
Permanent home	Renting home or apartment	170	32.0	369
	Hotel	111	20.9	
	Working out of town	21	4.0	
	Reserve	67	12.6	
Temporary home	Couch surfing	20	3.8	380
	Friend's place	140	26.4	
	With family	220	41.4	
Homeless	Shelter	58	10.9	363
	Camps	14	2.6	
	Street	238	44.8	
	Do not sleep (walked all night)	63	11.9	
Institutional	Transitional housing	19	3.6	199
	Detox	52	9.8	
	Hospital	128	24.1	
Corrections	Corrections	148	27.9	148

Housing Stability

Almost half of the respondents (n=219, 41.9%) described their current housing situation as very unstable (Table 5). A Cramer V test was conducted to determine the effect size and the strength of the relationship between respondents' perceived housing stability and their reported sleeping location (Table 6). A significant association (Table 6) with a small effect size was obtained from all housing categories aside from respondents who reported sleeping in a transitional housing setting during the preceding six months. Thus, the Cramer V test indicated that sleeping locations were associated with a respondent's perceived housing stability (Table 6).

A chi-square test was conducted to evaluate whether respondents' perception of housing stability differed based on their sleeping location (corrections, permanent housing, temporary housing, institutional housing, and homelessness) in the preceding six months (Table 6). For the chi-square test, each housing category (corrections, permanent housing, temporary housing, institutional housing, and homelessness) was dummy coded as either "yes" or "no."

A significant chi-square statistic was obtained for all housing categories except institutional housing χ^2 (15, n=531) = 23.552 p=0.073 (Table 6). A follow-up z-test of column proportions using the Bonferroni correction was utilized to determine which sleeping locations

reported a significant difference in their housing stability. The test found that respondents who reported sleeping in corrections, hotels, work accommodations, on a reserve, at a friend's place, with a family, homeless shelter, on the street, “do not sleep” (gone without sleep), detox, or hospital were more likely to report a significantly higher proportion of unstable housing. In contrast, respondents who reported renting their own homes or apartment or staying in camps or settlements were more likely to report a more stable perception ($p<0.05$) of housing stability.

A chi-square does not determine the strength of the relationship between a respondent's perceived housing stability and their sleeping location. As a result, a Cramer V test was conducted to determine the effect size and the strength of the relationship between respondents' perceived housing stability and their reported sleeping location (Table 6). A significant association was obtained from all housing categories aside from respondents who reported sleeping in a transitional housing setting during the preceding six months. Thus, the Cramer V tests indicated that sleeping locations were associated with a respondent's housing stability.

Table 5: Rating of Housing Stability

Housing Stability:	N	%
Very unstable	219	41.2
A little unstable	85	16.0
Neither unstable nor stable	26	4.9
A little stable	86	16.2
Very stable	113	21.3
Don’t know	2	0.4
Total	531	100.0

Table 6: Respondents' Perception of Housing Stability Correlated with their Sleeping Location

Variable	Results	*p*	*V*
Corrections	χ^2 (5, n=531) = 15.013	0.010	0.122
Permanent Housing	χ^2 (20, n=531) = 106.913	*< 0.001*	0.224
Temporary Housing	χ^2 (15, n=531) = 46.229	*< 0.001*	0.170
Homelessness	χ^2 (20, n=531) = 156.861	*< 0.001*	0.272
Institutional Housing	χ^2 (15, n=531) = 23.552	*0.073*	0.090

Sex and sleeping locations during the preceding six months

A chi-square test was conducted to evaluate whether males differed from females in their sleeping location. A significant chi-square was obtained for the crosstabulation of gender and homelessness: χ^2 (8, N=531) =25.220, p<0.001. The researcher conducted a follow-up z-test of column proportions using the Bonferroni correction to determine where the sleeping locations of males and females varied. The test found that males reported a significantly higher frequency of sleeping at a friend's place χ^2(6, N=531) =15.996, p = 0.012, while more females reported a higher frequency of sleeping at a family member's home χ^2(4, N=531) =10.501, p = 0.021.

Sex and Polysubstance Use

As more than half of the respondents reported using more than one type of drug on the same occasion (58.6%) compared to 41.2% who did not (Table 9), a chi-square test was conducted to evaluate where polysubstance use patterns differed between males and females. The distribution of polysubstance use as a function of gender is displayed in (Table 7). The chi-square statistic indicated there was no significant difference between males and females in their polysubstance use in this sample: χ^2 (8, N=524) =9.388, p= 0.310.

Table 7: Polysubstance Use and Gender Crosstabulation

Polysubstance Use	Male	Female	Total
Never	117	94	212
Once a month	23	9	32
2-4 times/month	38	22	61
2-3 times/month	47	23	70
4 times a week or more	94	55	149
Total	319	203	524

Substance Use

Alcohol Use

More than a quarter of respondents (30.9%, Table 8) in the survey reported consuming an

alcoholic beverage on four or more occasions per week over the preceding six months. In addition, among the respondents who reported consuming a drink containing alcohol, over a quarter of the respondents (31.5%) reported consuming ten or more alcoholic beverages on a typical day.

Table 8: Frequency of Having a Drink Containing Alcohol

Frequency of drinking	N	%
Never	117	22.0
Less often than once a month	94	17.7
2-4 times a month	78	14.7
2-3 times a week	76	14.3
4 or more times a week	164	30.9
Don't know	2	0.4
Total	531	100.0

Non-beverage Alcohol Use

More than one-tenth of respondents (12.1%) reported drinking non-beverage alcoholic substances (cooking wine, rubbing alcohol, mouth wash, or cologne) compared to 87.4% of respondents who did not consume these liquids. A chi-squared test was applied to compare the difference in the drinking patterns of respondents (alcohol vs. non-beverage alcohol consumption) and their sleeping locations during the preceding six months. A significant chi-square statistic was obtained: χ^2 (5, N=531) = 12.636, p=0.027. A follow-up z-test of column proportions using the Bonferroni correction was conducted to observe the significant differences among respondents engaging in non-beverage alcoholic substance use based on their sleeping location. The test found that respondents who reported engaging in non-beverage alcoholic substance use also reported a significantly higher proportion of sleeping in corrections: χ^2 (3, N=531) = 14.031, p=0.003; on a reserve: χ^2 (12, N=531) = 25.249, p=0.044; on the street: χ^2 (12, N=531) = 50.119, $p < 0.001$; or in the hospital: χ^2 (9, N=531) = 28.569, $p< 0.001$ during the preceding six months. These findings suggest that housing instability is associated with non-beverage alcohol substance use: V=.154, p = 0.027. However, the effect size is relatively small.

For statistical analysis, different substance use profiles were coded into classes of substance use such as non-injection drugs, injection drugs, alcoholic beverage use, non-beverage alcohol use, and polysubstance use. A significant proportion of respondents (94%, Table 9) reported engaging in non-injection drugs followed by beverage-based alcohol use (77.6%) in the preceding six months. Classes of substance use were also recoded into different drug use categories (Table 10) to explore the relationship between substance use profiles, housing stability, and sleeping location.

Table 9: Overview of Substance Use During the Preceding Six Months

Type of substance use	No		Yes	
	n	%	n	%
Non injection drugs	32	6.0	499	94.0
Injection Drug	351	66.1	180	33.9
Alcohol (beverage)	119	27.4	412	77.6
Alcohol (non-beverage)	464	87.4	64	12.1
Polysubstance Use	219	41.2	312	58.8

Table 10: Class of Use During the Preceding Six Months

Class of substance use	N	%
Opioid based non-injection drugs	247	46.5%
Stimulant based non-injection drugs	428	80.6%
Depressant based non-injection drugs	211	39.7%
Hallucinogen/inhalant based non-injection drugs	111	20.9%
Other types of non-injection drugs	22	4.1%
Opioid based injection drugs	113	21.3%
Stimulant based injection drugs	146	27.5%
Depressant based injection drugs	18	3.4%
Hallucinogen/inhalant-based injection drugs	4	0.8%
Other types of injection Drugs	22	4.1%

Non-Injection Drug Use

The most common group of non-injection drugs was non-injection stimulants (80.6%) and other categories of non-injection drugs (72.5%). In the stimulant-based non-injection drug category, more than half of the respondents (68.9%) reported consuming methamphetamine during the preceding six months, followed by crack cocaine (24.8%). Of the “other” category of non-injection drugs, over half of the respondents reported smoking cigarettes (50.6%), followed

by marijuana/hash use (29.6%).

Non-Injection Drug use by Sex and City

Over a quarter of respondents reported consuming non-injection oxycodone (30.8%), with females reporting higher consumption (36.6%) than males (26.7%). Respondents in Fort McMurray reported higher rates of oxycodone consumption (51.6%) compared to the other three cities. In addition, respondents in Fort McMurray also reported a significantly higher proportion of MDMA χ^2 (21, N=111) = 26.386, p=0.029 and Ritalin χ^2 (12, N=428) = 47.162, p<0.033 non-injection drug use compared to the other three cities. Meanwhile, Lethbridge respondents reported a significantly higher proportion of non-injection crack cocaine use: χ^2 (12, N=428) = 47.162, p=0.039. Finally, respondents in Edson reported a significantly higher proportion of methamphetamine use: χ^2 (12, N=35) = 47.162, p<0.001.

Smoking was the most common form of non-injection drug consumption in all four cities, as more than half of the respondents (64.2%) reported consuming non-injection drugs via smoking. However, a smaller proportion of respondents in Lethbridge used smoking as a method of consuming drugs (58.7%) when compared to Edson (84%), Fort McMurray (80.3%), and Grande Prairie (70.2%).

Injection Drug Use

More than a quarter of the respondents reported engaging in injection substance use during the preceding six months (33.9%). The most common injection drugs consumed were stimulant-based injection drugs (27.5%), followed by opioid-based injection drugs (21.3%). More than a quarter of respondents (26.9%) reported using crystal methamphetamine – in the stimulant-based injection drug category. In the opioid category, the most injected drugs were fentanyl (23.0%) and morphine (21.2%), while only a few respondents (1.8%) reported

knowingly consuming carfentanil by injection.

Injection Drug Use by City

The highest frequency of crystal methamphetamine injection use was observed in Lethbridge (34.4%). Respondents in Lethbridge also reported significantly higher proportions of oxycodone – χ^2 (30, N=113) = 49.303, p=0.0036 – and OxyNeo – χ^2 (30, N=113) = 49.303, p=0.022 – as an injection drug than the other three cities. In contrast, a significantly higher portion of respondents in Grande Prairie reported engaging in heroin injection drug use – χ^2 (6, N=4) = 8, p=0.005 – compared to the other three cities.

Association between Sleeping Locations, Housing Stability and Substance Use

Housing Stability and Non-Injection Substance Use

A chi-square test was conducted to evaluate whether respondents' perceived housing stability varied based on the type of non-injection drug used. A significant chi-square was obtained for respondents who used non-injection stimulant drugs (e.g., crack cocaine, cocaine, or crystal methamphetamine): χ^2 (2, N=531) = 6.396, p=0.041. A follow-up z-test of column proportions using the Bonferroni correction was utilized to observe the significant differences among respondents engaging in non-injection stimulant drugs and their housing stability. The results indicated that respondents who consumed non-injection crystal methamphetamines reported a significantly higher frequency of unstable housing conditions: χ^2 (8, N=428) = 14.218, p=0.038. These findings indicated that the use of non-injection stimulant drugs is associated with respondents experiencing housing instability during the preceding six months: V=.110, p = 0.041. However, the effect size of this association is small.

Housing Stability, Beverage Alcohol and Non-beverage Alcohol Use

Almost half of the respondents reported consuming ten or more alcoholic beverages on a

typical day (Table 11). A chi-square test was conducted to evaluate whether respondents' housing stability was associated with consuming beverage alcohol or non-beverage alcohol (cooking wine, rubbing alcohol, mouth wash or cologne). A significant chi-square statistic was obtained, χ^2 (5, N=531) = 12.636, p=0.027, with those reporting greater instability more likely to report drinking non-beverage alcohol. A Cramer V test was utilized to evaluate the strength of the relationship between non-beverage alcohol and housing stability in 64 individuals. A significant association of V =.154, p =0.027 was obtained, indicating non-beverage alcohol use is associated with housing instability to a small degree.

Table 11: Number of Standard Drinks Containing Alcohol per Day

Number of drinks	n	%
1 or 2	60	14.5
3 or 4	60	14.5
5 or 6	60	14.5
7 to 9	43	10.4
10 or more	167	40.3
Don't know	17	4.1
Refused	7	1.7
Total	414	100.0

Sleeping Locations and Binge Use of Non-Injection Drugs

Chi-squared statistics were utilized to evaluate whether the sleeping locations of respondents differed between those who binged non-injection drugs more than usual and those who did not. "More than usual" referred to respondents who perceived using more drugs than they usually did in a day. A significant chi-square statistic was obtained for all sleeping locations aside from respondents who reported sleeping in temporary housing conditions (Table 12). A z-test of column proportions using a Bonferroni correction was utilized to evaluate the differences in sleeping locations among respondents engaging in more than usual (binge) doses of non-injection drugs. These tests indicated that respondents who binged non-injection drugs reported a significantly higher frequency of sleeping in corrections, camps, streets, detox/hospital, or not

sleeping. A Cramer V test was utilized to determine the strength of the association between binge use of non-injection drugs and a respondent's sleeping locations (Table 12). These results indicated that binge use (to a greater degree than usual) of non-injection drugs was significantly associated with respondents sleeping in homeless conditions, corrections, or an institutional housing facility. However, the strength of these associations was relatively small.

Table 12: The Association of Respondents Sleeping Location and Binge Use of Non-Injection Drugs

Variable	Results	*p*	*V*
Corrections	χ^2 (2, n=500) = 8.504	0.014	0.130
Permanent Housing	χ^2 (8, n=500) = 25.625	0.001	0.160
Temporary Housing	χ^2 (6, n=500) = 5.540	0.477	0.074
Homelessness	χ^2 (8, n=500) = 32.004	< *0.001*	0.179
Institutional Housing	χ^2 (6, n=500) = 29.622	< *0.001*	0.172

Sleeping Locations and Unintentional Substance Use Overdose

A chi-square test was conducted to determine whether respondents' sleeping location varied based on whether they had unintentionally overdosed on a substance during the six months preceding the survey. Four respondents who reported not knowing if they had intentionally overdosed from substance use during the preceding six months were excluded from the analysis. The results indicated that respondents who unintentionally overdosed reported a significantly higher frequency of sleeping in corrections, at a friend's place, on the street, or in a hospital during the preceding six months (Table 13).

Table 13: Significant Type of Sleeping Locations Associated with Intentionally Overdosing Substances

Type of sleeping location	Results	*p*	*V*
Corrections	χ^2 (2, n=527) = 15.673	0.002	0.141
Friends Place	χ^2 (8, n=527) = 14.082	0.034	0.138
Street	χ^2 (6, n=527) = 12.780	0.009	0.128
Hospital	χ^2 (8, n=527) = 15.282	0.023	0.115

Relationship between Substance Use and Housing

Influence of Substance Use and Housing Stability

A logistic regression investigated characteristics differentiating respondents with stable

housing from respondents without stable housing (Table 15). Eleven predictor substance use variables were used: alcohol use, polysubstance use, hallucinogen based non-injection drug use, stimulant-based non-injection drug use, depressant based non-injection drug use, other types of non-injection drug use, hallucinogen-based injection drug use, opioid-based injection drug use, stimulant-based injection drug use, depressant based injection drug use, and other types of injection drug use. Although the large number of variables in the logistic model may steal statistical power from the possibility of identifying a significant relationship between the dependent variable and some independent variables, it was essential to enter all classes of substance use into the logistic regression model simultaneously to explore characteristics differentiating respondents with stable housing from those without, since many respondents were concurrent users of multiple classes of substances. Thus, some classes of substance use reported as non-significant predictors might emerge as significant predictors of housing stability if there was a larger sample size or if the bivariate relationships were explored individually.

The entry of the variables into the equation was simultaneous. No missing values were detected, leaving 531 respondents available for analysis: 332 respondents with unstable housing and 199 respondents with stable housing.

A full model test with all eleven predictors against a constant-only model was not statistically significant χ^2 (11, N=531) = 19.396, p=0.054, indicating that the eleven predictors, as a set, did not reliably distinguish between respondents in stable and unstable housing conditions. The variance accounted for was moderate, however, with Nagelkerke R squared = 49%. Overall prediction success was also modest at 62.9%, with 94.3% of the respondents in unstable housing correctly classified and 11.1% of respondents in stable housing correctly classified. According to the Wald criterion, only stimulant-based non-injection drug use

predicted the presence of unstable housing (Table 14). Thus, the findings suggest that respondents' housing stability cannot be accurately predicted solely based on their drug use. However, respondents engaging in non-injection stimulants have almost 2.9 times (288% higher) the risk of housing instability with a 95% CI range, from 1.2 times to 2.9 times.

Table 14: Logistic Regression of Characteristics Differentiating Respondents with Stable Housing from Respondents without Stable Housing

Variable	Regression coefficients	Wald statistic	Odds Ratio
Stimulant Based non-injection drug	0.580	6.045*	1.785

*p=0.010

Table 15: Variables in the Logistic Regression Equation (Substance Use)

Variable	B	S. E	Wald	df	Sig	Odds Ratio	Lower Odd Ratio (B)	Upper Odds Ratio (B)
Alcohol Use	-0.099	0.226	0.193	1	0.660	0.906	.582	1.410
Polysubstance Use	0.104	0.205	0.260	1	0.610	1.110	0.743	1.657
Non-Injection Hallucinogen/Inhalant	-0.330	0.246	1.795	1	0.180	0.719	0.444	1.165
Non-Injection Stimulant	0.600	0.233	6.617	1	0.010	1.822	1.154	2.878
Non-Injection Depressants	-0.180	0.214	0.711	1	0.399	0.835	0.549	1.270
Other types of Non-injection drugs	0.009	0.231	0.001	1	0.969	1.009	0.642	1.586
Injection Opioids	0.282	0.292	0.937	1	0.333	1.326	0.749	2.349
Injection Stimulant	0.124	0.242	0.262	1	0.609	1.132	0.704	1.818
Injection Depressant	1.251	0.858	2.124	1	0.145	3.494	0.650	18.787
Other types of Injection drugs	-0.063	0.627	0.010	1	0.920	0.939	0.275	3.208
Injection Hallucinogen/Inhalant	20.101	19697.484	0.000	1	0.999	536660659.234	0.000	.
Constant	-21.856	19697.484	0.000	1	0.999	0.000		

Other Factors Predicting Housing Instability

As many classes of substance use were not significant predictors of unstable housing, a logistic regression model was utilized to explore other characteristics differentiating respondents with stable housing from respondents without. Five predictor variables were used, including the

presence of an undiagnosed addiction disorder, an undiagnosed mental health disorder, treatment enrollment or a detox program, a substance use overdose, and homelessness. No missing values were detected, leaving 531 respondents available for analysis: 332 respondents with unstable housing and 199 respondents with stable housing.

A full model test with all eleven predictors against a constant-only model was statistically significant χ^2 (5, N=531) = 75.479, p <0.001, indicating that the five predictors, as a set, reliably distinguished between respondents in stable and unstable housing conditions. The variance accounted for was low, however, with Nagelkerke R squared = 8.1%. Overall prediction success was modest at 68.4%, with 87.3% of the respondents in unstable housing correctly classified and 36.7% of respondents in stable housing correctly classified. According to the Wald criteria, having an undiagnosed addiction disorder, having an undiagnosed mental health disorder, experiencing a substance use overdose, and having experienced homelessness predicted the presence of unstable housing (Table 16). Respondents having an undiagnosed addiction disorder possessed a 1.5 times (150%) higher risk of unstable housing, with a 95% CI (range 1.0 times – 2.2 times). However, having an undiagnosed mental health disorder approximately doubled (2.1 times, 210% higher) the risk of unstable housing with a 95% CI range from 1.4 times – 3.2 times. In addition, respondents who had experienced a substance use overdose during the preceding six months had an almost 1.8 times (180%) higher risk of unstable housing. The highest risk of housing instability was observed among respondents who had been homeless during the preceding six months, at almost 4.0 times (400% higher) the risk of unstable housing, with a 95% CI (range from 2.7 times – 6.0 times). Finally, the results indicated that attending a treatment or detox program did not significantly predict respondents' housing stability.

Table 16:Variables in the Logistic Regression Equation (Other Factors related to Housing Stability)

Variable	B	S. E	Wald	Df	Sig	Odds Ratio	Lower Odds Ratio	Upper Odds Ratio
Attending treatment	0.006	0.206	0.001	1	0.977	1.006	0.671	1.507
Substance Use Overdose	0.566	0.261	4.704	1	0.030	1.762	1.056	2.938
Undiagnosed substance use disorder	0.417	0.195	4.569	1	0.033	1.517	1.035	2.224
Undiagnosed mental health disorder	0.750	0.206	13.429	1	<0.001	2.116	1.417	3.160
Homeless	1.381	0.207	44.449	1	<0.001	3.980	2.652	5.974
Constant	-2.069	0.295	49.037	1	<0.001	0.126		

Substance Use and Homelessness

All classes of substance use were inserted into the logistic regression analysis to thoroughly examine the influence of substance use and the probability of homelessness for new cases. The logistic regression model investigated characteristics differentiating between respondents experiencing homelessness and respondents who were not. Eleven predictor substance use variables were entered into the model: polysubstance use, hallucinogen based non-injection drug use, stimulant-based non-injection drug use, depressant based non-injection drug use, other types of non-injection drug use, hallucinogen-based injection drug use, opioid-based injection drug use, stimulant-based injection drug use, depressant based injection drug use, and other types of injection drug use. The entry of the variables into the equation was simultaneous. No missing values were detected, leaving 531 respondents available for analysis: 373 reportedly experiencing homelessness in the preceding six months, and 158 who were not.

A full model test with all eleven predictors against a constant-only model was statistically significant: χ^2 (11, N=531) = 34.093, p<0.001. Thus, the test indicated that the eleven predictors, as a set, reliably distinguished between respondents experiencing homelessness (living on the street, in a shelter, a camp or in a settlement, or respondents who do not sleep at night) and respondents who were not. However, the variance accounted for was low, with Nagelkerke R

squared = 8.8% (Table 17). Thus, these results should be interpreted with caution as the class of substance use only accounts for 8.8% of the variance in the dependent variable (homelessness). Overall prediction success was also high at 70.4%, with 70.2% of the respondents who reported experiencing homelessness correctly classified and 29.6% not experiencing homelessness.

According to the Wald criteria, non-injection depressant-based drugs and polysubstance use predicted the presence of homelessness (Table 18). Engaging in non-injection depressant-based drugs placed respondents at an almost 1.9 times (190%) higher the risk of homelessness with a 95% CI (range from 1.2 times – 3.2 times), while polysubstance use was associated with an almost 1.7 times (170%) higher risk of homelessness, with a 95% CI (range from 1.0 times – 2.1 times).

Table 17: Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	612.427	0.032	0.088

Table 18. Logistic Regression of Characteristics Differentiating Between Respondents who are Homeless and Respondents who are not

**p*=0.004

Variable	Regression coefficients	Wald Statistic	Odds Ratio	Confidence Interval
Non-injection depressant drugs	- 0.676	8.239*	1.943	95% CI [1.2 – 3.2]
Polysubstance use	0.546	8.108**	1.727	95% CI [1.0 – 2.1]

Substance Use and Corrections

A logistic regression investigated characteristics differentiating respondents who had slept in a corrections facility during the preceding six months and respondents who had not. Eleven predictor substance use profiles were entered into the model as independent variables: polysubstance use, hallucinogen based non-injection drug use, stimulant-based non-injection

drug use, depressant based non-injection drug use, other types of non-injection drug use, hallucinogen-based injection drug use, opioid-based injection drug use, stimulant-based injection drug use, depressant based injection drug use, and other types of injection drug use. The entry of the variables into the equation was simultaneous. No missing values were detected, leaving 531 respondents available for analysis: 383 respondents reported not sleeping in a corrections facility and 148 respondents reported sleeping in a corrections facility within the preceding six months.

A full model test with all eleven predictors against a constant only model was statistically significant χ^2 (10, N=531) = 31.346, p<0.001, indicating that the eleven predictors, as a set, reliably distinguished between respondents who had slept in a corrections facility during the preceding six months and respondents who had not. The variance accounted for was low, with Nagelkerke R squared = 8.3%. Overall prediction success was also low at 73.4%, with 99.2% of respondents not sleeping in a corrections facility correctly classified and 6.8% of respondents not correctly classified as sleeping in a corrections facility within the preceding six months; thus, the results should be interpreted with caution. According to the Wald criterion, polysubstance use and other types of injection drug use such as speedballs, W18, and non-beverage alcohol use significantly predicted the presence of respondents sleeping in a corrections facility (Table 19). Polysubstance use increased the risk of sleeping in a corrections facility by 1.8 times (180% higher), with a 95% CI (range from 1.0 times – 2.5 times), while other types of injection drug use placed respondents at almost 4.8 times (480% higher) the risk of unstable housing with a 95% CI (range from 1.1 times – 5.6 times).

Table 19. Significant Results from Logistic Regression of Significant Characteristics Differentiating Between Respondents who have Slept in a Corrections Facility and Respondents who have not

Variable	Regression coefficients *(B)*	Wald Statistics	Odds Ratio
Polysubstance use	0.559	5.831*	1.750
Other types of injection drug use	1.572	6.149**	4.815

*p=0.016

**p=0.013

Addiction Severity Indicators and Housing Stability

A linear regression analysis was conducted to assess if a respondent's housing stability was influenced by a combination of addiction severity factors related to their substance use. Thus, a multiple regression was performed with housing stability as the dependent variable and the independent variables as an irresistible craving for drugs, not being able to stop using drugs, neglecting to do something due to drug use, morning drug use after heavily using drugs the previous day, and having a bad or guilty conscience due to drug use. The entry of the independent variables was simultaneous. Respondents who refused to answer the question were excluded from the analysis leaving 498 respondents available for analysis. No univariate or multivariate outliers were observed. Table 20 displays the unstandardized regression coefficients *(b)*, the standardized regression coefficients (B), the semi-partial correlations ($sri^{2)}$ and adjusted R^2 for the two variables that contributed significantly to the prediction of housing instability. R was significantly different from zero, **F** (5, 498) = 4.587, $p<0.001$.

Only two addiction severity indicator variables (Table 20) significantly contributed to the prediction of unstable housing. The variables were as follows: needing to take drugs in the morning after heavily drug use the previous day ($sr_i^2 = 0.009$) and having guilty feelings because of drug use ($sr_i^2 = 0.015$). The direction of the effect may be in question as having unstable housing may increase the feelings of guilt. However, the cross-sectional nature of these data makes this hard to confirm. Altogether, 3.5% of the variability of unstable housing was predicted by knowing the four independent variables' scores. As the effect size of the two significant variables listed above was small, the results should be interpreted with caution. Nevertheless, the multiple regression test results indicate a significant relationship between addiction severity indicators such as having a bad or guilty conscience due to drug use, morning drug use after

heavily using drugs the previous day, and a respondent's housing stability. Furthermore, respondents who had experienced homelessness at least once were more likely to take drugs the morning after heavy drug use and to experience greater housing instability.

Table 20: Significant results from multiple regression

Variable	Regression coefficients *(B)*	Standardized regression coefficient	Squared Semi partial correlation (sr_i^2)
Needing to take drugs in the morning after heavily using drugs the previous day	-0.031*	-0.111	0.009
Having guilty feelings or a bad conscience because of drug use	-0.043**	-0.133	0.015

*p=0.036
**p=0.007

CHAPTER 5: DISCUSSION

In this section, I discuss the findings in several ways. First, I explore the significant differences in substance use profiles and housing outcomes by city. Then, I highlight the significant findings across all four cities in the study. Next, I answer each of the research questions. Finally, I address limitations to the study findings and highlight recommendations for future research.

Substance Use and Housing by City

Fort McMurray

In Fort McMurray, respondents ranged in age from 21 to 65 years old, with a median range of 36-40 years. Almost 70% were male, which represents a higher proportion of male respondents than other Canadian cities (Hyshka et al., 2016; Public Health Agency of Canada, 2014). This age and gender distribution are perhaps unsurprising, given Fort McMurray's well-established position as a city centered around oil and gas development. Therefore, the higher proportion of younger working-age men engaged in resource extraction in that city is likely shaping the stronger demographic presentation of substance users responding to the survey from this locale (Statistics Canada, 2017). In addition, the combination of long hours of work, high-income levels, and the numbers of workers living away from their social support networks in work camps, likely not only contributes to substance use, but influences the types of substances used. The results from the survey confirmed a higher use of non-injection stimulants such as crack cocaine, ecstasy, and Ritalin in Fort McMurray when compared to the other cities. The three highest substance use profiles observed in Fort McMurray were alcohol (93.7%), non-injection codeine (72.1%), and the use of two or more different kinds of illicit substances (68.3%). Furthermore, there was also a higher frequency of respondents in Fort McMurray who

reported sleeping in a hotel during the preceding six months as compared to the other cities.

Second, a higher prevalence of respondents in Fort McMurray reported engaging in alcohol use also reported experiencing homelessness. This might be attributable to the high cost of housing in Fort McMurray, increasing the risk of homelessness among respondents with alcohol dependence compared to other communities with more affordable housing. Compared to the other three cities, the average cost of housing in Fort McMurray was $530 higher than the monthly average cost of housing in Alberta (Statistics Canada, 2017). The 2016 Statistics Canada census revealed that the average monthly shelter cost for rented dwellings in Fort McMurray was $1,809, followed by Grande Prairie ($1,372), Edson ($1,124) and Lethbridge ($1,038) (Statistics Canada, 2017). The high cost of housing in Fort McMurray could also explain why there is a significantly higher proportion of respondents sleeping on the street, not sleeping, sleeping in detox, or being incarcerated during the preceding six months.

In addition, respondents in Fort McMurray who reported sleeping in the hospital reported significantly higher non-prescribed methadone drug use during the preceding six-month period. Interestingly, respondents in Fort McMurray preferred to consume methadone from street sources (i.e., diverted) instead of from treatment or substance use programs such as clinics using opioid agonist therapy. Although this is speculation, it is possible that respondents feared that their employers and workplaces would stigmatize workers with methadone prescriptions. Thus, it is possible that individuals could be acquiring diverted methadone to avoid the medication on their health record, which could be a barrier to employment. Furthermore, it is possible that the diverted methadone supply might be mixed with other substances that would induce harm and thus lead to more interactions with institutional facilities such as hospitals. These findings agree with Appel et al. (2012) who found that respondents using diverted methadone were more likely

to experience homelessness, stigma associated with their status as a methadone patient, erratic participation in treatment, and formidable challenges in a clinical setting. Further research is needed to explore the perception of people on opioid agonist therapy in Fort McMurray.

Noticeably, in Fort McMurray, a significant association was observed among respondents concurrently consuming fentanyl and crystal methamphetamine and respondents who reported sleeping in a corrections facility during the preceding six months (V =.405). As Fort McMurray lacks a supervised consumption site, respondents concurrently using fentanyl and crystal methamphetamine might not have access to a safe environment to consume their substances and could be highly visible to the public, increasing interactions or calls to law enforcement. The higher frequency of respondents in Fort McMurray sleeping in corrections during the preceding six months could also explain why there was a higher proportion of respondents in Fort McMurray sleeping in detox compared to the other cities. Respondents participating in the drug treatment court program might choose to attend a detox program as an alternative to incarceration. The drug treatment court (DTC) program facilitates treatment for non-violent offenders with drug addictions through judicial supervision, treatment programs, random and frequent drug testing, incentives and sanctions, clinical case management, and social services support (Public Prosecution Service of Canada, 2020).

Lethbridge

In Lethbridge, respondents ranged from 15 to 75 years old, with a median range of 31-35 years. This age distribution aligns with the 2016 census data as seniors aged 65 years and older accounted for roughly 19% of the Lethbridge population. In addition, a higher proportion of female respondents in Lethbridge (42.9%) completed the Alberta Drug Use Survey compared to the other cities. The gender distribution is unsurprising as Lethbridge had more females (44,700)

than males (42,880) in 2016. However, a slightly higher proportion of males (57%) reported sleeping in unstable housing conditions than females (53%) in Lethbridge in the preceding six months. These findings may suggest that some aspects of the male gender role could make it more likely for males in Lethbridge to encounter housing instability. For example, there could be a greater likelihood of men not seeking treatment, staying in temporary accommodations, or being in substance abuse programs. It is important to note that just because women are more likely to be stably housed does not mean they live in ideal living situations. The women who considered their housing as stable may also have been improvising more to secure accommodations or have had less control over personal resources, prompting them to engage in survival sex for accommodation or to act in a supportive role in criminal activities, such as being drug runners (O'Grady & Gaetz, 2009). Lastly, the similar gender distribution of unstable housing could indicate that although more men might be experiencing unstable housing, contributing factors such as poverty, unemployment, lack of affordable housing, and income might not affect both genders equally.

There is much debate about the role of sex and the etiology, nature, and course of homelessness. For example, some authors found that homeless women with children comprise the fastest growing sub-group of homeless respondents (Rodriguez-Moreno et al., 2021). In contrast, other authors found that compared to males, females spent shorter periods in an unsheltered location and reported a less frequent history of substance abuse, incarceration, and felony conviction (De Vet et al., 2019). Thus, this survey's findings indicate homelessness can be a different experience for females, and further exploration is required to thoroughly explore the relationship between gender, sex, and housing outcomes.

More females reported sleeping with family, renting a home, and sleeping in hospitals in

our study. If female respondents did not have a social network, they were more likely to have been hospitalized or homeless during the preceding six-month period. According to these findings, the susceptibility to homelessness and substance use can be contingent on the strength of peer influences and addiction severity indicators (Cutrín et al., 2017). Unfortunately, our data was not granular enough to determine whether the friends or family with whom respondents temporarily lived were engaged in substance use. Thus, further exploration is warranted to examine the significance of social network relationships and the housing outcomes among respondents engaging in substance use. This will deepen our understanding of how peer networks and addiction severity indicators differentially influence this population's risk, protective health factors, and behaviours.

The highest proportion of respondents (68%) identifying as First Nations, Métis or Inuit was observed in Lethbridge compared to the other cities: Grande Prairie (57.5%), Edson (48%), and Fort McMurray (38.1%). Almost three-quarters of the female respondents self-identified as First Nations, Métis, or Inuit (72.9%), while 25.1% identified as Caucasian women. This demographic finding was comparable to the Edmonton survey (Hyshka et al., 2016). These findings are unsurprising as the city of Lethbridge is southeast of Canada's largest First Nations community, the Kainai Nation (Treaty 7) (Wildcat, 2020). Treaty 7 First Nations are in the Southern portion of the province and are composed of members of the Blackfoot Confederacy, the Stoney Nation, and the Tsuut'ina Nation. This finding could explain why there is a significantly higher proportion of respondents in Lethbridge living on the reserve and with family compared to the other three cities.

In local Indigenous cultures, a family is composed of members beyond the traditional nuclear family who lives in one house (Tam et al., 2017). The concept of family members can

extend to include multiple generations and non-blood-related members (Statistics Canada, 2008). The westernized perception of nuclear family structure and kinship often differs among Indigenous, First Nation, and Métis groups, which could explain why there is a significantly higher distribution of respondents in Lethbridge staying with family (51%) or friends (60%) compared to the other surveyed cities. Therefore, it could be possible that it was uncommon for respondents to sleep at a family or friend's place for extended periods. In addition, the increased distribution of respondents in Lethbridge sleeping in a shelter (64.6%) could also reflect the transient nature among respondents travelling between the reserve and Lethbridge who experienced unstable housing during the six months preceding the survey.

The three highest substance use profiles observed in Lethbridge were alcohol (75%), concurrently using two or more drugs (60%), and non-injection crystal methamphetamine (50%). In addition, the highest frequency of non-injection crystal methamphetamine via smoking, snorting, or ingestion was observed in Lethbridge. Due to the large proportion of respondents in Lethbridge who preferred to smoke, snort, or ingest crystal methamphetamine, the supervised consumption service in that city (not yet established at time of the study) instituted two smoking rooms (Bourque et al., 2019). There was also a higher frequency of respondents in Lethbridge who reported engaging in injection crystal methamphetamine use (34%) compared to Edson (30.4%), Grande Prairie (26%), and Fort McMurray (3.2%).

Our data also indicated that there could be higher toxicity in Lethbridge's drug supply as the highest distribution of respondents unintentionally overdosing from any drugs consumed in the preceding six months (25%) was observed in this city. These findings align with the Alberta Substance Use Surveillance system, as Lethbridge had the highest death rate among Alberta cities, with a rate of 19 deaths per 100,000 people (Alberta Health, 2021).

Finally, a significant proportion of respondents in Lethbridge who reported consuming speedballs[1] also reported being in a detox facility during the preceding six months. This finding suggests that respondents who use speedballs and seek detox continue to experience negative health consequences and homelessness after leaving treatment (DiGuiseppi et al., 2020). Furthermore, these findings agree with the study authored by Au et al. (2021), who found that after people are discharged from or leave substance use treatment, their tolerance decreases significantly, and they are at a greater risk of opioid overdose.

Grande Prairie

In Grande Prairie, respondents ranged from 15 to 65 years old, with a median range of 36-40 years, and the Grande Prairie sample was comprised of more men (60%). This age distribution is unsurprising as Grande Prairie is another oil and gas hub and is 450 kilometres northwest of Edmonton. Like Fort McMurray, the higher proportion of younger working-age men engaged in resource extraction in that city is likely shaping this demographic presentation of substance users responding to the survey from this locale (Statistics Canada, 2017).

Compared to males in Grande Prairie, twice as many women earned less than $40,000 in Grande Prairie (Lim et al., 2019). The income gap in Grande Prairie could suggest that a portion of women's financial standing and accessibility to housing may be linked to their partner's income (Milaney et al., 2020), or it may reflect the remunerative rewards of blue collar jobs in the oil patch, as compared to traditionally female-dominated lines of work that are not as financially rewarding. The median total income of a household in Grande Prairie ($105,288) was higher than the Albertan average ($93,835) despite 73% of 18–65-year-olds in private homes identifying as low income (Statistics Canada, 2017). Low income was classified as income

[1] A combination of an upper such as cocaine and downer such as morphine

situations below the low-income Canadian threshold in 2015, which was $24,012 for a single household, $33,958 for two person household, $41,590 for three people household and $48, 023 for 4 people households (Statistics Canada, 2019). Despite the average monthly shelter cost being higher than the Albertan average ($1,387 vs 1,279), 65% of the Grande Prairie population reported owning their own home in 2015 (Statistics Canada, 2017). These findings could insinuate the presence of a huge wealth disparity between employed and non-employed respondents in Grande Prairie. The wealth disparity in this city could also explain why the proportion of Grande Prairie respondents who reported owning or renting their house place them in second place (37%) in the study, compared to Edson, the leader at 54%. Therefore, further exploration is required to determine the impact of income on homelessness and housing instability, to determine if income is a protective or risk factor.

Both Fort McMurray ($1,809) and Grande Prairie ($1,372) had a higher monthly shelter cost than the Albertan average ($1279) (Statistics Canada, 2017). The higher-than-average monthly cost of housing in Grande Prairie could explain why Grande Prairie respondents were the second most likely group to report couch surfing (39%) during the preceding six months, compared to Lethbridge, which was in first place at 46% as well as Fort Mc McMurray at 30%, and Edson at 27, holding third and fourth place respectively. Thus, respondents in Grande Prairie, who cannot afford to rent or own their own place, may be forced to couch surf with individuals who can afford to rent or own a home. The high cost of housing may also explain why respondents from Grande Prairie (53%) and Fort McMurray (54%) both reported a higher frequency of sleeping on the street compared to Lethbridge (40%) and Edson (27%). With the high cost of housing and the high proportion of respondents sleeping on the street, it was unsurprising to observe that Fort McMurray (62%) and Grande Prairie (62%) had the highest

proportion of respondents who reported experiencing unstable housing conditions compared to Lethbridge (55%) and Edson (48.2%). Although Grande Prairie was similar to Fort McMurray, related to housing issues, the substance use profiles in Grande Prairie differed significantly. For example, a substantially higher proportion of respondents in Grande Prairie reported consuming injection morphine (25%), injection heroin (25%), and non-injection GHB (15%) compared to the other cities.

This year, the Alberta Health Substance Use Surveillance Dashboard indicated Grande Prairie had the highest drug poisoning death rate at 68.2 per 100,000 in the province, followed by Lethbridge (63.9 per 100,000) in 2016 (Alberta Health, 2021). Although unintentionally overdosing from substance use does not always translate into death and does not accurately reflect the morbidity of substance use, Grande Prairie had the second-highest frequency of survey respondents who unintentionally overdosed (19%) compared to the other cities. Close to a quarter of respondents (25%) in Lethbridge reported unintentionally overdosing during the preceding six months, followed by Fort McMurray (14%), and Edson (13%).

Noticeably, there was a predominant use of non-injection crystal methamphetamine in Grande Prairie (64%), which was not clearly associated with respondents' type of sleeping locations. For example, more than half (64%) of respondents who reported owning or renting their own home also disclosed using non-injection crystal methamphetamine during the preceding six months. Furthermore, more than half of the respondents who reported staying with family (80%), friends (85%), on the street (85%), or in a hotel (67%) also reported consuming non-injection crystal methamphetamine during the preceding six months. These findings suggest that although substance use affects respondents differently, no specific kind of substance use appeared to predict or define a respondent's sleeping location or housing stability. In addition,

the higher use of non-injection crystal methamphetamine could reflect the current drug supply for stimulants in Grande Prairie. Crystal methamphetamine could be the most accessible or preferred substance amongst respondents in Grande Prairie to cope with labour-intensive tasks, to block out painful emotions, to provide euphoric effects, or to produce an intensive feeling of power (Papamihali et al., 2021).

Among 100 cities in Canada, Markusoff (2016) reported that Grande Prairie had the highest rates of non-violent and violent crimes such as drug violations, firearms use, impaired driving, fraud, and motor vehicle theft. Furthermore, the Statistics Canada measure of length of sentence served by those from Grande Prairie was triple the Canadian average (Markusoff, 2016). However, Grande Prairie ranked third in the number of respondents who reported sleeping in a corrections facility during the preceding six months. The highest frequency of respondents who reported sleeping in a corrections facility during the preceding six months was in Fort McMurray (44%), followed by Lethbridge (27%), Grande Prairie (26%), and Edson (18%). The high frequency of respondents sleeping in a corrections facility in Fort McMurray may be linked to the freezing temperature in northern Alberta and attempts to place publicly intoxicated respondents in the "drunk tank" for their protection. Nevertheless, the data did not determine whether respondents were incarcerated for a crime committed while intoxicated, for possession, or for resorting to alternative measures to find injection drugs. Thus, further exploration is needed to determine the relationship between mixed drug use and respondents in a correctional facility.

Lastly, compared to the other cities, more than half of respondents sleeping on the street in Fort McMurray (83%) and Grande Prairie (58%) also reported engaging in MDMA substance use compared to Edson (50%) and Lethbridge (33%) during the preceding six months. These

findings could be a result of greater drug availability and usage patterns in Grande Prairie. For example, the high usage of crystal methamphetamine may indicate the long working hours in the oil patch. In contrast, the high usage of MDMA could perhaps reflect some of the oil patch workers' desire to escape their cold, monotonous reality with a “party” drug during their time off.

Edson

In Edson, respondents ranged from 15 to 70 years, with the oldest median range of 41-45 years, and almost 70% of respondents were male. This age and gender distribution were unsurprising as the primary industries in Edson involved coal, oil, forestry, and farming. However, in this survey, respondents from Edson only accounted for 11% of the total survey population. Thus, some substance use and housing outcomes of respondents in Edson, which appear insignificant, could potentially be significant with a larger sample. In Edson, the median income was twice as high for males ($65,769) in private households than females ($29,385). Thus, the economic dynamic and higher proportion of younger working-age men could impact the demographic presentation of substance users and housing outcomes of respondents in Edson.

In this location, the average monthly shelter costs for rented dwellings were lower than the Alberta average ($1,124 vs $1,279) (Statistics Canada, 2017). The lower cost of housing in this small city could explain why a significantly higher proportion of respondents (75%) in Edson reported owning or renting a home, compared to Fort McMurray (51%), Grande Prairie (47%), and Lethbridge (46%). Interestingly, Edson had a significantly lower proportion (4%) of respondents who reported sleeping in a homeless shelter compared to Fort McMurray (78%), Lethbridge (65%), and Grande Prairie (41%) during the preceding six months. That said, Edson’s homeless shelter consists of only five small rooms at the back of a recycling center, which could explain why there was a low population of respondents in Edson who slept in a shelter (Riebe,

2021). Therefore, some respondents in Edson might have needed to access the homeless shelter but if the five rooms were occupied, they were left with no choice but to seek alternative sleeping locations.

Finally, over a quarter of the respondents (30.4%) in Edson reported using crystal methamphetamine via injection during the preceding six months. Limited availability of safe smoking supplies, user preference, or market supply could explain why a high proportion of Edson respondents reported engaging in injection crystal methamphetamine use compared to Grande Prairie (26%) and Fort McMurray (3.2%).

Substance Use and Housing Patterns across All Locations

In each city, distinct profiles of substance use and housing outcomes were observed, suggesting that substance use varies by city and that the market may influence the type of substances used. For example, non-injection crystal methamphetamine was significantly higher among respondents in Edson who reported sleeping in a home they rented or owned (95%), hotels (91%), on the street (93%), and in the hospital (80%) during the preceding six months. Furthermore, there was a higher use of non-injection oxyNEO among respondents who reported not sleeping during the night (50%) and respondents who reported sleeping in the hospital (67%). Third, the use of codeine was also strikingly high among respondents who reported not sleeping at night in Edson (75%) compared to Fort McMurray (49%), Lethbridge (30%), and Grande Prairie (13%).

There was also a significantly higher distribution of respondents consuming Percocet (29%) in Edson compared to Lethbridge (15%), Grande Prairie (10%), and Fort McMurray (3%). Lim et al. (2019) found that prescribed and non-prescribed opioid pills such as Percocet, morphine, or oxycontin significantly increased the risk of homelessness, incarceration, HIV risk,

and violence. Further investigation is warranted to determine the source of prescribed and diverted Percocet in Edson to reduce these adverse health outcomes. Additional exploration is also needed to see why Edson had the highest distribution of respondents sleeping in a hospital (80%) during the preceding six months compared to Lethbridge (76%), Grande Prairie (56%), and Fort McMurray (52%). This high distribution of respondents sleeping in a hospital in Edson could be associated with the lack of shelter space, leading to healthcare as a default solution for finding somewhere to house people and/or manage mental health and addictions needs.

More than half of the respondents in all four cities reported engaging in alcohol use (78%), polysubstance use (60%), and non-injection crystal meth use (60%) during the preceding six months. In addition, the top three sleeping locations for all survey respondents were sleeping on the street (45%), with family (41%), and in a home that was owned or rented (32%).

Respondents who engaged in polysubstance use were more likely to have slept in a correctional center (33%), on the street (52%), or in a hospital during the preceding six months (28%). These findings are consistent with other studies about people who engaged in illicit drug use (Hyshka et al., 2016; Morley et al., 2015). It is possible that polysubstance use is more likely among respondents sleeping on the street as they have fewer options available to them, or because they may seek a more intensive high to survive the brutal conditions of sleeping on the street.

A fundamental dilemma when examining polysubstance use is whether the patterns of use are shaped intrinsically (i.e. intrapersonal determinants or dynamics relating to the respondents) or extrinsically (i.e., extra-personal factors or dynamics such as drug markets, costs of drugs, or availability of drugs) (Patra et al., 2009). Sanders et al. (2008) found that the pharmacological interaction between a stimulant and a depressant drug is often conjointly sought

by respondents experiencing housing instability or homelessness, which some suggest is a normalized character of this population for a variety of reasons. This could explain why there is a higher prevalence of polysubstance use (particularly stimulant-opioid and depressant-based drugs) among respondents experiencing unstable housing (56%) and sleeping on the street (52%). Aside from polysubstance use, no significant type of substance use impacted the housing stability and sleeping location of respondents who reported homelessness. Thus, the current findings suggest that although some substance use and housing trends were observed, no single type of substance use could be definitively predictive of a respondent's sleeping location or housing stability.

When comparing overall substances used and housing outcomes, a significantly higher proportion of non-injection MDMA (60%) and codeine (48%) use was observed among respondents sleeping on the streets. Although, MDMA is considered a party drug for young adults, the findings suggest MDMA is not exclusive to college students and could be consumed by respondents sleeping on the street to manage their experience of past or present trauma, or to lose track of time spent sleeping in unfavorable conditions. Likewise, codeine is an opiate (narcotic) painkiller which could be used by respondents sleeping on the street to escape their current reality, to induce feelings of euphoria, or to treat underlying health symptoms.

In addition, a significantly higher proportion of injection crystal methamphetamine (53.2%), tranquillizers (60%), and fentanyl (48%) were observed among respondents staying with family. Methamphetamine is a powerful stimulant, and injecting methamphetamine can produce more intense and faster euphoric effects than by smoking. Therefore, a higher proportion of respondents staying with family could consume methamphetamine as it is a safer environment to engage in injection use, and it is easier to inject if smoking isn’t permitted and

the respondents have people to check on them. Tranquillizers could be used by respondents staying with family to combat insomnia, calm individuals living in stressful living environments, or perhaps to come down from a methamphetamine high. However, fentanyl could be sought by respondents needing a more potent painkiller to treat underlying pain or to experience happiness or relaxation that less powerful opioids cannot produce.

Over three-quarters of the respondents (77%) consumed over ten alcoholic beverages a week in the survey. The high prevalence of alcohol use concomitant with other substances is consistent with a Brache et al. (2012) study, which found that alcohol is often used by people who use drugs to manage cravings, alter their consciousness, or to enhance or alter their functioning.

Significant diversity was seen in our sample in terms of non-injection drug use. However, when comparing non-injection vs injection drug use, it is unclear the degree to which drug use patterns were related to pharmacodynamics, affordability, accessibility, or personal preferences. For example, it is unclear why some respondents preferred not to inject –perhaps due to the drug's effect on the body, to avoid the risks of injecting, due to an inability to find injection supplies, or to avoid the stigma associated with the injected drug (Novak & Kral, 2011). Finally, respondents pursuing a road to recovery might prefer engaging in substance use via non-injection routes to avoid being trigged by injection. From a harm reduction and recovery-oriented approach, every individual's road to recovery is different, and both approaches accept that abstinence may not always be a realistic or desirable goal for individuals (Alberta Health Services, 2020).

Research Question Findings

Are respondents' sleeping locations during the preceding six months related to their substance use? When comparing the relationship between alcohol, non-injection and injection drugs, and housing outcomes, non-injection depressant-based drugs and polysubstance drug use were associated with homelessness. For example, non-injection depressant-based drugs placed respondents at an almost 1.9 times (190%) higher risk of homelessness with a 95% CI (range from 1.2 times - 3.2 times), while polysubstance use was associated with an almost 1.7 times (170%) higher risk of homelessness with a 95% CI (range from 1.0 times – 2.1 times). In contrast, stimulant-based non-injection drug use predicted the presence of housing instability as respondents engaging in non-injection stimulants had an almost 2.9 times (288%) higher the risk of housing instability with a 95% CI (range from 1.2 times – 2.9 times). Based on this survey, respondents consuming multiple drugs simultaneously, opioid-based non-injection drugs, or depressant non-injection drugs were more at risk to experience homeless housing conditions during the preceding six months. Not all respondents who reported experiencing unstable housing conditions were homeless, as the perception of home or stable housing among the respondents could vary. However, the highest risk of housing instability was observed among homeless respondents at almost 4.0 times (400% higher) the risk of unstable housing with a 95% CI (range from 2.7 times – 6.0 times) compared to other sleeping locations.

Is the housing stability of respondents correlated to higher or lower substance use?

Several items from the DUDIT portion of the survey predicted housing problems. Addiction severity indicators such as not having an addiction disorder diagnosis, an irresistible craving for drugs, daily influence of drug use, binge use of non-injection drugs, and overdosing by accident were significantly associated with housing instability or homelessness. This indicates

the severity of homelessness or housing stability could be associated with how dependent an individual is on their preferred substance, i.e., an individual could experience greater housing stability or more extended periods of homelessness based on these indicators. These findings are consistent with Cheng et al. (2013) who illustrated that binge use of non-injection drug use is significantly associated with housing instability among substance users. While some respondents with an addiction or mental health diagnosis reported seeking professional help, the very nature of addiction and mental health problems tended to impede a respondents' motivation or ability to remain housed or seek treatment (Daiski, 2007). Perhaps, these findings could reflect a difficulty navigating social and health programs among respondents experiencing unstable housing conditions and homelessness.

When exploring if a respondent's sleeping location is associated with higher or lower substance use, binge use of non-injection drugs to a greater degree than usual was significantly associated with respondent sleeping in homeless conditions, corrections, or an institutional facility. However, the strength of these associations was relatively small (V =.179), and other sleeping locations were non-significant, suggesting housing is not strongly correlated with a respondent's frequency of substance use. For example, close to half (43%) of respondents renting their own home or apartment reported a binge use of more than usual non-injection drug use. Interestingly, a higher proportion (65%) of respondents who reported engaging in more than usual binge use of non-injection drug use also reported experiencing housing stability. These findings suggest that a respondents' sleeping location does not guarantee or equate to stable housing conditions, and respondents who have to keep looking for places to sleep might not consider their housing situation very stable.

When exploring other housing factors, those with an undiagnosed addiction disorder

experienced a 1.5 times (150%) higher risk of unstable housing with a 95% CI (range from 1.0 times – 2.2 times). Having an undiagnosed mental health disorder approximately doubled (2.1 times higher, 210%) the risk of unstable housing with a 95% CI (range from 1.4 times – 3.2 times). In addition, respondents who had experienced a substance use overdose in the preceding six months had an almost 1.8 times (180%) higher risk of unstable housing. Interestingly, attending a treatment or detox program did not significantly predict respondents' housing stability. These findings could suggest that respondents with unstable housing accessing treatment face the same housing conditions after leaving treatment or a detox program.

Limitations to the Current Study

The current study contributes to a greater understanding of the patterns of substance use and housing difficulties experienced in the four surveyed Alberta communities. Inferential statistics have also provided some clues as to possible significant associations between substance use and housing instability among the survey respondents; however, it should be noted that the small effect sizes associated with many of these associations and the relatively small amount of variance (adjusted R^2/Nagelkerke R^2) accounted for in the developed regression models suggest that substance use only accounts for a small component of the variance in housing outcomes measured in this survey. There are clearly additional contributing variables that are not included in the model because these data were not available in the current study. Perhaps most notably is the lack of socio-demographic data that could speak to the broader social determinants of health that these substance users experienced. Housing outcomes may be greatly affected by things such as income level, social support networks, harm reduction programming and treatment availability, access to housing models. the broader socio-economic profiles of the community of residence, the presence of systemic racism (e.g., towards Indigenous peoples), which may limit

housing options, and the availability and accessibility of health care services to support mental health and addictions treatment. Therefore, the commonly stated assumption that people are homeless because of their substance dependence alone may not hold water in many cases.

While the overall sample size (n=531) was reasonably large, the sample size dropped significantly in some analyses, which ultimately affected the power to identify statistically significant associations and differences in some cases. Therefore, it is possible that some non-significant differences and associations might reach statistical significance in the presence of a larger sample, especially at the community level of analysis.

This study was cross-sectional, thus limiting the ability to infer the causality of the observed relationships (Rindfleisch et al., 2008). For example, substance use in general, and specifically polysubstance use, can be linked to many independent variables which were unexplored in this survey; therefore, they could not be included in the analysis. Possible influencing variables may consist of income, education, and adverse childhood experiences, among others. Thus, the small effect sizes and low r^2 values in the generated regression models suggest that housing stability and homelessness cannot be accurately determined solely based on respondents' substance use.

Furthermore, during a survey questionnaire, a response bias might have caused respondents to curate their responses to please the interviewer (McCambridge et al., 2014). Also, while typically, the findings used to recruit a hidden population of respondents who use illicit substances cannot be generalized to a representative and general sample, a respondent-driven sampling approach accurately represents the people who use drugs in all four Alberta communities.

Another limitation of this study is that the data analyzed were based on self-report.

Hence, there is no way for this study to verify and scrutinize the objectivity and accuracy of the information presented by the respondents, although multiple studies have confirmed high levels of validity from illicit substance users presenting self-reported information (Abdesselam et al., 2020; Ashrafi et al., 2018; Darke, 1998; Hjorthøj et al., 2012). In addition, some of the variables were analyzed based on binary (rather than continuous) prevalence within the preceding six months. Due to binary categorization of some main variables, some results might be skewed as respondents may have been in more than one category. As well, the power of the regression analysis was potentially decreased by the numerous classes of substance use included in the model. Thus, some drug classes described as non-significant might have proved significant if there was a larger sample.

Finally, these data were primarily based on the six months immediately preceding the survey, which do not reflect longitudinal trajectories or trends in substance use, housing instability and homelessness among respondents. In addition, the researcher did not have access to data that indicated the composition of drugs in circulation, which may have been a leading cause of overdoses. Lastly, some parametric tests were computed despite assumptions being violated as there was no equivalent non-parametric method. As a result, some of the findings should be interpreted with caution.

Recommendations for Future Research

Based on these findings, future research is needed to explore several key areas. A solid systematic investigation is required to explore the determinants and dynamics of why people use and combine specific drugs based on their user experiential data and preferences. For example, it is essential to determine the degree to which respondents' substance use choices are intrinsically (individually modifiable) or extrinsically (system or policy modifiable) determined. In addition,

there is a need for approaches that integrate treatment and housing for respondents engaging in substance use and experiencing housing instability. A longitudinal study is required to examine the drug use among Albertans and clarify the nature of the relationships between the social determinants of health, homelessness, and housing instability. It would be helpful to collect additional variables related to the social determinants of health to explore the interaction between them and substance use in the respondent's ultimate housing. Lastly, drug checking services across the province would provide important covariate data for future studies linking housing with substance use.

Conclusion

Interestingly, a significantly higher proportion of respondents reported engaging in non-injection drug use compared to respondents engaging in injection drug use. This finding could explain why non-injection crystal methamphetamine was more prevalent among different sleeping locations than injection crystal methamphetamine drug use. In addition, over three-quarters of respondents engaging in non-injection crystal meth use also reported sleeping at a friend's place, with family, on the reserve, corrections, and couch surfing in the preceding six months.

Although close to a quarter of respondents in the survey reported engaging in codeine use, a higher proportion of codeine was observed among different sleeping locations. For example, more than half of the respondents sleeping with family, on the street, and hospital reported engaging in codeine drug use in the preceding six months. In contrast, a higher proportion of respondents sleeping on the street reported using MDMA compared to the other sleeping locations.

These findings may suggest that although there may be trends in substance use, specific

kinds of substance use are not exclusive to a housing instability. However, respondents sleeping on the street may not have the luxury of choice as multiple substance use profiles were observed among this group. For example, respondents who reported sleeping on the street reported slightly higher rates of polysubstance use, MDMA, crystal methamphetamine and injection crystal methamphetamine compared to respondents who did not sleep on the street in the preceding six months.

The survey findings correlate to Bardwell et al. (2017) study that found an association between housing instability and overdoses. Similarly, Strang (2003) found an increase in overdose mortality among respondents who had attended inpatient opiate detoxification programs. In Alberta, there is a significant incidence of mortality, hospitalization and harm related to opioid overdoses (Sharma et al., 2020). As a result, policy support is needed to assist substance users leaving a detox facility to acquire or maintain stable housing. Thus, future research is warranted to explore overdosing prevention interventions' efficacy in improving housing stability among respondents engaging in non-injection and injection substance use.

The high frequency of substance use and varying substance use profiles reported in this survey indicate that Alberta's drug use scene has evolved and is becoming more complex as Alberta is facing a substance use-related health crisis with more Albertans dying each year from drug overdoses than at the height of the HIV/AIDS epidemic (City of Lethbridge, 2019). The different drug use profiles evident from this survey could be attributed to multiple factors: supply and demand of drugs, economic problems, income levels, fluctuations in drug availability, personal drug choice, access to equipment for drugs or supervised consumption facilities, and overdoses. Consequently, most of these results illustrated a predominant use of two or more distinct substance use profiles (stimulant-based non-injection drug use and depressant-based non-

injection and injection opioid drugs). These findings accentuate a prevailing dynamic of polysubstance compared to mono-drug use among respondents in our study.

APPENDIX: Datapoints of Interest

Variable Name	**Question/ Description**	**Label or Values**	**Purpose**	**Comments**
Age	How old are you?/ Age	1 = 15-20 2 = 21-25 3 = 26-30 4 = 31-35 5 = 36-40 6 = 41-45 7 = 46-50 8 = 51-55 9 = 56-60 10 = 61-65 11 = 66-70 12 = 71-75 13 = 76-80 15 = 81-85 16 = 86-90 17 = 91+ 99 = Refused*	Is there a relationship between age and substance use? Housing stability?	Check distribution.
Gender	What is your gender?/ Reported Gender	1 = Male 2 = Female 3 = Trans 66 = Other 98 = Don't know* 99 = Refused	Does gender influence substance use and/or housing instability or location of "where you slept last night?"	Evaluate "66, 98, and 99" for trends and if these can be merged into the other 3 categories.
Ethnic	What ethnic group or family background do you most closely identify with?/ Ethnicity		Does ethnicity influence substance use and/or housing instability or location of "Where did you sleep last night?"?	Combine small groups – e.g. Middle Eastern – with other similar or just make an "other" category – don't want to doxx people who are rare.
City	From which site/city are you reporting?/ City/Town	1 = Edson 2 = Fort McMurray 3 = Grand Prairie 4 = Lethbridge	Is city correlated to substance use patterns (i.e. regional differences in preferred substances) or to housing instability?	Check distribution.
Housing	In the past 6 months, what types of places have you slept in?/ Sleeping Location	1 = Own apartment/ house 2 = Hotel/ furnished room/ boarding room 3 = Transition Housing 4 = Shelter/hostel 5 = Friends place 6 = With a family member 7 = Camps (squatting) 8 = Working out of town (rigs/work camp) 9 = Reserve or settlement 10 = Couch Surfing	Does what type of place you slept in the past six-month influence substance use?	Check regression.

		11 = Detox 12 = Jail/prison 13 = Hospital 14 = Street (sleeping rough) 66 = Don't sleep (walk all night) 98 = Don't know* 99 = Refused*		
Housing Stability	How would you describe your current housing situation?/ Housing Situation	1 = Very unstable 2 = A little unstable 3 = Neither unstable nor stable 4 = A little stable 5 = Very stable 98 = Don't know* 99 = Refused*	Is housing stability correlated to higher or lower substance use?	Check distribution.
Drink1	How often do you have a drink containing alcohol?/ Frequency of Alcohol Ingestion	0 = Never 1 = Less often than once a month 2 = 2-4 times a month 3 = 2-3 times a week 4 = 4 or more times a week 98 = Don't know* 99 = Refused*	What is the relationship between alcohol use and housing stability? What is the relationship between alcohol use and polysubstance use?	Binary categorize alcohol cases; (0 = no alcohol, 1 = alcohol use).
Drink3	How often do you have six or more drinks on one occasion? Frequency of Higher Levels of Alcohol Ingestion	0 = Never 1 = Less often than once a month 2 = Monthly 3 = Weekly 4 = Daily or almost daily 98 = Don't know* 99 = Refused*	What is the relationship between binge drinking and housing security?	Check distribution.
Drink5	In the last 6 months, did you drink cooking wine/rubbing alcohol/ mouthwash/ or cologne?/ Ingestion of Unconventional Types of Alcohol	1 = Yes 2 = No 98 = Don't know* 99 = Refused*	What is the relationship of non-palatable to housing security? To other substance use?	Check distribution.
Drink6	How often?/ Frequency of Alcohol Ingestion	1 = Once a month or less 2 = 2-4 times a month 3 = 2-3 times a week 4 = 4 or more times a week 98 = Don't know* 99 = Refused*	Does the frequency in use of non-palatable influence housing stability? Does any impact differ from regular drinking alcohol? Substance use?	Check regression.
DUDIT1	How often do you use drugs other than	0 = Never (This will end the survey) 1 = Once a month or less	What is the relationship between polysubstance use	Categorize polysubstance use cases.

	alcohol?/ Frequency of Other Drugs Besides Alcohol	often 2 = 2-4 times a month 3 = 2-3 times a week 4 = 4 or more times a week 98 = Don't know (This will end the survey) * 99 = Refused (This will end the survey)*	and housing stability? How does this relationship compare to that of alcohol?	(0 = no polysubstance use; 1 = polysubstance use) Compare with drink: 1. Does DUDIT 1 or Drink1 have a more significant impact on housing and housing stability?
DUDIT2	Do you use more than one type of drug on the same occasion?/ Concurrent Use of More than One Type of Drug	0 = Never (This will end the survey) 1 = Once a month or less often 2 = 2-4 times a month 3 = 2-3 times a week 4 = 4 or more times a week 98 = Don't know (This will end the survey)* 99 = Refused (This will end the survey)*		
DUDIT3	How many times do you take drugs on a typical day when you use drugs?/ Frequency of Drug Use per Day	0 = Never 1 = 1-2 times 2 = 3-4 times 3 = 5-6 times 4 = 7 or more 98 = Don't know* 99 = Refused*	Does the frequency of polysubstance use influence housing and/or housing stability? For example, is there a relationship between frequency of drug use vs alcohol use?	Check regression.
DUDIT 4	How often are you influenced heavily by drugs? (e.g. How often do you get high on drugs other than alcohol?) Frequency of Heavy Drug Use (aside from Alcohol)	0 = Never 1 = Less often than once a week 2 = Every month 3 = Every week 4 = Daily or almost every day 98 = Don't know* 99 = Refused*	Does lower or higher polysubstance use correlate to housing and/or housing instability?	Check distribution.
DUDIT 7	How often over the past year have you taken drugs and then neglected to do something you should have done?/ Significant Effects of Taking Drugs	0 = Never 1 = Less often than once a month 2 = Less often than once a week 3 = Every week 4 = Daily or almost daily 98 = Don't know* 99 = Refused*	Does neglect due to substance use correlate to housing insecurity?	Check distribution.
Ni.6mths	Have you used any NON-	1 = Yes 2 = No	Does non-injection drug use correlate to	Categorize cases as

	injection drugs in the How often have you used drugs during the last 6 months?/ Frequency of Non-Injection Drugs	98 = Don't know* 99 = Refused*	housing insecurity? How does non-injection drug use compare with injection drug use in terms of housing insecurity?	1 = yes to non-injection drugs; 2 = no non-injection drug use.
Ni.Drugs	In the last 6 months, when you were using, which of the following NON-injection drugs did you use? For pharmaceutical drugs, I mean prescription drugs that you take without a prescription from a doctor or for non-medical reasons./ Names of Non-Injection Drugs Used	1= Barbiturates (barbital) 41 = Carfentanil 2 = Cigarettes 3 = Cocaine (sniffed or snorted) 4 = Codeine 5= Crack cocaine 6 = Crystal meth (smoked) (pint, speed,) 7 = Demerol 8 = Ecstasy 9 = Fentanyl 10 = Gasoline 11 = GHB 12 = Glue (sniffed) 13 = Goofballs 14 = Heroin (smoked) 15 = Heroin (sniffed or snorted) 16 = Hydrocodone (Vicodin) 17 = Hydromorphone (hydros), Dilaudid (dilly's) 18 = Ketamine (Special K) 19 = LSD 20 = Marijuana, hash 21 = MDMA 22 = Mescaline 23 = Morphine (kadians, greys, pinks) 24 = Mushrooms 25 = Nitrous oxide 26= Oxycodone (sometimes also referred to as Percs) 28= OxyNEO 29 = Paint 30 = PCP/angel dust 31 = Percocet (Oxycodone + Acetaminophen) 32 = Poppers 33 = Ritalin 34 = Speedballs 35 = Street methadone 36 = SXM 37 = Talwin 38 = Tranquilizers (Sedatives, Xanax, Ambien, sleeping pills, benzos, etc.)	Which drug is most strongly correlated to housing insecurity?	Categorize drug classes into groups: 1. <u>Hallucinogens & Inhalants</u>, including: Glue (sniffed) PCP/angel dust, LSD, Gasoline, Paint, Ketamine (special K), Mescaline, Mushrooms, Nitrous Oxide, or MDMA. 2 = <u>Opioids</u> Heroin (smoked) Heroin (sniffed or snorted) Fentanyl Percocet (Oxycodone + Acetaminophen) Carfentanil Hydrocodone (Vicodin) Demerol Goofball Hydromorphone Morphine Oxycodone (percs) OxyNEO 3 = <u>Stimulants</u> Cocaine (sniffed or snorted) Crack Cocaine Ecstasy Talwin Ritalin Crystal Meth 4 = <u>Depressants</u> GHB Barbiturates Poppers Tranquillizers

		39 = Valium 40 = Wellbutrin 66 = Other 67 = Other 98 = Don't know* 99 = Refused*		(Sedatives, Xanax, Ambien, sleeping pills, benzos, etc.) Valium Wellbutrin Codeine Street Methadone 5 = <u>Other</u> Marijuana/hash SXM Cigarettes Other (66) Other (67) Speedballs Serroquel Gravol Prozac Dexedrine Darvon Gabapentin W18 Check distribution.
Ni.Frequ	How often did you use that drug?/ Frequency of Non-Injection Drug	5 = Daily 4 = A few times a week 3 = Once week 2 = A few times a month 1 = Once a month 98 = Don't know* 99 = Refused*	Does the frequency of non-injection drug use correlate to housing instability? Is the *drug* or the *frequency* the predictor of instability?	Check distribution.
Ni.Binge	In the last 6 months, did you go on any runs or binges (that is, when you used injection drugs more than usual)?/ Binges of Injection Drugs	1 = Yes 2 = No 98 = Don't know* 99 = Refused*	Does bingeing non-injection drugs correlate to housing insecurity?	Check distribution.
Ni.Binge.a	How many times did you binge?/ Frequency of Binges	0 = 1 = 2 = 3 = 4 = 5 = 6 = 7 = 8 = 9 = 10 =	Does lower or higher bingeing of non-injection drug use correlate to housing insecurity?	Check distribution.

		11 = 12 = 13 = 14 = 15 = 16 = 17 = 18 = 19 = 20 = 21 = 22 = 23 = 24 = 25 = 26 = 27 = 28 = 29 = 30 = 31+ = 98 = Don't know* 99 = Refused*		
Inj.6mnths	Have you used any injection drugs in the last 6 months?/ Use of Injection Drugs in the Previous 6 Months	1 = Yes 2 = No 98 = Don't know* 99 = Refused*	Does injection drug use correlate to housing insecurity?	Categorize injection drug users as binary. 0= no injection drug use 1= Injection drug use in the past 6months
Inj.Drug	In the last 6 months when you were using, which of the following drugs did you inject? Please note when I mention prescription drugs, I mean ones that you inject without a prescription from a doctor or for non-medical reasons)./ Names of Drugs Used	1 = Barbiturates (barbital) 2 = Carfentanil (elephant tranquilizer) 3 = China White (3) 4 = Cocaine 5 = Codeine 6 = Crack cocaine 7 = Crystal meth (pint, speed,) 8 = Demerol 9 = Ecstasy 10 = Fentanyl 11 = GHB 12 = Goofball (heroin & crystal meth) 13 = Heroin 14 = Hydrocodone (Vicodin) 15 = Hydromorphone (hydros), Dilaudid (dilly's) 16 = Ketamine (Special K) 17 = LSD 18 = MDMA 19 = Mescaline 20 = Methadone	Does the drug class of injection substance use correlate to housing insecurity?	Categorize drug classes into groups: 1 = <u>Hallucinogens & Inhalants</u> PCP/angel dust, LSD, Ketamine (special K) Mescaline Nitrous Oxide MDMA Poppers 2 = <u>Opioids</u> Heroin Fentanyl Percocet (Oxycodone + Acetaminophen) Carfentanil Hydrocodone (Vicodin) Demerol Goofball Hydromorphone

		21 = Morphine (kadians, greys, pinks) 22 = Nitrous oxide 23 = Oxycodone (sometimes also referred to as Percs) 24 = OxyContin 25 = OxyNeo 26 = PCP/angel dust 27 = Percocet (Oxycodone + Acetaminophen) 28 = Poppers 29 = Ritalin 30 = Speedball (heroin & cocaine) 31 = Steroids 32 = Street Methadone 33 = SXM 34 = Talwin 35 = Tranquilizers (Sedatives, Xanax, Ambien, sleeping pills, benzos, etc.) 36 = Valium 37 = W18 38 = Wellbutrin 66 = Other 98 = Don't know* 99 = Refused*		Morphine Oxycodone (percs) OxyNEOSpeedballs China White Carfentanil (an elephant tranquillizer) Methadone Street Methadone 3 = <u>Stimulants</u> Cocaine (sniffed or snorted) Crack Cocaine Ecstasy Ritalin Talwin Crystal Meth 4 = <u>Depressants</u> GHB Barbiturates Tranquillizers (Sedatives, Xanax, Ambien, sleeping pills, benzos, etc.) Valium Wellbutrin Codeine 5 = <u>Other</u> SXM Other (66) Other (67) Steroids Speedball W 18 Non-beverage alcohol Check regression
Inj.Binge	In the last 6 months, did you go on any runs or binges (that is, when you used injection drugs more than usual)?/ Binges in the Previous 6 Months	1 = Yes 2 = No 98 = Don't know* 99 = Refused*	Does bingeing injection drugs correlate to housing insecurity?	Check distribution.
Inj.Binge.a	How many times did you binge?/	0 = 1 = 2 =	Does the frequency binge use of injection drugs	Compare with Ni.Binge.a. to explore if Inj.Binge.a

	Total of Binge Episodes	3 = 4 = 5 = 6 = 7 = 8 = 9 = 10 = 11 = 12 = 13 = 14 = 15 = 16 = 17 = 18 = 19 = 20 = 21 = 22 = 23 = 24 = 25 = 26 = 27 = 28 = 29 = 30 = 31+ = 98 Don't know * 99 Refused *	correlate to housing insecurity?	or Ni.Binge.a led to more significant or fewer housing challenges. Check distribution.
OD6mths	In the last 6 months, have you overdosed by accident (i.e. where you had a negative or unintended reaction from using too much drugs)?/ Experiences of Overdosing	1 = Yes 2 = No 98 = Don't know* 99 = Refused*	Is there a relationship between overdoses and insecurity? i.e. Is overdose a predictor of housing insecurity/loss? Is it a proxy measure? Is Is bingeing or overdosing a better predictor of housing insecurity?	Compare with Inj.Binge & Ni.Binge.a. Does overdosing have a greater or lesser influence on housing and/or housing stability? Check distribution.
OD.6mthsFrequ	How many times did you overdose?/ Frequency of Overdose	1 = 1 2 = 2 3 = 3 4 = 4 5 = 5 6 = 6 7 = 7 8 = 8 9 = 9 10 = 10 11 = 11 + 98 = Don't know* 99 = Refused*	Is there a relationship between overdoses and insecurity? i.e. Is overdose a predictor of housing insecurity/loss? Is it a proxy measure?	Check distribution.

MHaddict	Has a health professional ever told you that you have an addiction?/ Informed of an Addiction	3 = Yes, in the past 12 months 2 = Yes, but not in the past 12 months 1 = Yes (only if unable to specify time period) 0 = No 98 = Don't know* 99 = Refused*	Does a formal diagnosis of addiction have any relationship to housing insecurity or a degree of perceived illness?	Check distribution.
MHdisorder	Has a health professional ever told you that you have a mental disorder?	3 = Yes, in the past 12 months 2 = Yes, but not in the past 12 months 1 = Yes (only if unable to specify time period) 0 = No 98 = Don't know* 99 = Refused*	Does a formal mental health diagnosis have any relationship to housing insecurity or degree of perceived illness?	Compare with MHaddict. Does MHaddict or MHdisorder have a lesser or greater influence on housing and/or housing stability? Compare means
MHaddict.a	Do you think you have ever had an addiction problem that has not been diagnosed by a professional? By addiction problem, I mean misuse of things like alcohol, street drugs, or prescription medications to get high or engaging in behaviors like gambling, sex, or work in a way that creates problems in life?	3 = Yes, in the past 12 months 2 = Yes, but not in the past 12 months 1 = Yes (only if unable to specify time period) 0 = No 98 = Don't know* 99 = Refused*	Does having an undiagnosed substance use addiction influence housing and/or housing stability? Also, explore the degree to which people think they have a problem that a professional has not diagnosed. Do only the 'really sick' get a diagnosis? And are the 'really sick' more likely to be homeless?	Compare with MH addict. Does having a diagnosed or an undiagnosed addiction to substance use correlate to greater or fewer housing challenges?
MHdisorder.b	Do you think you have ever had a mental health problem that has not been diagnosed by a professional?	3 = Yes, in the past 12 months 2 = Yes, but not in the past 12 months 1 = Yes (only if unable to specify time period) 0 = No 98 = Don't know*	Does having an undiagnosed substance use addiction influence housing and/or housing stability? Also, explore the degree to which	Compare with MHadi/lct.a. Does an undiagnosed mental health disorder or an undiagnosed addiction to

		99 = Refused*	people think they have a problem that a professional has not diagnosed.	substances correlate to more significant or fewer housing challenges? Compare means and check distribution.
TreatEVER	Have you ever been in a substance use treatment program such as detox, AA, NA, inpatient treatment, recovery house, etc.? (not methadone or suboxone)	1 = Yes (only if unable to specify time period) 0 = No 98 = Don't know* 99 = Refused*	Is there a relationship between substance use treatment and housing security?	Categorize as 0 = No to substance use treatment program. 1 = Yes to substance use treatment program.
TreatFrequ	How many times have you been in treatment before?	1 = 1 time 2 = 2-3 times 3 = 4-5 times 4 = 5-8 times 5 = 8 or more times 98 = Don't know* 99 = Refused*	Does the number of times in treatment influence housing security?	Check distribution.
TreatOpioid	Have you ever been in an opioid dependency treatment program that include taking methadone or suboxone?	1 = Yes (only if unable to specify time period) 0 = No 98 = Don't know* 99 = Refused*	Is there a relationship between enrollment in an opioid dependency program and housing security?	Compare with TreatEVER. Does substance abuse treatment or opioid dependency treatment programs correlate to fewer or more significant housing challenges? Compare means and check distribution.
TreatOpioid.a	Are you in this type of program right now?	1 = Yes (only if unable to specify time period) 0 = No 98 = Don't know* 99 = Refused*	Is there a relationship between current enrollment in an opioid program and housing security?	Check distribution.

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