# Understanding the Link Between Housing, Socioeconomic Status, and Drug Dependence in Edmonton

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# Introduction

The COVID-19 pandemic has caused extensive social and economic upheaval, affecting the lives of Canadians and introducing various sources of stress. In addition to the increase in mortality from communicable diseases, the long-lasting socioeconomic uncertainty continues to reveal its effects on public health. Many pandemic-related stressors led to increases in substance use among Canadians since March 2020 (Canadian Centre on Substance Use and Addiction, 2022). Coupled with this is a noticeable difficulty in accessing housing, especially for individuals with substance use disorders and those experiencing homelessness (Galarneau, 2021). Substance use entails the recurrent consumption of alcohol or illicit substances and the improper use of over-the-counter or prescription medications. The use of these substances, whether illicit or not, has become a pressing concern for public health and sociology, representing a significant risk factor for various health issues and premature mortality (Henderson *et al*.; 2021; Rehm & Probst, 2018).

Similar to other social phenomena, substance use varies with socioeconomic status (SES) which encompasses social and economic measures, including employment, education, income, resource access, and relative social position, although directionality remains unclear (Baker, 2014; Nicholson, 2020). Among these, housing is a crucial yet often under-researched component, where a disproportionate percentage of people with substance use disorder (SUD) also experience homelessness to varying degrees (Henderson *et al*., 2021). This project investigates the following questions: What is the relationship between housing and current trends of illicit drug use within Edmonton's inner city? How have general trends in illicit substance use

changed with the COVID-19 global pandemic? Finally, how are different dimensions of housing, like accessibility and stability, associated with the severity of illicit drug use?

My goals for this project were to understand how and to what extent substance use is linked to housing accessibility and stability at the intersection of the COVID-19 pandemic and opioid epidemic. The project aimed to bridge the gap between theoretical frameworks and applied research to address the needs of vulnerable populations disproportionately affected by the pandemic. To achieve these goals, I analyzed survey data provided by the Canadian Research Initiative in Substance Misuse (CRISM) and Inner City Health and Wellness Program (ICHWP), collected by Dr. Elaine Hyshka and her team at the University of Alberta. The dataset used for this study was comprised of 450 participants, most recruited from Edmonton's inner city. The survey predominantly covers sociodemographic factors like housing, income, substance use, and access to safe supplies. Guided by a Social Determinants of Health (SDOH) perspective and its connection to illicit drug use, I used linear and logistic regression models with descriptive statistics to examine the relationships between current housing status, housing stability, housing accessibility, and substance use for people who use drugs (PWUD).

At the end of this study, there were several key findings to note. One, there was a statistically significant relationship between whether or not participants had current access to housing when controlling for education and income levels. Participants who did not currently have access to housing were more likely to have more severe patterns of illicit drug use. Two, the association between participants' reported housing stability and their severity of drug use was also statistically significant. Participants who reported lower stability were associated with

higher severity of illicit drug use. Third, when it came to investigating housing under pandemic conditions, participants who reported finding housing more difficult to access were associated with higher scores for the severity of illicit drug use. Finally, there was a statistically significant association between participants who experienced a change in their living situation during the COVID-19 pandemic and an observed change in their drug use. Participants who reported a change in their living situation during the pandemic were also associated with an increase in illicit drug use. All results for this study were statistically significant at the 95% confidence level.

Based on the results of this study, some recommendations that could possibly be made is more access to safe and stable housing, especially during major public health crises such as the drug poisoning crisis and the COVID-19 pandemic, as well as reframing housing to be a method of harm reduction that aims to target structural inequities in health outcomes. When considering the complex needs of PWUD, housing is a necessity towards alleviating the burden of disease and the strain on public health services.

# Background Research

## 2.1: Understanding the role of theory: Social Determinants of Health

Social Determinants of Health (SDOH) refer to the social and economic conditions that affect the health status of individuals and groups (Marmot, 2005). The World Health Organization (WHO) has highlighted that the social conditions in the settings where individuals are born, live, learn,

and work, affect a variety of health, functional, and quality-of-life outcomes (World Health Organization, 2008).

SDOH includes both upstream and downstream social determinants (Braveman, 2011). Downstream SDOHs are factors that are proximally close to health effects and, thus, more likely to be apparent. Upstream SDOHs are broad fundamental causes that establish causal pathways that lead to health outcomes via downstream SDOH. Upstream SDOHs are more complicated to affirm as they are less readily apparent and, as a result, are considerably more complex. The WHO (2008) and Braveman (2011) highlight a few trends concerning upstream SDOH. First, they demonstrate that health-related behaviours and recommended medical care do not occur in a vacuum and are shaped by upstream SDOH related to living and working conditions. Furthermore, health is also shaped by social and economic resources that impact access to ideal living and working conditions and choices (World Health Organization, 2008).

Certain social factors can function as SDOH because they are connected to a wide range of resources that can be leveraged to enhance health directly and indirectly (Braveman, 2011). In the Canadian context, Bryant *et al.* (2011) identified specific social factors such as income, education, housing, and Aboriginal status as SDOH in need of addressing health inequity. Housing is an especially important social determinant of health because Canada has undergone "significant policy shifts" that have led to a housing crisis and rising rate of people experiencing homelessness within Canada (Bryant *et al.,* 2011, p. 47). In addition, income is also a key determinant of health. It directly affects health-related inequalities and indirectly impacts the "material and social deprivation associated with lack of income," which contributes to

health-related inequalities (Bryant *et al.,* 2011, p. 47). The effects of housing and income inequality have become increasingly apparent since the initial publication of this study. With the rise of two major health crises, the COVID-19 pandemic and the drug poisoning crisis, Social Determinants of Health are essential in addressing and alleviating the burden of disease caused at the intersection of both health crises.

Although the availability of drugs is a contributing component to the current drug poisoning crisis in Canada and the United States, the drug poisoning crisis is also a consequence of social and economic factors with certain classes of drugs, such as opioids, playing a crucial role in providing relief from "psychological and physical trauma, concentrated disadvantage, isolation, and hopelessness" (Dasgupta *et al.,* 2018, p. 182). Dasgupta *et al.* (2018) also found that poverty and substance use issues "operate synergistically," which at the extreme ends of the spectrum are underpinned by mental health issues and unstable housing, causing drug poisonings and overdoses to be especially concentrated among lower SES communities (Dasgupta *et al.,* 2018).This study's authors concluded that for any improvements to be made in the current drug poisoning crisis, the SDOH dynamics must be addressed.

For this project, the focus will primarily be on housing as  a social determinant of health and especially its association to current trends of illicit substance use among people experiencing homelessness in Edmonton's inner city. Specifically, my project will investigate the link between housing as an SDOH and illicit substance use within the context of the COVID-19 pandemic. More broadly, the project will also examine the link between housing and severity of illicit drug

use by using the social determinants of health as the main theoretical framework guiding this research project.

The classification of diseases of despair encompasses a wide range of mortality causes, reflecting accidental deaths from poor mental health, often associated with economic stagnation. Deaths of despair often include suicide, drug overdoses, or liver failure (Case & Deaton, 2017). Deaths of despair, such as morbidities in the context of the drug poisoning crisis and illicit polysubstance use, are on the rise in populations where they were previously less common (Case & Deaton, 2017; Addorisio *et al.,* 2021). In Edmonton specifically, many who live in precarious conditions due to unstable housing or homelessness often report having problems with mental health in addition to or as a cause for illicit substance use (Addorisio *et al.,* 2021). Coupled with this, and as a pre-condition for SES as SDOH is the concurrence of other comorbidities such as Human Immunodeficiency Virus (HIV) and Hepatitis C (Jenkins *et al.,* 2021), which often stem from unsafe drug administration due to lack of access to clean supplies and environment (Addorisio *et al.,* 2021; Jenkins *et al.,* 2021).

In essence, socioeconomic status (SES) can influence individuals' health through pathways connected to mental well-being and access to resources needed to treat or, better yet, prevent morbidities and early mortality. As a result, even with substantial evolutions in healthcare, these advances have done little to reduce healthcare disparities because the social determinants of health that have influenced the current rise in illicit substance use, like housing and income, have yet to be addressed. Unfortunately, current interventions for the drug poisoning crisis have failed to address the current etiological realities of the epidemic, which have

historically marginalized the voices of those with lived experiences. Every instance of death of despair has been a consequence of a long and prevailing series of policy failures and missed opportunities for harm reduction (Park *et al.,* 2020).

## 2.2: Housing as a Social Determinant of Health

Housing is a physical manifestation of one's socioeconomic status and is crucial in explaining health disparities' social origins (Braveman, 2011; Bryant, 2011; Nicholson, 2020). Lack of housing, or homelessness, can be viewed as a continuum of unstable housing, from people sleeping in tents, parks, and temporary shelters to those living in poor housing and couch surfing (Addorisio *et al.,* 2022). Considering homelessness shows that housing affordability is a complex social issue beyond simply owning or renting property.

The majority of people experiencing homelessness within Alberta are also vulnerable to a host of other issues outside drug poisonings, including increased likelihood of criminalization (Gehring *et al.,* 2022) and other mental illnesses (Addorisio *et al.,* 2022). Without access to stable housing, finding resources for treating conditions like substance use disorder (SUD) becomes incredibly difficult. For instance, Huntley (2015) compared substance abuse severity among unhoused and housed adults in the Baltimore area and found that homelessness and mental health status are significant predictors of substance abuse in adults. In addition to homelessness, the mental health condition of adults is a strong predictor of the intensity of substance abuse (Huntley, 2015). In this case, intervening mechanisms due to SES affect disease outcomes.

The trend is also consistent within the Albertan context, where Alberta has the highest unhoused population per capita in Canada (Addorisio *et al.,* 2022) and experiences some of the

highest rates of opioid-related deaths, emergency room visits, and hospitalizations (Milaney *et al.,* 2021). Milaney *et al*. (2021) surveyed 813 residents in Calgary, Red Deer, and Medicine Hat, where most residents reported being unstably housed. They found that individuals experiencing unstable housing were twice as likely to seek hospital care. Participants were more inclined to utilize hospital services if they reported unstable housing, experienced overdoses, or frequently neglected tasks due to drug use. Milaney *et al.,* (2021) argue that housing, rather than requiring compliance or sobriety, serves as the foundation for enhancing health and overall well-being. Once housing is established, individuals can effectively tackle other facets of their lives, including physical health, mental health, substance use, employment, and education. The study also clarifies that housing should "not [be treated as] a panacea" (Milaney *et al.,* 2021, p.8) but should be used in conjunction with other harm-reduction initiatives.

In a cross-sectional survey with 150 participants in Edmonton experiencing absolute homelessness, Addorisio *et al*. (2021) assessed unmet needs like counseling, skills training services, and harm reduction. They concluded that the participants experiencing homelessness had complex needs that were failing to be met, which often led to high rates of morbidity and lower life expectancy. Many participants reported not knowing where to receive healthcare or being apprehensive about receiving healthcare due to prior treatment from healthcare staff. The authors found consistent trends in hospitalizations and emergency room visits, a similar trend by Milaney *et al*. (2021). The conclusion of this study found that the first step to recovery and access to health care resources for participants experiencing absolute homelessness was first to get them "indoors and into contact with primary and mental health care providers and housing staff" (Addorisio *et al*.,2021, p. 393). In other words, housing and other harm reduction

techniques are crucial to serving the unmet and complex needs of participants and possibly others experiencing homelessness.

Magwood *et al*. (2019) reported similar findings in a systematic review, where individuals experiencing homelessness and those with SUD encountered significant social exclusion, numerous physical and mental health issues, and increased rates of premature illness and mortality. Given that homelessness and precarious housing are linked to public injection, infection risks, and restricted healthcare access, it underscores the significance of providing easily accessible services near homeless communities. Additionally, it emphasizes the need for incorporating housing support services for individuals who are homeless and concurrently dealing with substance use disorders without pretenses of abstinence or other barriers to access.

Housing, as a condition of SES, needs to be addressed in future policy going forward. Unstable housing can lead to multiple disease outcomes, including both communicable and non-communicable diseases. Homelessness also introduces a variety of risk factors that can affect the outcome of disease. Many individuals experiencing homelessness are also restricted from accessing primary health care to acquire complex and often unique needs required for recovery and stability, which is usually due to increased marginalization and social exclusion or lack of knowledge on where to seek help. Homelessness also provides multiple mechanisms for disease that can be produced over time. Housing as a SDOH continues to have both direct and indirect effects on healthcare disparities.

## 2.3: Housing as Harm Reduction

As previously stated, SES is a fundamental cause of healthcare disparities. It is unsurprising that individuals experiencing homelessness are confronted with heightened rates of illicit substance use (Magwood *et al.,* 2019). During times of social and economic uncertainty like the pandemic, rates of substance use become increasingly exacerbated. Although individuals may resort to substance use as a means of coping with inadequate living conditions, stress, and trauma associated with homelessness, the absence of stable housing impedes access to and adherence to treatment recommendations for SUD. For this reason, harm reduction becomes essential in mitigating and preventing morbidities caused by SUD and deaths of despair (Henderson *et al.*, 2021; Galarneau *et al.,* 2023). Harm reduction is a framework designed to mitigate the negative consequences of substance use and the associated social exclusion. Within harm reduction, specific interventions encompass responding to opioid overdoses with naloxone, establishing supervised consumption sites, and implementing clinics for safe supply and temporary shelters (Magwood *et al.,* 2019; Vakharia & Little, 2017).

With the advent of public health measures during the COVID-19 pandemic, PWUD experiencing homelessness reported a decrease in access to safe consumption sites (SCS), social support, and healthcare staff due to limited hours of operation, building closures, and social distancing protocols (Galarneau *et al.,* 2021). Due to this, PWUD detailed taking risks they usually would not, such as using alternative drugs or using alone. More importantly, with mass closures of social support centers and funding for SCS during the pandemic, PWUD also reported heightened barriers to housing and steady income, necessities for safeguarding against substance-related morbidity and deaths of despair (Galarneau *et al.,* 2021). This trend is particularly alarming because housing and income are essential to accessing healthcare,

especially during public health emergencies. Furthermore, restrictions to housing and safe supply situate many PWUDs in a vulnerable position of not only at risk of overdoses but also at a heightened risk of contracting COVID (Galarneau *et al.,* 2023). Many studies have recommended expanding access to harm reduction methods during public health crises, which continue to adhere to prior COVID-19 public health recommendations while not putting vulnerable populations at more risk (Galarneau *et al.,* 2023; Addorisio *et al*., 2021). These recommendations could include initiatives like temporary shelters, safer delivery methods including vending machines, and greater access to mental health care networks during periods of high anxiety and uncertainty marked by the pandemic (Galarneau *et al.,* 2021).

To address the unique issues of PWUD experiencing homelessness in Edmonton, specifically between February and March of 2022, Boyle Street Community Services operated an overdose prevention site (OPS) intending to alleviate COVID-19 transmission and other health risks for people experiencing homelessness (Galarneau *et al.,* 2023). People used the shelter-based OPS to use illicit substances (orally, intranasally, or by injection), receive medical attention, acquire sterile drug use equipment, and connect to extra health and social support without leaving the shelter (Galarneau *et al.,* 2023). Most visits to the OPS included a consumption event, with the most common substances being fentanyl, heroin, and methamphetamine. The shelter-based OPS also had a few advantages over previous service models in other provinces like Ontario and Saskatchewan, including the ability for users to consume legal or illegal drugs, accessibility to a larger population of people who were not subject to isolation orders, and the provision of a stable, secure space inside the shelter. However, when asked for feedback, many of the visitors to the OPS commented on the absence of

inhalation services as a significant service need, which is in line with other research showing a strong propensity among users of illegal drugs to seek supervised inhalation services (Galarneau *et al.,* 2023). A significant portion of the population of PWUD who are homeless were left out due to the lack of supervised inhalation services, even though this OPS may have served a greater spectrum of service users than other shelters. Nevertheless, the inclusion of a temporary shelter offered much needed relief to visitors of the OPS.

Thus, having temporary and permanent housing is essential in preventing further morbidities and mortality among people experiencing homelessness, especially for those with SUD amidst the pandemic. Housing becomes an emergent need during public health emergencies in conjunction with other specific needs for PWUD, including alternative public health measures that protect against both COVID-19 but also substance use-related complications.

# Methods

## 3.1 Data

Data collection for this project took place over several months in the form of interview surveys with participants, starting in March 2023 and concluding at the beginning of September 2023. Data collection was done so through the *Survey of People Who Use Drugs*, created and distributed by ICHWP. The goal for the survey was to recruit at least 500 participants who self-identified as people who use drugs (PWUD) within Edmonton's inner city to understand their unique experiences and address any persistent or urgent unmet needs. Survey interviews

were conducted by research assistants, with each interview lasting approximately 45 minutes to an hour.

ICHWP had recruited participants for this study through a snowball sampling method. Most participants were interviewed at some of Edmonton's largest SCSs. These primarily included George Spady Society, Boyle Street Community Services, and Boyle Street McCauley (Radius) Health Centre. All participants were adults aged 18 or older and had been living in inner-city Edmonton for at least two weeks prior to their interviews. Missing data points were dealt with through listwise deletion, since many of the questions I ended up using from the survey had only a few non-responses or missing data. The questions I used from the dataset were mainly to do with housing and some of its dimensions, income, education, and illicit drug use. The total number of participants used for data analysis was n = 450, which is less than the original 503 due to exclusion of certain participants who had missing data. For this study, eight variables were selected, with one of these variables being a composite variable to assess the severity of drug use. Due to how the survey questions were designed and encoded, aside from the composite variable, all other variables were either nominal or ordinal variables that had to be recoded from numerical variables into ones with categorical names in accordance with the codebook.

## 3.2 Measures

### Key Measures

The total number of participants used for this study was n = 450, and most participants came from Edmonton’s inner city. For this study, around 16 variables were picked and sorted into either the housing or substance use categories. Due to how the survey questions were designed

and encoded, all 16 variables are either nominal or ordinal variables that had to be recoded from numerical variables into ones with categorical names in accordance with the codebook. Aside from renaming the different categories for each of the 16 variables, I did not regroup or redefine any of the variables.

### 3.2.1. Housing

One of the key predictor variables for this project is housing. In particular, I was interested in examining a few dimensions of housing reflected in the *Survey of people who use drugs.* These dimensions included whether or not participants currently had housing, the stability of their housing situation, and the degree to which participants had access to housing during the pandemic as compared to their experiences with accessing housing pre-pandemic. These dimensions of housing will serve as predictor variables to compare the severity of drug use among groups of people who do and do not report having access to housing in Edmonton's inner city. According to the survey, housing is defined as "[a] permanent or semi-permanent place where you live, either independently or with other people" (Hyshka, 2023, p. 3).

Starting with whether or not participants currently have housing, an overwhelming majority of participants (n = 404) reported that they did not have housing as defined by the survey. This variable is a nominal variable, where each participant was identified in one of 6 categories, either "Yes" (1), "No" (0), "Don't Know" (666), "Refused" (777), and "Not answered" (888), which were then recoded to indicate yes, no, and unknown. When comparing responses from 450 participants, 362, or 80.44% of participants reported that they currently did not have access to housing (Table 1.1).

The housing stability variable delves further into participants' housing situations by asking about whether they feel their current housing situation to be stable. Housing stability is an ordinal variable, with categories ranging from very unstable to very stable housing. Roughly 401 participants reported being in unstable housing situations, with 302 or 67.11% of the sample reporting very unstable housing (Table 2.1).

Both the housing and housing stability variables are important in assessing the current state of housing experienced by participants in the survey. However, they are limited in that they only offer a cross-sectional view of housing and do not provide much to compare the housing situations of participants pre and post-pandemic. Therefore, I decided to also look at housing accessibility and housing change before versus during the pandemic. The housing change variable looks at whether participants had undergone a change in living situations during the COVID-19 pandemic. Housing change was also coded as a nominal variable similar to the housing variable, where participants either reported that yes they had a change in housing, or no they did not. Overwhelmingly, 81.3% of participants reported that their housing situation had changed during the COVID-19 pandemic (Table 4.1). Housing accessibility, on the other hand, asks whether participants had noticed any changes to how difficult or easy it was for them to find a place to stay, where answers ranged primarily in one of three categories: more difficult than usual, same as usual, and easier than usual. Of the participants who responded, the largest group reported that it was more difficult than usual to access housing when compared to pre-pandemic circumstances at 74.4% (Table 3.1).

Variables measuring housing change and housing accessibility were used to compare housing between pre-pandemic conditions and during the current pandemic. The reason for choosing these two is because they help to illuminate some of the difficulties in housing accessibility expected in the advent of a global pandemic.

### 3.2.2. Substance use

My primary outcome variable is substance use based on a section of the survey that addressed the participants' illicit drug use patterns, which was used to evaluate the severity of their situation. For this study, I combined ten questions into a composite variable to represent the degree or severity of substance use issues, also known as a Drug Use Disorders Identification Test (DUDIT) variable. The DUDIT is a psychosocial metric that is designed to assess the identification and severity of drug-related problems among participants in research studies, ranking scores from 1 to 44 (Berman *et. al*, 2003). The purpose of the DUDIT in this study was to assess the severity of illicit drug use based on how they answered questions 21-31 of the survey. For the purposes of this study, I plan on treating the DUDIT composite variable as an interval ratio outcome variable in order to use it for regression analysis. The updated sample size for this study using the DUDIT scale and accounting for missing responses came to be n = 450. The combination of these questions were used to compare groups of participants who currently do have housing with those who do not to see if there is a significant link between the lack of housing and the severity of illicit substance use. The questions used to create DUDIT scores were all ordinal variables, where participants are placed into about four to five different ranked categories. All the questions in this set were recoded into their respective categories from numerical values.

Along with the DUDIT scores as an outcome variable, I also looked at a variable which asked whether participants noticed a change in their illicit drug use within an average week compared to pre-pandemic conditions. This variable was used to compare pre-COVID and current illicit drug use of participants. The change in illicit drug use variable focuses primarily on comparing participants' experiences with substance use before and during the pandemic, and is an ordinal variable, ranging in options from has decreased, has not changed, and has increased. Nearly 53.3% of participants (n = 240) reported that their illegal substance use has increased (Table 4.1). This variable was also recoded to represent the different categorical variables.

### 3.2.3. Education and Income

Some other variables that were used for this study were education and income. Education was measured as an ordinal variable based on the highest educational attainment reported by participants, which ranged from less than high school all the way to graduation and professional degrees. Out of the 450, roughly 72.9% of the participants (n = 328) reported that they had a high school diploma/GED or less, with the largest group of participants responding that they had less than a high school education at 52.2% (Table 1.1).

The income variable was used to measure the total amount of income reported by participants in the last year. This variable is also an ordinal variable and participants were grouped according to their reported income ranging from less than $20,000 all the way to over $100,000. From the survey results, the majority of participants reported that they had an income of less than $20,000 at roughly 64.4% (Table 1.1).

Education and Income were also considered in this study because both variables are considered common social determinants of health and are components used to measure the socioeconomic status of individuals (Braveman, 2011). Although the primary focus of this study is on housing, it is important to also consider other social determinants of health because they help to illustrate a full picture of the phenomenon of interest, which in this case is looking at illicit drug use within Edmonton's inner city.

## 3.3 Analytic strategy

Wilkinson et al. (1988) define reflexivity as reflecting on our roles as researchers, our subjectivities and biases that influence our work, and how our worldview is influenced by the research we conduct and vice versa. Reflexivity comprises interpretation and reflection, which incorporates several layers and levels of review, going beyond a straightforward analysis of the research process and its results. Tied to reflexivity is our positionality, which is what we know and believe based on our position and intersecting identities (Jamieson et al., 2023). In other words, knowledge of the phenomenon we aim to study in the social sciences is very often dependent on the types of questions we ask, how we choose to ask them and how biases can affect our interpretation of the questions we ask and their answers. Reflexivity enacts deliberate, active acknowledgment of one's belief, prejudice, and judgment systems before, during, and after the research process, allowing it to have greater potential in guiding research than simple reflection (Jamieson et al., 2023). While quantitative research is understood as objective science, it is important to note that there are many ways in which scientific research, whether it be in the

physical, life, or social sciences, often can and does reproduce bias that, if we are not privy to, can cause research to be less accurate or credible (Gelman & Hennig, 2017).

The goal for the project was to collaborate with people who use drugs (PWUD) within Edmonton's inner city to understand their unique experiences and, more importantly, address any persistent or urgent needs that have been unmet (Addorisio et al., 2022). PWUDs have complex needs for social support and health care connected to substance use, which is made more difficult by the intersection of structural vulnerabilities and limited resources. Therefore, to enhance their health and well-being, PWUDs need access to comprehensive health care, social support, and drug use-related services (Russell et al., 2021). Research shows that PWUDs consistently have unmet treatment needs, and for this reason, the survey aimed to address the needs within Edmonton's inner city, especially concerns related to housing inaccessibility and safe supply, two urgent needs not only because of the current drug crisis in Edmonton being understudied but also because, with the onslaught of COVID-19, there has been a significant rise in drug-related morbidities and mortalities (Galarneau et al., 2021).

It is important, then, to consider the role of reflexivity and positionality in my research project because the end goal is to address the lived experiences of a group that I am not part of. The types of structural and social barriers that inhibit the wellbeing and necessary harm reduction needed to address the drug poisoning crisis extends far beyond the scope of this project, but nevertheless, exist and need to be acknowledged. For Edmonton’s inner city, substance use and misuse are higher and the effects of the drug poisoning crisis are more visible, where many PWUDs are also experiencing various degrees of homelessness and mental health

issues (Addorisio et al.,2022). The type of questions we ask in the survey are intentional because they are informed by prior knowledge of addiction and substance abuse, with a focus on mental health and socioeconomic factors. The research questions we asked help not only inform the current state of Edmonton's inner city population but also affirm a lot of the understanding of how addiction is shaped socially and culturally which is discussed extensively in prior literature.

Thus, being mindful of my positionality and reflexivity, I sought to examine the rise in illicit drug use and its association to housing, which I did using data collected from the *Survey of people who use drugs in Edmonton*.

First, to examine the link between drug use and housing, I used several different regression models to determine the different aspects of how housing interacts with drug use. This includes examining the link between participants who indicated whether or not they simply had housing along with other aspects of housing such as accessibility and stability of housing and its link to the severity of illicit drug use. In total, I used four different regression models. The first one used was a multiple linear regression model that looked at the association between whether or not having current housing and severity of drug use, or DUDIT score, while controlling for education and income. The second regression model was a simple linear regression that looked at the association between perceived housing stability and the severity of drug use, or DUDIT score. The third regression model was very similar to the second one, the only difference was that the predictor variable was switched to perceived housing accessibility during the pandemic, while everything else was kept the same. For the fourth and final regression model, I used a logistic regression model that looked at the association between change in housing situation

during the pandemic and whether there was a change in drug use patterns as well. For this fourth part, I also divided up the outcome variable into a binary one, where I recoded participants whose drug use did not change or decreased into one group, and those whose drug use increased into another group.

### Part A: Current Housing and Severity of Drug Use

The first question I wanted to answer was: What is the relationship between having current housing and the rise in current trends of illicit drug use within Edmonton's inner city? For this question, I used a multiple regression model that used the respondent's education, income, and current housing situation as predictor variables to assess the severity of illicit drug use reflected by the DUDIT scores at the 95% confidence level. A multiple regression model was appropriate for this question because I wanted to see if there was a link between having access to housing and the DUDIT scores. However, housing itself is not the sole determinant of how severe illicit drug use can be, as previous literature has shown, but due to a host of other factors as part of the social determinants of health. As a result, I also included income and education as markers of socioeconomic status, mainly because these variables tend to be definitive and stable over time and because prior literature has shown that these variables are consequential in predicting patterns of illicit drug use. Variables measuring participants' highest level of education completed and their total income over the past year were used as controls for this regression model. Additionally, since I decided to treat the DUDIT variable as an interval-ratio variable, it allowed me to use a multiple regression model to test the link between the three predictor variables and a quantitative outcome variable.

### Part B: Housing stability and Severity of Illicit Drug Use

While Part A determined whether participants currently had housing, it is important to consider that housing has multiple dimensions and that housing as a variable is seldom ever understood to be binary. Therefore, I also explored housing stability, with the question: Is there a link between the degree of housing stability and drug use in Edmonton's inner city? The outcome variable for Part B also utilizes the DUDIT scores. However, there are two noticeable differences between Part A and Part B. First, Part B examines the link between perceived housing stability and DUDIT scores. Second, I used a simple linear regression model to answer this question because I wanted to assess the link between the different levels of housing stability and their respective DUDIT scores. Since the DUDIT variable is again being treated as a quantitative outcome variable, a simple linear regression is appropriate for answering the question for Part B in assessing the association between housing stability and severity of drug use.

### Part C: Housing Access and Severity of Drug Use During COVID-19

Along with housing stability, I was also interested in exploring housing accessibility during the pandemic. For this section, the main objective was to assess the link between housing accessibility and the severity of drug use. In other words, is there a link between housing accessibility and drug use among residents in Edmonton's inner city during the COVID-19 pandemic? For this part, I shifted my attention toward understanding the role of housing accessibility within the context of the pandemic. In order to do so, I looked at the degree of housing accessibility, where participants were asked to report whether they noticed any change in how easy or difficult it was to access housing since the pandemic was declared in 2020. As with Parts A and B, Part C also uses the DUDIT variable as the outcome variable to assess the severity of illicit drug use.

A simple linear regression was used to explore the relationship between housing accessibility and DUDIT scores. I refrained from using a multiple regression model where I controlled for income and education because I was specifically interested in looking at pandemic-related conditions. In addition, question 6 asks for participants' income level and only asks to report total income over the past year instead of income since 2020, when the pandemic was declared. Since there would be a timeline discrepancy in the measurement between questions 6 and 12, I decided to use a simple regression model for this section instead.

**Part D: Housing change and Illicit Drug Use**

For Part D, the main question I was interested in exploring was: Is there a link between changes in housing situations and an increase in overall illicit drug use since the start of the COVID-19 pandemic? For this question, I used question 11 of the survey, which asks whether participants had a change in living situations during the COVID-19 pandemic as the predictor variable. For the outcome variable, I used question 33, which asks whether participants' overall use of illegal drugs has changed since the COVID-19 pandemic was declared. Since my outcome variable is not an interval ratio variable, I used logistic regression to answer this question. It is also possible to use an ordered logistic regression model to answer this question; however, since my goal was to see if there was a link between an increase in illicit drug use and a change in housing situation, I decided to use a logistic regression model.

Furthermore, I divided up the answers for question 33, where participants were initially given three options of "had increased," "had not changed," and "has decreased" into two categories in order to fit a logistic model. In order to do so, I recoded this variable so that all

participants who answered “had not changed” and “had decreased” were put into the referent group, whereas participants who answered “had increased” were put into a separate one. Thus, question 33 had to be modified slightly to be used in a logistic regression model.

# Findings

## Part A: Analysis and Results

When I ran the multiple regression model in R, the results showed a significant negative correlation between housing and DUDIT scores. Participants without current housing had higher DUDIT scores by a factor of 3.74 points on average compared to those who did currently have housing when controlling for education and income. Furthermore, the relationship between income and DUDIT scores showed significance for participants who reported earning $60,000 to $79,999 over the past year. However, this result could be due to the difficulty ascertaining exact income levels. Regarding education, participants who had a high school degree or equivalent or some college or university education but no degree showed statistically significant results compared to participants who had less than a high school degree. In other words, participants with a high school degree or equivalent had lower DUDIT scores by a factor of 2.74 compared to participants with less than a high school diploma. Similar results were shown for participants with some college or university education but no degree, where participants in this category had lower DUDIT scores by a factor of 3.20 compared to participants with less than a high school diploma. What this implies is that there is a negative association between education and the

severity of drug use at the 95% confidence level. From this model, it can be concluded that simply having access to housing was associated with a lower severity of drug use when controlling for education and income.

Overall, the model for Part A had an F-statistic of 2.342 at (11,442) degrees of freedom and was significant in predicting DUDIT scores, with a p-value less than 0.01 (Table 1.2). This conclusion is further confirmed by examining the confidence intervals, which provided similar conclusions to the regression model for Part A (Table 1.3). In summary, the model was significant in predicting DUDIT scores, where factors like housing and income were useful predictors for the severity of illicit drug use for participants in the study.

Examining the bivariate relationship between whether or not participants currently had access to housing and their DUDIT scores using a box plot showed some interesting results. Using the boxplot in Figure 1.1, Individuals without housing were skewed more to the right than those with housing and had a slightly smaller spread, as reflected by a narrower IQR. Participants with current access to housing had a more symmetric distribution than those who did not have access to housing. The median DUDIT score and first and third quartiles DUDIT scores were higher for the “No” group than the “Yes” group. This result indicates that generally, those who answered “No” to whether they currently had housing were more likely to present with higher DUDIT scores.

Conversely, when examining the bivariate relationship between income and DUDIT scores, there was a lot more variation among the different groups of participants and their

DUDIT scores concerning their income levels (Figure 1.2). Most noticeable are the groups that answered their combined income to be between $60,000 to $79,999 and $80,000 to $99,999. Their spreads are much lower than the other groups, where participants in these two groups tended to have higher DUDIT scores with slight variation. There is a significant positive skew for the $60,000 to $79,999 group and a moderate positive skew for participants who reported having an income over $100,000. A single outlier for the group reported having a total combined income between $60,000 and $79,999 with a lower DUDIT score than the rest.

Additionally, the median DUDIT scores were higher for the three largest income groups than the three lowest, indicating a positive correlation between income level and DUDIT scores, as reflected in the multiple regression model. Spreads for the higher income groups were also smaller compared to the lower income groups, which had more variation in their DUDIT scores. However, these results may not be accurate as self-reported income required participants to recall their total income over the past year.

## Part B: Analysis and Results

The model between housing stability and DUDIT scores (Table 2.2) demonstrated a similar pattern to housing and DUDIT scores in Part A, with a negative correlation between housing stability and DUDIT scores. A less stable housing situation was associated with a higher severity of illicit drug use. Participants who reported "A little unstable," "A little stable," or "Very stable" housing were associated with lower DUDIT scores when compared to participants who reported very unstable housing. All three are statistically significant at the 0.05 confidence level (Table 2.2).

The bivariate linear regression results indicated a significant relationship between housing stability and participant DUDIT scores at the 95% confidence level ($p < 0.025$). The overall model was significant in predicting DUDIT scores based on the level of housing stability, with an F-statistic of 7.264 at (4,445) degrees of freedom (Table 2.2). The Pearson correlation coefficient was roughly 0.247, indicating a weak negative relationship between the two variables. This model indicates that while housing stability is a significant predictor of the severity of drug use as measured by the DUDIT scale, there are other important determinants, as well. This is not surprising, as indicated by the background literature review, where problematic substance use is often associated with a host of different social determinants of health.

There are a few noticeable characteristics when examining the boxplot of DUDIT scores as a function of housing stability. One, the group that reported very unstable housing had higher median and 75th percentile values for their DUDIT scores, where most participants reported higher scores than the other groups (Figure 2.1). There were a few outliers in this group, however. Generally, all the groups besides those reporting very stable housing situations are symmetric in their distributions. The dispersion of DUDIT scores for the "Very unstable" and "A little unstable" groups was higher than for the other groups (Figure 2.1). This result indicates that those with less stable housing generally tended to report higher DUDIT scores.

## Part C: Analysis and Results

As with the general results on housing, the regression model for part C, presented in Table 3.2, yielded similar results. There was a negative correlation between the degree of housing accessibility during the pandemic and the severity of illicit drug use among participants

in the study. Those who reported lesser accessibility to housing since the pandemic was declared in March 2020 were more likely to report higher DUDIT scores. The results of this regression model were significant at the 95% confidence level ($p < 0.025$). The model yielded an F-statistic of 6.691 at (2, 447) degrees of freedom and a p-value < 0.001. Thus, the correlation between housing accessibility during COVID-19 and the severity of illicit substance use was statistically significant. That being said, the Pearson correlation for this model was 0.170, which indicates that, unsurprisingly, there were other determinants influencing the severity of illicit drug use for participants in this study during the COVID-19 pandemic. While housing accessibility is a prominent predictor for illicit substance use during the pandemic, other factors still need to be considered among this demographic.

When looking at the box plot between housing access and DUDIT scores presented in Figure 3.1, participants who reported that accessing housing was easier than usual or more difficult than usual had positively skewed distributions. In contrast, participants who reported finding no difference in accessing housing had a negatively skewed distribution. Those who reported finding it more difficult than usual to access housing had a higher median DUDIT score compared to the other two groups and a higher first and third quartile. The dispersion of scores was larger for the “Same as usual” and “More difficult than usual” groups in DUDIT scores compared to the “Easier than usual” group, which had a noticeably smaller box and slightly more symmetric distribution compared to the other two groups.

## Part D: Analysis and Results

When conducting a logistic regression analysis between whether or not participants experienced a change in housing situation since the beginning of the pandemic and their overall change in patterns of drug use, there was a positive correlation found between the two variables. In essence, change in housing during COVID-19 is positively associated with a change in illegal drug use in a single week (Table 4.2). Those whose living situation changed since the start of the pandemic were more likely to report an increase in illicit drug use in a single week. The results of this logistic regression were significant at the 95% confidence level. However, the Pearson correlation coefficient was 0.0303, indicating a weak relationship. Again, this is not surprising given background research on illicit drug use, not only because of the various social determinants of health but also because housing is a multifaceted and complex concept to quantify within the scope of this model. It does offer insight into how pandemic-related housing conditions have been associated with an increase in drug use, which may help with further research and informing policy in future studies.

Since this model's predictor and outcome variables were categorical, a bar chart was used to compare drug use between participants who reported "No" versus "Yes" to whether their housing situation changed during the pandemic (Figure 4.1). There was a noticeable difference in the increase in drug use between participants in the "Yes" and "No" categories compared to all other options. For all changes in drug use on the survey, those who answered "Yes" to a change in living situations had larger frequencies for all three changes in drug use compared to the "No" category. However, this is also because, in general, most participants in this study reported changing living situations since the beginning of the pandemic in early 2020.

In summary, there is a significant correlation between a change in housing situations and illicit drug use throughout the pandemic. This correlation is positive, meaning that typically, participants who reported a change in their living situation were also more likely to report an increase in drug use. This model has a weak correlation coefficient, which indicates that other factors besides changes in housing conditions played a role in the changes in illicit drug use.

## Discussion and Conclusion

In conclusion, this study examined the associations between housing and illicit drug use among the population in Edmonton's inner city. The study was guided by the social determinants of health framework, which states that individual and group health outcomes are greatly influenced by the social and physical environment, including housing, which reflects one's socioeconomic status and significantly impacts health disparities, especially among individuals experiencing homelessness. Lack of stable housing not only exacerbates health issues but also poses barriers to accessing healthcare and adhering to treatment, particularly for substance use disorders (SUD).

The needs of PWUD experiencing homelessness are considerably complex and often require a targeted approach to provide effective harm reduction. This is especially pronounced

for PWUD during the COVID-19 global pandemic, where there has been a reported uptick in illicit substance use, drug poisonings, and other deaths of despair. Since the onslaught of the pandemic, housing and safe supply have become more challenging to access, putting PWUD at considerable risk of turning towards contaminated or compromised illicit substances or experiencing drug poisonings and overdoses. While observing consistent patterns of substance-related morbidities and mortalities, principles of positionality and reflexivity are invaluable for conducting meaningful research that causes the least amount of harm possible to marginalized communities. Furthermore, positionality and reflexivity are invaluable when considering the variables and individual survey questions used for this study.

Since there are several avenues in which to analyze the association between housing and illicit drug use, I broke my initial question down into four smaller questions in order to look at the different dimensions of housing and to further examine pandemic-related housing changes and their associations to patterns of illicit drug use. The first question asked whether there is an association between simply having housing and the severity of drug use. In order to answer this question, I used a Drug Use Disorder Identification Test (DUDIT) score that assigned participants scores ranging from 1-44 depending on their answers to their substance use habits and patterns, which reflected the severity of their drug use. With this being my outcome variable, I used a multiple regression model that looked at the association between whether or not participants currently had housing and their DUDIT scores while controlling for their highest educational attainment and total income in the past year. The result of this regression model showed a significant association between housing and DUDIT scores. Participants who reported having no housing were likelier to present with a higher DUDIT score than those with housing.

The second question I asked was, is there an association between housing stability and the severity of illicit drug use? To answer this question, I used a linear regression model examining the association between participants' reported housing stability as the predictor variable and DUDIT scores as the outcome variable. The results of this regression model showed a significant association between housing stability and severity of illicit drug use, where reported unstable housing was associated with DUDIT scores.

For the third question, I was interested in housing accessibility during the COVID-19 pandemic. Similar to the second question, I asked if there was an association between housing accessibility during the pandemic and the severity of illicit drug use. Like the first two questions, I used a linear regression model where the DUDIT variable was the outcome, and perceived housing stability was the predictor variable. Consistent with the first two questions, my results for this regression model were also significant. There was a significant association between a decrease in housing accessibility during the COVID-19 pandemic and the severity of illicit drug use as measured by the DUDIT variable.

Finally, the fourth question I asked was whether there is an association between changes in living situations during the COVID-19 pandemic and changes in illicit drug use. For this question, I decided to use a logistic regression model, with the outcome variable measuring changes in illicit drug use in an average week, where participants were grouped into one of two categories. The first group was participants who reported that their drug use had not changed or had decreased. The second group was participants who reported that their drug use had

increased. The results of this regression model showed a significant association between a change in living situation during the COVID-19 pandemic and increased drug use.

With this study, there is also potential for future research. Some avenues that I would potentially like to explore more going forward would include looking at more variables, such as age and gender, to see how they also interact with substance use. In addition, it would also be interesting to include more longitudinal analyses, including the long-term effects of disability, including drug poisonings, on PWUD experiencing homelessness.

The results found in this study are not surprising and reinforce the main ideas taken from the background research. First, housing is a fundamental social determinant of health and has been consistently linked to health outcomes and inequities. In the case of the current COVID-19 pandemic and the drug poisoning crisis, inequities in access to proper healthcare and harm reduction are apparent and concentrated among PWUD experiencing homelessness. Second, housing has the potential to be a compelling strategy for mitigating the negative consequences of substance use among marginalized populations, particularly those experiencing homelessness. Recognizing that housing instability exacerbates health risks and impedes access to treatment, the provision of safe and stable housing as a primary intervention to reduce the harm associated with substance use should be given more consideration, especially when considering the increasing housing unaffordability in Canada. By ensuring individuals have access to secure housing, they are better positioned to address problematic substance use, access healthcare services, and stabilize their lives overall, including reduction of conditions like HIV, Hepatitis, and others that are so often comorbid with illicit substance use. Housing is a basic human need

and a fundamental component of effective harm reduction, ultimately improving health outcomes and reducing social exclusion among vulnerable populations.

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# Appendix

## **Appendix A:** Regression Model A

**Table 1.1:** Descriptive Statistics of Predictor Variables (n = 450)

| | **Frequency** | **Proportion (%)** |
|---|---|---|
| **Highest educational attainment** | | |
| Less than high school degree | 235 | 52.22 |
| High school degree/ GED | 93 | 20.67 |
| Some college/uni; no degree or certificate | 42 | 9.33 |
| Trade/university certificate | 65 | 14.44 |
| Bachelor degree | 14 | 3.11 |
| Graduate/professional degree | 1 | 0.22 |
| **Reported income over the past year** | | |
| Less than 20,000 | 290 | 64.4 |
| 20,000 to 39,999 | 117 | 26.00 |
| 40,000 to 59,999 | 27 | 6.00 |
| 60,000 to 79,999 | 8 | 1.78 |
| 80,000 to 99,999 | 2 | 0.44 |
| over 100,000 | 6 | 1.33 |
| **Current Housing** | | |
| Yes | 88 | 19.56 |
| No | 362 | 80.44 |
| SOURCE: Survey on People who use drugs in Edmonton, n = 450 | | |
| Note: subset of original survey data of n = 503 | | |

**Table 1.2:** Regression Summary for Model A (n = 450)

| | *Dependent variable:* |
|---|---|
| | DUDIT |
| Housing (No) | 3.739*** |
| | (1.156) |
| High school degree/ GED | −2.741** |
| | (1.180) |
| Some college/uni; no degree or certificate | −3.203** |
| | (1.621) |
| Trade/university certificate | −0.876 |
| | (1.348) |
| Bachelor degree | −2.490 |
| | (2.741) |
| Graduate/professional degree | −3.963 |
| | (9.614) |
| Income: 20,000 to 39,999 | 1.333 |
| | (1.064) |
| Income: 40,000 to 59,999 | 0.723 |
| | (1.965) |
| Income: 60,000 to 79,999 | 7.975** |
| | (3.460) |
| Income: 80,000 to 99,999 | 8.406 |
| | (6.825) |
| Income: Over 100,000 | 5.447 |
| | (4.052) |
| Constant | 27.224*** |
| | (1.180) |
| Observations | 450 |
| $R^2$ | 0.056 |
| Adjusted $R^2$ | 0.032 |
| Residual Std. Error | 9.587 (df = 438) |
| F Statistic | 2.342*** (df = 11; 438) |
| *Note:* | *p<0.1; **p<0.05; ***p<0.01 |

** *Note:* Referent categories for Model A: Housing (Yes); Education (Less than high school); Income ( < $20,000 CAD)

**Table 1.3:** Confidence Interval for Model A (n = 450)

| | 2.5 % | 97.5 % |
|---|---|---|
| (Intercept) | 24.906 | 29.542 |
| Housing (No) | 1.468 | 6.011 |
| Education (High school degree/ GED) | -5.060 | -0.421 |
| Education (Some college/uni; no degree or certificate) | -6.389 | -0.017 |
| Education (Trade/university certificate) | -3.525 | 1.773 |
| Education (Bachelor degree) | -7.878 | 2.898 |
| Education (Graduate/professional degree) | -22.859 | 14.933 |
| Income ($20,000 to $39,999) | -0.758 | 3.424 |
| Income ($40,000 to $59,999) | -3.140 | 4.585 |
| Income ($60,000 to $79,999) | 1.174 | 14.775 |
| Income ($80,000 to $99,999) | -5.007 | 21.820 |
| Income (Over $100,000) | -2.517 | 13.410 |

** *Note:* Referent categories for Model A: Housing (Yes); Education (Less than high school); Income ( < $20,000 CAD)

**Figure 1.1:** Boxplot measuring current housing status along DUDIT scores (n = 450)

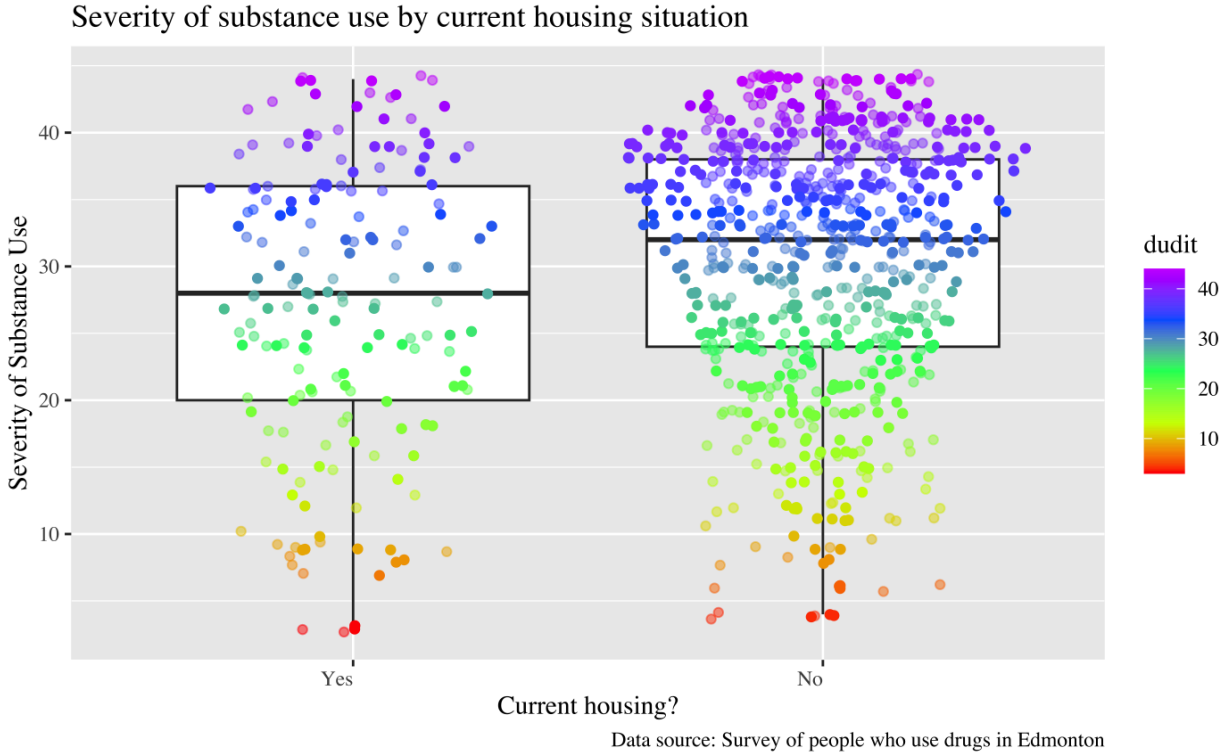


**Figure 1.2:** Boxplot measuring total income over the past year along DUDIT scores (n = 450)

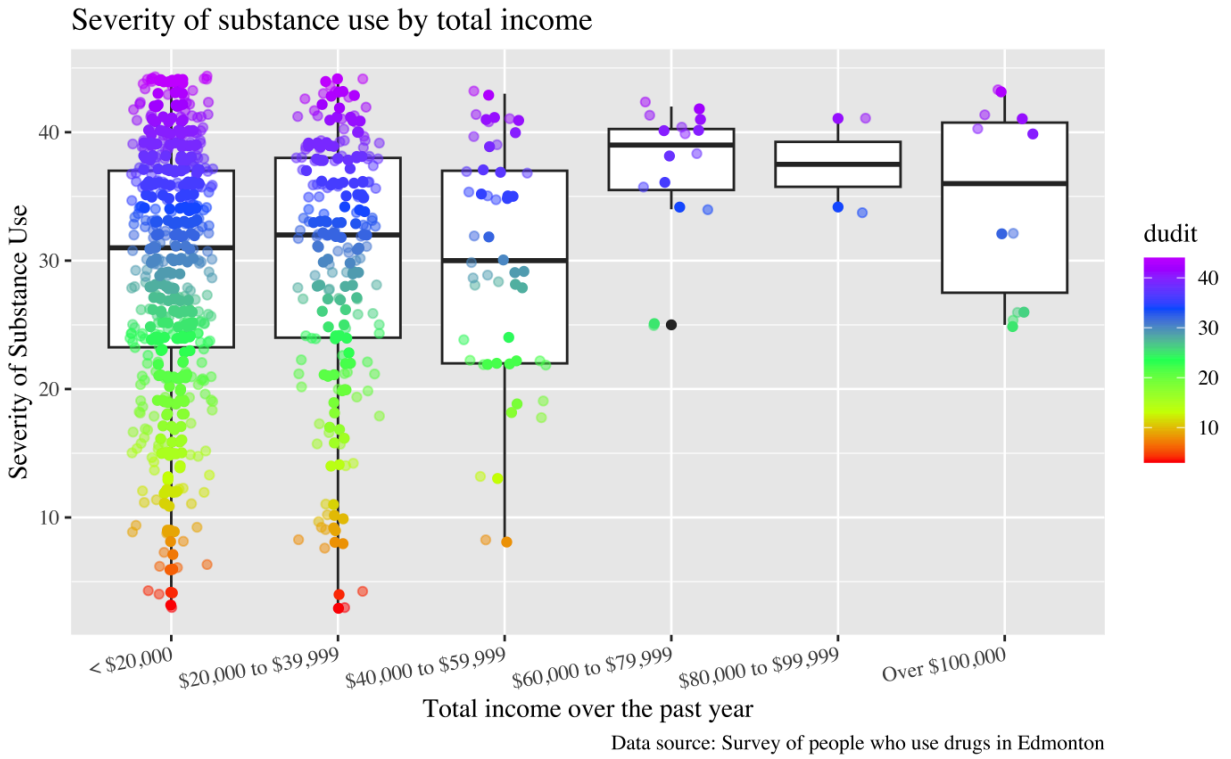
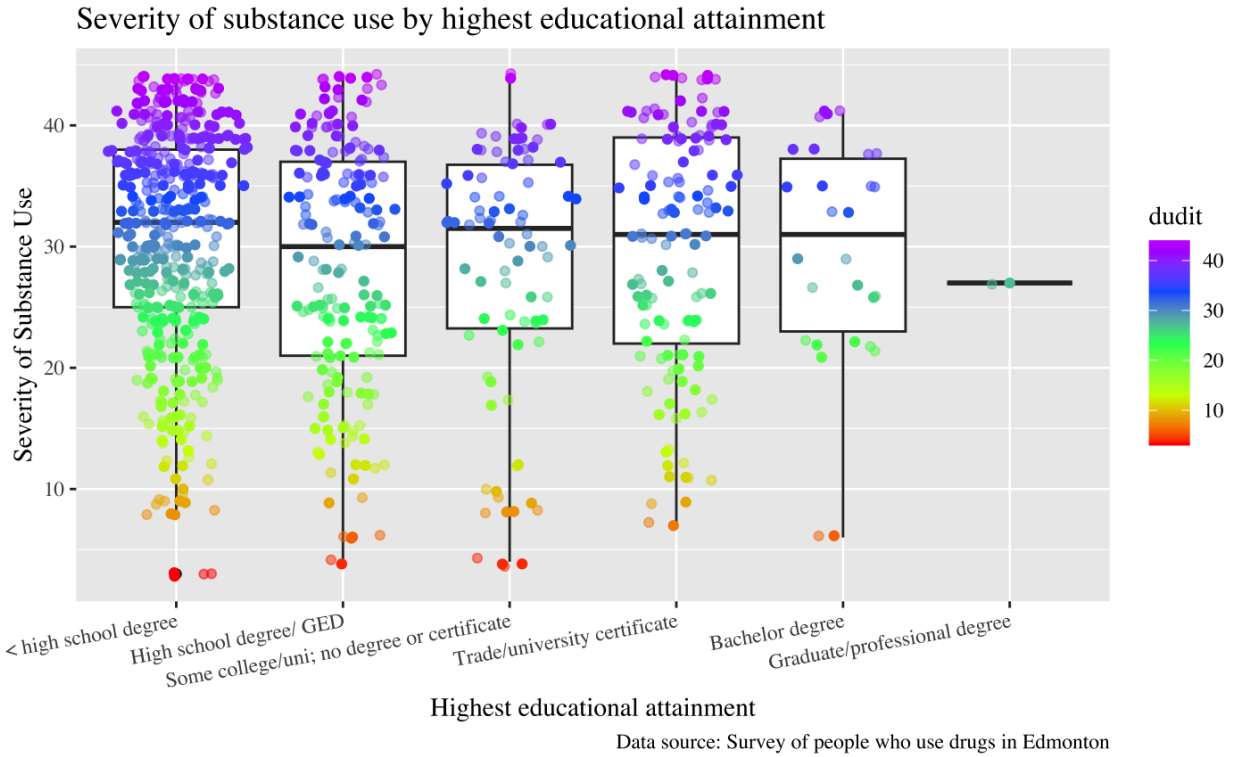


**Figure 1.3:** Boxplot measuring highest educational attainment over the past year along DUDIT scores ( n = 450)



## **Appendix B:** Regression Model B

**Table 2.1:** Descriptive Statistics of Predictor Variables (n = 450)

| | **Frequency** | **Proportion (%)** |
|---|---|---|
| **Housing stability** | | |
| Very unstable | 302 | 67.11 |
| A little unstable | 60 | 13.33 |
| Neither stable or unstable | 14 | 3.11 |
| A little stable | 35 | 7.78 |
| Very stable | 39 | 8.67 |
| SOURCE: Survey on People who use drugs in Edmonton, n = 450 | | |
| Note: subset of original survey data of n = 503 | | |

**Table 2.2:** Regression Summary for Model B (n = 450)

| | *Dependent variable:* |
|---|---|
| | DUDIT |
| Housing stability (A little unstable) | −5.521*** |
| | (1.340) |
| Housing stability (Neither unstable nor stable) | −4.063 |
| | (2.592) |
| Housing stability (A little stable) | −3.135* |
| | (1.693) |
| Housing stability (Very stable) | −5.985*** |
| | (1.613) |
| Constant | 31.421*** |
| | (0.546) |
| Observations | 450 |
| $R^2$ | 0.061 |
| Adjusted $R^2$ | 0.053 |
| Residual Std. Error | 9.482 (df = 445) |
| F Statistic | 7.264*** (df = 4; 445) |
| *Note:* | *p<0.1; **p<0.05; ***p<0.01 |

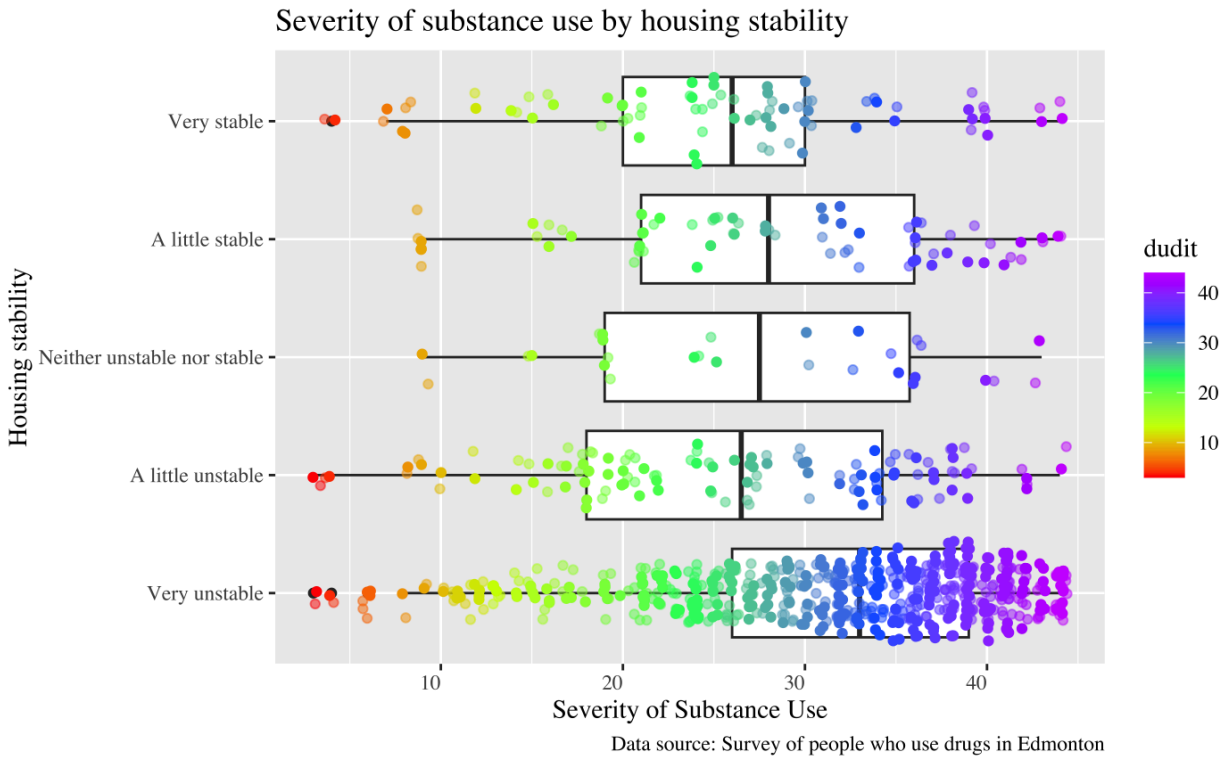
** *Note:* Referent category for Model B: Housing stability (very unstable), ρ = 0.247

**Table 2.3:** Confidence Interval for Model B (n = 450)

| | 2.5 % | 97.5 % |
|---|---|---|
| (Intercept) | 30.348 | 32.493 |
| Housing stability (A little unstable) | -8.154 | -2.887 |
| Housing stability (Neither unstable nor stable) | -9.158 | 1.031 |
| Housing stability (A little stable) | -6.462 | 0.193 |
| Housing stability (Very stable) | -9.155 | -2.814 |

** *Note:* Referent category for Model B: Housing stability (very unstable)

**Figure 2.1:** Boxplot measuring housing stability along DUDIT scores



## **Appendix C:** Regression Model C

**Table 3.1:** Descriptive Statistics for Model C (n = 450)

| | **Frequency** | **Proportion (%)** |
|---|---|---|
| **Housing accessibility during COVID** | | |
| More difficult than usual | 335 | 74.44 |
| Same as usual | 86 | 19.11 |
| Easier than usual | 29 | 6.44 |
| SOURCE: Survey on People who use drugs in Edmonton, n = 450 | | |
| Note: subset of original survey data of n = 503 | | |

**Table 3.2:** Regression Summary for Model C (n = 450)

| | *Dependent variable:* |
|---|---|
| | DUDIT |
| Housing access (Same as usual) | $-4.236^{***}$ |
| | (1.163) |
| Housing access (Easier than usual) | $-1.495$ |
| | (1.862) |
| Constant | $30.701^{***}$ |
| | (0.526) |
| Observations | 450 |
| $R^2$ | 0.029 |
| Adjusted $R^2$ | 0.025 |
| Residual Std. Error | 9.622 (df = 447) |
| F Statistic | $6.691^{***}$ (df = 2; 447) |
| *Note:* | $^{*}$p<0.1; $^{**}$p<0.05; $^{***}$p<0.01 |

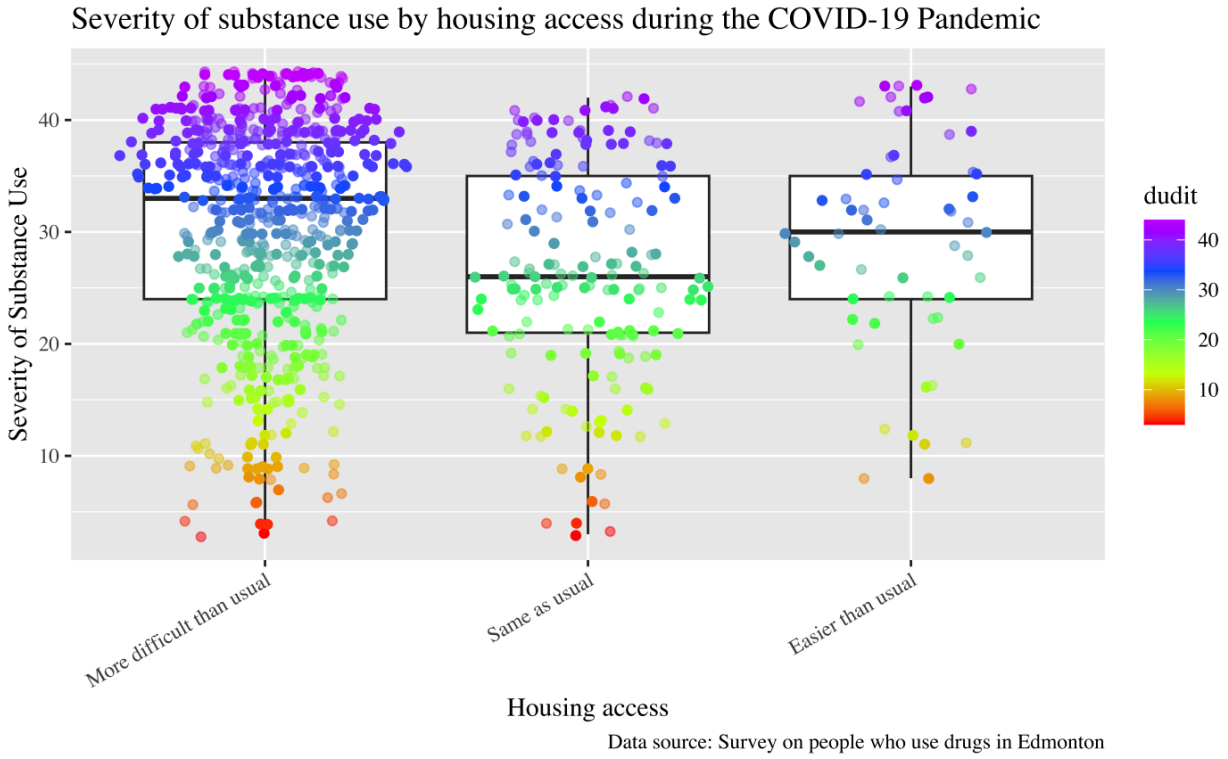
** *Note:* Referent category for Model C: Housing access (More difficult than usual), ρ = 0.170

**Table 3.3:** Confidence Interval for Model C (n = 450)

| | 2.5 % | 97.5 % |
|---|---|---|
| (Intercept) | 29.668 | 31.735 |
| Housing access (Same as usual) | -6.522 | -1.951 |
| Housing access (Easier than usual) | -5.155 | 2.166 |

** *Note:* Referent category for Model C: Housing access (More difficult than usual)

**Figure 3.1:** Boxplot measuring housing accessibility along DUDIT scores (n = 450)



## **Appendix D:** Regression Model D

**Table 4.1:** Descriptive Statistics for Model D ( n = 450)

| | Frequency | Proportion (%) |
|---|---|---|
| **Change in living situation during COVID** | | |
| Yes | 366 | 81.33 |
| No | 84 | 18.67 |
| **Overall use of illegal drugs changed during COVID** | | |
| Has decreased | 82 | 18.22 |
| Has not changed | 128 | 28.44 |
| Has increased | 240 | 53.33 |
| SOURCE: Survey on People who use drugs in Edmonton, n = 450 | | |
| Note: subset of original survey data of n = 503 | | |

**Table 4.2:** Regression Summary for Model D (n = 450)

| | *Dependent variable:* |
|---|---|
| | Change in drug use |
| COVID housing change (Yes) | 1.078*** |
| | (0.257) |
| Constant | −0.747*** |
| | (0.234) |
| Observations | 450 |
| Log Likelihood | −301.499 |
| Akaike Inf. Crit. | 606.997 |
| *Note:* | *p<0.1; **p<0.05; ***p<0.01 |

** *Note:* Referent category for Model D: COVID housing change (No); ρ = 0.03028

**Table 4.3:** Confidence Interval for Model D (n = 450)

| | 2.5 % | 97.5 % |
|---|---|---|
| (Intercept) | -1.205 | -0.289 |
| COVID Housing change (Yes) | 0.575 | 1.581 |

** *Note:* Referent category for Model D: COVID housing change (No)

**Figure 4.1:** Bar graph depicting change in housing and drug use during the COVID-19 pandemic (n = 450)