Income generation and the patterning of substance use: A gender-based analysis

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Abstract

Background.—Previous research has demonstrated how income-generating activities among marginalized people who use drugs (PWUD)–including employment, income assistance, street-based activities, sex work, and illegal activities–can provide both benefit (e.g., additional income) and harm (e.g., violence, criminalization). However, little is known about gender differences in factors such as drug use patterns that are associated with income-generating activities among PWUD.

Methods.—Using data from prospective cohorts of HIV-positive and HIV-negative PWUD in Vancouver, Canada, we conducted exploratory gender-stratified analyses of associations between substance use patterns and income-generating activities, using generalized linear mixed-models.

Results.—Participants reported income sources as employment (23.4%), income assistance (88.1%), street-based activities (24.9%), sex work (15.2%), drug dealing (31.5%), or other

illegal activities (13.9%). GLMM results showed gendered patterns of engagement in specific income-generating activities and some diverging patterns of substance use. For instance, men receiving income assistance were less likely to use opioids (Adjusted odds ratio(AOR)=0.64; 95% confidence interval(CI)=0.50–0.82) and women engaged in sex work were more likely to use crack-cocaine (AOR=2.74, 95% CI=2.22–3.37). However, results reflected primarily converging patterns of substance use between women and men across income-generating activities, particularly for drug dealing and other illegal activities.

Conclusions.—Our results suggest that substance use patterns may be more closely associated with income generation context than gender. Given potential harms associated with some income generation activities, results highlight the need for further investigation of the social and structural context of income generation, its intersections with gender and substance use, and the expansion of low-threshold work opportunities.

Keywords

income generation; work; gender; substance use

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1. Introduction

Work is a significant social determinant of health in that it may positively impact health through income, health benefits, social status, and social connection (Ahonen et al., 2018). However, for many groups, such as socioeconomically marginalized people who use drugs (PWUD), formal employment can be difficult to obtain. Despite their willingness to work (DeBeck et al., 2011), some PWUD experience substantial barriers to employment, such as drug-related stigma, discrimination, drug scene involvement, or health comorbidities (Pescosolido and Martin, 2015; Richardson et al., 2013). In the absence of employment opportunities, socioeconomically marginalized PWUD may engage in other income-generating activities to meet their basic needs, including income assistance, street-based activities (e.g., recycling, panhandling), or illegal/prohibited activities (e.g., sex work, drug dealing, theft). Though associations between precarious employment, substance use, and suboptimal health are well-established (Benach et al., 2014; Richardson et al., 2016), these activities can differ greatly in terms of their viability, flexibility, intensity, and degree of exposure to social and structural harms, such as socioeconomic marginalization, housing instability, or exposure to violence. For instance, informal recycling may be less lucrative but more accessible, while theft may be more lucrative but associated with higher risk of incarceration or violence (Boyd et al., 2018; Jaffe et al., 2018). Given the activity-specific characteristics and environments of different types of income generation, more research is needed to understand and compare these differences and their implications for well-being (e.g., substance use patterns), supports (e.g., harm reduction resources), and policy (e.g., income assistance rates).

While unemployment and precarious work can shape substance use patterns (Boden et al., 2017; Henkel, 2011), characteristics related to substance use may also shape marginalized PWUDs capacity to engage in different income-generating activities (Richardson et al., 2016). Factors such as drug availability, cost, mode of administration, and frequency of use can structure day-to-day income generation, through both physiological effects associated

with substances and social-structural conditions of drug use environments. People who have lower frequency substance use may find it easier to retain employment (Alexandre and French, 2004), while people with higher intensity drug use may require greater flexibility or quicker access to remuneration from income-generating activities. For example, previous research has found higher intensity substance use to be associated with greater sex work income (Deering et al., 2011). Biological attributes of substances, such as side effects or metabolizing mechanisms, can also impact patterns of income generation. For instance, stimulants, including cocaine or methamphetamine, can result in increased alertness, energy, and motor activity (Fernández-Serrano et al., 2011), to the extent that people using stimulants may prefer income-generating activities that allow greater flexibility (e.g., hours of the day, length of time, etc.) and freedom of movement, or that people engaged in these activities use stimulants to stay awake. Conversely, the use of depressants such as opioids or alcohol may result in increased drowsiness (Fernández-Serrano et al., 2011), making it difficult to engage in activities that require prolonged movement or heightened awareness. Further, the mode of administration and the varied and fluctuating potency of unregulated substances can mean certain substances are consumed in smaller, more frequent amounts, while others last longer and are consumed less frequently (Hall et al., 2018). Accordingly, the pharmacological profile of a substance can, hypothetically, determine the structure of a person's day, from the money required for purchasing substances and frequency of use, to where they spend their time and distance they travel. In these ways, substance use patterns may prime individuals to engage in income-generating activities that best suit their needs. Thus, understanding how frequency, intensity, and general patterns of substance use are associated with income generation is essential to supporting the health, social, and economic needs of PWUD.

Reflecting broader patterns of employment in the labor market (Moyser, 2017), gender-specific considerations may also shape access to and preference for different income-generating activities as well as attendant issues of health, well-being, or other harms, such as exposure to violence. Women may be socially excluded from primarily male-dominated activities, such as manual labor or informal recycling (Tremblay et al., 2010), but find other activities more accessible to them, such as sex work. Gender may also structure the risk environment in which these activities occur. For instance, previous research among women in drug dealing found that although women may be a greater target for violence compared to men, many women reported they were less likely to be detected by police and thus at lower risk for incarceration (Ludwick et al., 2015; Small et al., 2013). Further, gendered patterns, contexts and effects of substance use, such as biological mechanisms, health comorbidities, or treatment access, may shape income generation (Neale, 2004; Riley et al., 2018).

To date, research on income generation among socioeconomically marginalized PWUD has been limited, with analyses primarily focused on single activities or sources of income generation (Chettiar et al., 2010; Jaffe et al., 2018; Kerr et al., 2008; Krebs et al., 2016; Richardson et al., 2021), or substance-specific studies (Callahan et al., 2015; Cross et al., 2001; DeBeck et al., 2007), without comparing associations across different forms of income generation or looking at gender-specific patterns of income generation and substance-related harm. To address this gap, we utilize data from two prospective cohorts of predominantly socioeconomically marginalized PWUD in Vancouver, Canada, to conduct an

exploratory analysis with the aim of understanding substance use patterns across individuals engaged in different income-generating activities and whether these patterns vary by gender.

2. Methods

2.1. Data

Data come from the Vancouver Injection Drug Users Study (V-DUS) and AIDS Care Cohort to evaluate Exposure to Survival Services (ACCESS), two ongoing prospective cohort studies of HIV-seronegative people who inject (V-DUS) or HIV-seropositive people who use drugs other than or in addition to cannabis (ACCESS), which was a controlled substance during the study. Since 1996, V-DUS and ACCESS have been continuously enrolling participants in Vancouver, Canada, using community-based methods, consistent with prospective cohort study research design. When participants enroll in the study, they complete an initial baseline survey and then complete follow-up surveys semi-annually thereafter that elicit information on sociodemographic characteristics, substance use, income generation, health, and social-structural exposures. V-DUS and ACCESS protocols are harmonized to permit pooled analyses. Participants are offered $40 CAD honorarium for each visit. Both studies have received ethics approval from the University of British Columbia/Providence Health Research Ethics Board.

2.2. Measures

For this analysis, results were derived from data collected between June 2006 and December 2017. To derive the primary outcome, participants were asked, "In the last six months, what were your sources of income?" and responses were sorted into six categories: (1) employment (regular; temporary; self-employment); (2) income assistance (income assistance; Canada pension plan; employment insurance); (3) street-based activities (recycling; squeegeeing; panhandling); (4) sex work (i.e. sex for money, drugs, other goods); (5) drug dealing; (6) other illegal activities (theft, robbery, fraud). Data were analyzed separately by gender, which was derived from the question, "Do you now consider yourself to be …." with six response options: man; woman; trans woman; trans man; Two-spirit; or "other" with an open response option. In preliminary analysis, the sample sizes for trans women (n=17), trans men (n=0), Two-Spirit and "other" (n=5) were too small to provide adequate statistical power. As a result of this constraint, we collapsed categories for women and men in our main analyses, defined as transgender or cisgender women and cisgender men, respectively, and have omitted the other groups (Bauer et al., 2017).

Independent variables included substance use-related measures and structural risk variables that reflect the six months prior to follow-up and sociodemographic characteristics at baseline, including gender, educational attainment, and race/ethnicity. To assess substance use patterns, we include measures of at least daily substance use within the previous six months, including the use of unregulated opioids (heroin; illicitly manufactured fentanyl; nonmedical prescription opioids), cocaine, methamphetamine, crack-cocaine, cannabis, and heavy alcohol (defined as >4 drinks per day on average). We also incorporate indicators associated with greater health risk, including public injection drug use and non-fatal overdose. To account for social-structural influences, we assessed recent housing instability

and residence in the Downtown Eastside (DTES), an urban neighborhood in Vancouver characterized by prevalent substance use, marginalization, and criminalization, as well as strong social and community bonds (Ivsins et al., 2019; Liu and Blomley, 2013). We include sociodemographic measures of age (per 10 years), ethnicity (white vs. Indigenous vs. other ethnicities), and educational attainment (high school or greater vs. less than high school).

2.3. Analysis

In descriptive analyses, we assessed gender-specific differences (transgender and cisgender women versus cisgender men) at participants' baseline using Pearson's χ^2 test for categorical variables and the Wilcoxon rank-sum test for continuous variables. Participants may be engaged in several income-generating activities, and so we additionally assessed frequency of engagement in other activities among participants reporting employment. Then, we ran two sets of analyses, separately for men and women. In each analysis, we estimated bivariable associations between independent explanatory variables and each outcome (type of income-generating activity), using generalized linear mixed-effects models (GLMMs) with a logit-link function to account for repeated measures within individuals over time. Next, for each outcome, we built a multivariable GLMM to estimate the adjusted association between the outcome and explanatory variables (McCulloch and Neuhaus, 2005). We included all explanatory variables in multivariable analyses, to avoid overlooking suppression or mediation effects and to maintain consistency across models. Assessing multivariable associations for each of the six income-generating activities among women and among men resulted in 12 independent GLMMs. All *p*-values were two-sided at *p*<0.05 significance. While stratifying data into two independent samples of women and men precludes comparisons across gender, keeping model specifications identical across all analyses outcomes supports general inference about any similarities or differences. Data for all outcome variables was largely complete, with .07% missing data for all income-generating activities, apart from drug dealing, which had .05% missing data among completed observations. SAS 9.4 was used for all analyses (North Carolina, USA).

3. Results

Our sample included 2231 individuals (V-DUS n=1313; ACCESS n=918) providing 25,355 observations (median=11, interquartile range [IQR]=4–19 observations per person), with 780 (35.0%) women and 1434 (64.3%) men, and 17 (1%) trans women. There were 44 participants who did not state their gender and five participants who identified as a non-binary gender (e.g., Two-Spirit) who were not included in the final analytic sample. At baseline, the median age of participants was 41 (IQR=34–48) with 55.3% reporting white ethnicity, 35.3% reporting Indigenous ancestry, and 9.1% reporting another non-Indigenous ethnicity. The most common form of income generation was income assistance (88.1%), followed by drug dealing (31.5%), street-based activities (24.9%), employment (23.4%), sex work (15.2%), and illegal activities (13.9%) (Table 1). At baseline, men were significantly more likely to be employed or engaged in street-based or illegal activities, while women were more likely to receive income assistance or engaged in sex work (Table 1). Participants reporting employment were less likely to also be engaged in other street-based, prohibited, and illegal income-generating activities (Table 2).

In final multivariable models (Tables 3a-c), we saw patterns of both gender convergence, where patterns are similar (i.e., significant positive associations for both men and women), and divergence where patterns are different (i.e., difference in significance or direction of results) in the relationship between drug use and income generation. Figure 1 shows key patterns of significance across substance use results for men (blue circles) and women (red squares), in which larger shapes represent greater odds ratios and darker shades are associated with greater positive associations. Sensitivity analyses examining results using a Bonferonni-corrected threshold for significance did not substantially change our findings (Abdi, 2007). In Models 1 and 2 (Table 3a), we tested associations with employment and found similar results across gender for negative associations with opioid, and crack-cocaine use. However, results also diverged by gender, where among men in employment, we found negative associations with methamphetamine use (Adjusted odds ratio (AOR)=0.73, 95% Confidence Interval (CI)=0.57–0.94) and positive associations with heavy alcohol use (AOR=1.49, 95% CI=1.25–1.77), and among women in employment, we found significant positive associations with cannabis use (AOR=1.31, 95% CI=1.01–1.69) and with non-fatal overdose (AOR=1.45, 95% CI=1.06–1.99). Models 3 and 4 (Table 3a) focused on income assistance and results highlighted a significant association with methamphetamine use across gender but among men, a negative association with opioid use (AOR=0.64, 95% CI=0.50–0.82) and positive association with cannabis use (AOR=1.61, 95% CI=1.23–2.11). Models 5 and 6 (Table 3b) focused on street-based activities, and across women and men, there were positive associations with use of opioids, methamphetamine, crack-cocaine, cannabis and injecting in public, as well as positive associations for heavy alcohol use among men (AOR=1.24, 95% CI=1.01–1.51). Models 7 and 8 (Table 3b) assessed associations with sex work and among both women and men, results indicated positive associations for methamphetamine use and injecting in public, but only among women were there positive associations with the use of the use of opioids (AOR=1.36, 95% CI=1.10–1.69), cocaine (AOR=1.58, 95% CI=1.15–2.18), crack-cocaine (AOR=2.74, 95% CI=2.22–3.37), and heavy alcohol (AOR=1.45, 95% CI=1.12–1.88). Models 9 and 10 (Table 3c) examined associations with drug dealing and results for both women and men showed positive associations with the use of opioids, cocaine, methamphetamine, crack-cocaine, cannabis, heavy alcohol, injecting in public, and overdose. Models 11 and 12 (Table 3c) analyzed relationships with other illegal activities and found similar associations by gender for opioid use, crack-cocaine use, injecting in public, and overdose, as well as positive associations with cocaine (AOR=1.92, 95% CI=1.41–2.61) and methamphetamine (AOR=1.42, 95% CI=1.01–1.99) use among men.

4. Discussion

The current analysis explores relationships between substance use patterns and income-generating activities among women and men. Results suggest that each of these income-generating activities occurred in distinct physical environments and social milieu and help to understand how women and men who use drugs may be similarly or differentially positioned in relation to these activities vis-à-vis their substance use.

4.1. Baseline engagement in income-generating activities

At baseline (Table 1), men were more likely to be employed and women were more likely to receive income assistance, which could reflect broader patterns of employment due to gender-specific barriers (e.g. employer discrimination; Moyser, 2017), that may be amplified among women who use drugs due to greater structural barriers, such as socioeconomic marginalization (e.g. via exclusion from labor market), unmet childcare needs, or interpersonal violence (Boyd et al., 2018). Although a majority of study participants receive income assistance, the amount provided in the current study context is below Canada's poverty measures (Laidley and Aldridge, 2020), and thus recipients commonly engage in additional informal activities to supplement their income, as evidenced by our descriptive results (Table 2). Engagement in informal activities such as street-based work and sex work also diverged by gender at baseline. This is consistent with previous research, where men were more likely to engaged in street-based activities and women in sex work (Cross et al., 2001; Tremblay et al., 2010). Although street-based activities may be an easily accessible, flexible means of generating additional income for socioeconomically marginalized PWUD, these activities can require greater physical labor, geographical isolation, or transgressing local public disorder ordinances (Binion and Gutberlet, 2012; Wittmer and Parizeau, 2016). Women may be excluded from or select out of these primarily male-dominated activities to reduce associated exposures to social violence (Boyd et al., 2018), or avoid contravening social norms of "women's work" (Gowan, 2009). Women may opt into sex work as a potentially more lucrative option, in spite of the associated health and social-structural risks (Deering et al., 2011; Marchand et al., 2012; Shannon et al., 2008; Strathdee et al., 2015). Finally, we assessed baseline engagement in the unregulated drug market, as well as other illegal activities. These may be more lucrative income streams, particularly for those excluded from the formal labor market due to discrimination or existing criminal records (Pager, 2003), but these activities have also been associated with increased risk, including criminalization, robbery, and exposure to drug market-related violence (Kerr et al., 2008; Small et al., 2013). At baseline, men were more likely to be engaged in illegal activities, but there were no gender differences between participants engaged in drug dealing, in contrast to prior research about male-dominated drug markets (Ludwick et al., 2015). However, previous work on women and drug dealing has identified vertical gender segregation within drug dealing, whereby women may engage in equal numbers to men, but remain in low-level positions inside drug dealing organizations (Maher and Hudson, 2007).

4.2. Income generation and drug use patterns: gender divergence

In our multivariable models, we found significant differences around substance use patterns between men and women for each income-generating activity, including both more formal activities (employment, income assistance), as well as informal activities (street-based, sex work, drug dealing, illegal). In models testing associations with employment, there was a positive association between heavy alcohol use and employment among men, which suggests alcohol may be more compatible with employment for men, even encouraged by workplace norms and through coworker relationships (Colell et al., 2014; Probst et al., 2015), or through binge drinking behaviors in work-related group settings (Courtenay, 2000). However, among women, there was a positive association between daily cannabis

use and employment, which may also be attributed to higher compatibility with employment (Huang et al., 2011), and emerging research identifies cannabis as a substitute for stimulant or opioid use (Lucas et al., 2019; Socías et al., 2017), which may facilitate employment. Additionally, women who were employed were more likely to experience overdose. Though employment has stabilizing and protective effects, so-called "weekend warriors" may refrain from using opioids during the work week, and instead use opioids on the weekends or otherwise infrequently, a practice which may increase overdose risk by reducing tolerance and making it difficult to monitor and respond to variations in drug supply and potency (Rowe et al., 2018). This relationship may also persist for women due to gendered characteristics of the labor market—for instance, women are more likely to work part-time or have unpredictable work schedules that shape drug use patterns (Moyser, 2017). In addition to employment, we tested associations with receiving income assistance, which is also characterized by engagement with more formal institutions. Men were less likely to use opioids daily, which may be a selection effect of higher intensity opioid use but may also be attributed to the availability of opioid agonist treatment at no cost for people receiving income assistance in British Columbia (Province of British Columbia, n.d.).

Across informal income-generating activities, we saw less evidence of gender divergent substance use patterns. Among men in street-based activities, there was a significant association with heavy alcohol use and among women in sex work, there were positive associations with daily use of opioids, cocaine, and crack-cocaine, as well as heavy drinking. Odds ratios for stimulant use were particularly high, consistent with previous findings linking sex work and concurrent crack-cocaine and methamphetamine use (Chettiar et al., 2010; Ti et al., 2014). It may be that women in sex work are using stimulants to increase vigilance or the energy required to stay awake in the evening (Bungay et al., 2010), highlighting potential opportunities for stimulant harm reduction and safe supply programs with this population (Bourque et al., 2019; Fleming et al., 2020; Shannon et al., 2011).

4.3.   Income generation and drug use patterns: gender convergence

Across models of formal income generation, similarities in substance use patterns across gender were more pronounced. Past research has identified employment among marginalized PWUD as a beneficial activity characterized by more reliable payment structures but one that requires higher degrees of commitment and external accountability (Richardson et al., 2010). In multivariable models focused on employment, both men and women were less likely to use opioids and crack-cocaine daily, which is consistent with previous research highlighting negative associations between high intensity drug use and employment (French et al., 2001; Koo et al., 2007; Richardson et al., 2010). Employment may not be conducive to higher intensity substance use or people using substances daily may select out of employment due to the time and energy involved in drug-seeking activities and frequent use (Richardson et al., 2016). In models focused on income assistance, there were positive associations with daily methamphetamine use among men and women. It may be that compared to people with opioid use disorder receiving income assistance, people with stimulant use disorders lack access to pharmacotherapies or other evidence-based treatments. Given low levels of support from income assistance, daily methamphetamine use may also be a less expensive alternative to other stimulants as it has a longer half-life

(Hall et al., 2018), thus necessitating less frequent use than other stimulants, such as crack-cocaine. Additionally, when supplementing income assistance with other income-generating activities, PWUD may be engaged in street-based activities that are more conducive to stimulant use, due to the energy required (Boyd et al., 2018). As of 2019, the rate of income assistance remains below Canada's poverty measures, including the Market Basket Measure, the Low Income Measure, and the Low Income Cut-off (Laidley and Aldridge, 2020), and an increase to this rate may reduce reliance on supplemental income-generating activities and mitigate substance use-related harm.

Across multivariable analyses of informal income-generating activities, we also observed substance use patterns that converged by gender. Men and women were more likely to report using stimulants daily, particularly among those engaged in sex work. It may be that stimulants are functional in so far as they assist in maintaining the energy required to spend long periods of time working outside in these capacities (Ti et al., 2014). Further, the short half-life of stimulants such as crack-cocaine may necessitate more frequent use and thus create more immediate need for additional income—potentially easier to obtain through low-threshold informal activities that individuals can quickly start and stop (Cross et al., 2001; DeBeck et al., 2007). Men and women engaged in street-based activities, drug dealing, and illegal activities were also more likely to use opioids daily, consistent with previous research highlighting associations between earnings from illegal activities, heroin use, and cocaine use (Callahan et al., 2015; Uggen and Thompson, 2003). Drug dealing may give participants greater access to more substances and they are thus able to use them more frequently (Kerr et al., 2008; Semple et al., 2013), or participants may engage in these activities for higher renumeration, in order to support higher intensity substance use (Callahan et al., 2015; DeBeck et al., 2007; Uggen and Thompson, 2003). These results may also represent selection effects whereby people who use stimulants and opioids daily face greater social marginalization or health issues that preclude them from the formal labor force (Fischer et al., 2006), resulting in greater engagement in informal work. The expansion of low-threshold employment opportunities could provide additional safe avenues for income generation, reducing the necessity to engage in activities associated with higher intensity substance use and related harms (DeBeck et al., 2011; Richardson et al., 2012).

Men and women involved in informal and illicit income generation were also more likely to experience health-related harms associated with substance use. Participants in street-based work, sex work, drug dealing, and illegal activities were more likely to inject in public, a practice associated with increased criminalization, victimization, and rushed injection practices (Small et al., 2007). These participants may spend greater time outdoors while engaged in these activities (Gutberlet et al., 2009), in effect reducing their access to safer indoor places to inject. In addition, they may experience barriers to accessing harm reduction supports, due to stigma (Benoit et al., 2015), fear of criminalization (Strathdee et al., 2015), or health comorbidities (Marchand et al., 2012). Participants engaged in drug dealing and illegal activities were also more likely to experience overdose. Fluctuating income streams may mean participants experience periods where they have erratic or intermittent income, which may predispose them to intermittent periods of high intensity substance use and overdose risk (Hayhurst et al., 2017). It may also be the case that people engaged in drug dealing test drugs via local drug checking services prior to distribution to

ensure quality (Betsos et al., 2021), but those who do not use these services may self-test their drugs (Mayer et al., 2018), which can contribute to the likelihood of experiencing overdose.

4.4. Limitations and Conclusion

This analysis has several limitations. First, questionnaire responses are self-reported and may be subject to response biases. However, study staff dedicate significant energy to building trusting relationships with participants and to reducing the likelihood of response biases (Darke, 1998). Second, data are based on non-random samples and therefore may not be generalizable to the broader population of socioeconomically marginalized PWUD. Third, we cannot assess causal relationships. Fourth, this analysis collapses cisgender and transgender into the same category in the analyses as well as dichotomizes gender and thus may exclude or obscure the experiences of trans people or people who identify as Two-Spirit, genderqueer, nonbinary, gender-nonconforming, or other gender identities— perspectives that are critical to a more complete understanding of gender, substance use, and income generation but who are not present in our study sample in numbers sufficient to support analyses. Finally, this analysis does not account for how polysubstance use may shape income generation, nor does it account for participants with multiple income streams, but future analysis may explore these experiences.

In this study, we explored associations between patterns of drug use and different types of income generation. We investigated diverging patterns by gender, noting that gender may shape selection into activities (e.g., men into street-based activities, women into sex work) as well as highlighting some gender differences in income source-specific substance use patterns. For instance, women were less likely to be employed, and women who were employed were more likely to report recent overdose despite a lower likelihood of using opioids daily. Most of our findings, however, highlighted similarities between men's and women's substance use patterns across income-generating activities. These patterns underscore the significance of the income generation context, which may supersede gender differences in shaping substance use patterns. For instance, both women and men in employment used fewer substances, which may point to the stabilizing effects of employment, or that people with more stable use patterns can retain employment. Conversely, participants in informal and illicit activities engaged in higher intensity substance use. These participants may have greater access to substances or engage in these activities to generate greater income more quickly to support more intensive use. Although these alternative forms of work can provide essential income, some income-generating activities carry greater risk of criminalization, violence, and health-related harms, and have been associated with greater willingness to cease engagement should other employment opportunities arise (DeBeck et al., 2011). Based on this exploratory analysis, future research should investigate the circumstances in which gender may shape exposure to substance use-related risks in income generation, as well as additional social and structural vulnerabilities (e.g., housing instability, violence, criminalization) across different income-generating activities and generate insights into how low-threshold income generation models may be expanded to accommodate different drug use patterns.

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Highlights

- Substance use patterns are associated with different forms of income generation

- Selection into particular income-generating activities may also be gendered

- Results suggest the work context may supersede gender in shaping drug use patterns

| | Men | | | | | | Women | | | | | |
Substance use	Employed OR	Inc Assist OR	Street OR	Sex work OR	Dealing OR	Illegal OR	Employed OR	Inc Assist OR	Street OR	Sex work OR	Dealing OR	Illegal OR
Daily opioids	0.85	0.64	1.37		2.42	1.85	0.75		1.25	1.36	2.22	2.04
Daily cocaine					1.56	1.92				1.58	1.36	
Daily methamphetamine	0.73	2.29	1.26	3.52	1.98	1.42		3.56	2.01	2.15	2.04	
Daily crack-cocaine	0.73		1.38		3.60	2.92	0.59		1.55	2.74	4.10	1.39
Daily cannabis		1.61	1.34		1.26		1.31		1.43		1.49	
Heavy alcohol	1.49		1.24		1.39					1.45	1.32	
Public injection			1.67	2.67	2.77	2.66			1.33	1.69	2.12	1.80
Non-fatal overdose					1.64	1.77	1.45				1.45	1.62

Figure 1.
Significant associations with substance use among men and women

Note: Larger shapes represent greater odds ratios. Darker shades are associated with greater positive association.

OR, Odds Ratios.

Table 1.

Baseline characteristics among people who use drugs in Vancouver, Canada, stratified by gender, 2006 – 2017 (n=2231)

| Characteristic | Total (%) [*n* = 2231] | Gender | | *p*- value |
		Male (%) [*n* = 1434]	Female (%) [*n* = 797]	x^2
Sociodemographic				
Age (median, IQR)	41 [34–48]	43 [36–49]	38 [31–45]	<0.001
White	1233 (55.3)	895 (62.4)	338 (42.4)	<0.001
Indigenous	787 (35.3)	381 (26.6)	406 (50.9)	<0.001
Non-Indigenous POC	204 (9.1)	155 (10.8)	49 (6.1)	0.312
Minimum HS education	1088 (48.8)	748 (52.2)	340 (42.7)	<0.001
Social and Structural				
DTES residence [†]	1546 (69.3)	959 (66.9)	587 (73.7)	0.001
Homelessness [†]	841 (37.7)	546 (38.1)	295 (37.0)	0.651
Substance use				
Daily opioid use [†]	692 (31.0)	386 (26.9)	306 (38.4)	<0.001
Daily cocaine use [†]	198 (8.9)	127 (8.9)	71 (8.9)	0.912
Daily methamphetamine use [†]	181 (8.1)	108 (7.5)	73 (9.2)	0.152
Daily crack-cocaine use [†]	772 (34.6)	440 (30.7)	332 (41.7)	<0.001
Daily cannabis use [†]	510 (22.9)	371 (25.9)	139 (17.4)	<0.001
Heavy alcohol use [†]	294 (13.2)	170 (11.9)	124 (15.6)	0.012
Public injection [†]	866 (38.8)	554 (38.6)	312 (39.1)	0.700
Non-fatal overdose [†]	206 (9.2)	134 (9.3)	72 (9.0)	0.847
Income Generation				
Employment [†]	521 (23.4)	409 (28.5)	112 (14.1)	<0.001
Income assistance [†]	1965 (88.1)	1245 (86.8)	720 (90.3)	0.011
Street-based activities [†]	555 (24.9)	400 (27.9)	155 (19.4)	<0.001
Sex work [†]	338 (15.2)	47 (3.3)	291 (36.5)	<0.001
Drug dealing [†]	703 (31.5)	463 (32.3)	240 (30.1)	0.311
Illegal activities [†]	311 (13.9)	219 (15.3)	92 (11.5)	0.015

IQR, Interquartile range; POC, Person of Color; HS, high school; DTES, Downtown Eastside

[†] In the 6 months prior to follow-up.

Note: Some percentages do not sum to 100% due to missing values.

Table 2.

Engagement in an additional income-generating activity among people who use drugs reporting employment, Vancouver, Canada, 2006 – 2017 (n=6093 observations)

Income-generating Activity	Engagement	
	Yes (%)	No (%)
Income assistance	5016 (82.3)	1077 (17.7)
Street-based activities	811 (13.3)	5282 (86.7)
Sex work	212 (3.5)	5881 (96.5)
Drug dealing	669 (11.0)	5424 (89.0)
Other illegal activities	203 (3.3)	5890 (96.7)

Table 3a.

Multivariable GLMM analysis of factors associated with income generation activities among people who use drugs in Vancouver, Canada, 2006–2017 (n=2231)

Characteristic	Employment				Income assistance			
	Model 1: Men		Model 2: Women		Model 3: Men		Model 4: Women	
	AOR	95% CI	AOR	95% CI	AOR	95% CI	AOR	95% CI
Sociodemographic								
Age (per 10 years)	0.99	(0.89 – 1.10)	1.26**	(1.08 – 1.47)	2.13***	(1.78 – 2.55)	2.00***	(1.52 – 2.62)
Indigenous (vs. white)	0.93	(0.69 – 1.25)	1.36	(0.95 – 1.95)	1.33	(0.84 – 2.10)	0.84	(0.47 – 1.51)
Non-Indigenous POC (vs. white)	1.18	(0.78 – 1.79)	0.74	(0.34 – 1.62)	0.31***	(0.17 – 0.56)	1.16	(0.34 – 4.00)
Minimum HS education	1.60***	(1.24 – 2.06)	1.46*	(1.03 – 2.07)	0.58**	(0.39 – 0.85)	0.61	(0.34 – 1.07)
Social and Structural								
DTES residence[†]	0.73***	(0.64 – 0.83)	0.70***	(0.57 – 0.85)	1.94***	(1.55 – 2.42)	2.47***	(1.71 – 3.55)
Homelessness[†]	0.72***	(0.62 – 0.83)	0.74*	(0.58 – 0.95)	0.80	(0.63 – 1.02)	0.61*	(0.41 – 0.90)
Substance use								
Daily opioid use[†]	0.85*	(0.73 – 0.98)	0.75*	(0.59 – 0.96)	0.64**	(0.50 – 0.82)	0.86	(0.57 – 1.30)
Daily cocaine use[†]	0.84	(0.67 – 1.07)	0.85	(0.58 – 1.23)	1.01	(0.67 – 1.52)	1.35	(0.72 – 2.55)
Daily methamphetamine use[†]	0.73*	(0.57 – 0.94)	1.05	(0.72 – 1.52)	2.29**	(1.37 – 3.81)	3.56*	(1.35 – 9.44)
Daily crack-cocaine use[†]	0.73***	(0.63 – 0.86)	0.59***	(0.47 – 0.74)	1.10	(0.85 – 1.42)	0.73	(0.50 – 1.06)
Daily cannabis use[†]	1.09	(0.94 – 1.26)	1.31*	(1.01 – 1.69)	1.61***	(1.23 – 2.11)	0.88	(0.55 – 1.42)
Heavy alcohol use[†]	1.49***	(1.25 – 1.77)	1.01	(0.79 – 1.30)	0.87	(0.65 – 1.16)	1.35	(0.85 – 2.15)
Public injection[†]	0.99	(0.85 – 1.15)	0.92	(0.72 – 1.19)	1.20	(0.92 – 1.56)	0.78	(0.51 – 1.20)
Non-fatal overdose[†]	1.07	(0.87 – 1.31)	1.45*	(1.06 – 1.99)	1.32	(0.91 – 1.92)	1.31	(0.66 – 2.60)

*
$p < .05$,

**
$p < .01$,

***
$p < .001$

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[†]In the 6 months prior to follow-up; AOR, Adjusted Odds Ratio; CI, Confidence Interval; POC, Person of Color; HS, high school; DTES, Downtown Eastside

Table 3b.

Multivariable GLMM analysis of factors associated with income generation activities among people who use drugs in Vancouver, Canada, 2006–2017 (n=2231)

Characteristic	Street-based Activities				Sex Work			
	Model 5: Men		Model 6: Women		Model 7: Men		Model 8: Women	
	AOR	95% CI	AOR	95% CI	AOR	95% CI	AOR	95% CI
Sociodemographic								
Age (per 10 years)	0.71***	(0.63 – 0.80)	0.93	(0.80 – 1.08)	0.19***	(0.12 – 0.31)	0.29***	(0.23 – 0.36)
Indigenous (vs. white)	0.95	(0.69 – 1.33)	0.93	(0.67 – 1.30)	2.79*	(1.09 – 7.14)	0.44**	(0.27 – 0.72)
Non-Indigenous POC (vs. white)	0.43**	(0.26 – 0.70)	0.99	(0.50 – 1.97)	0.53	(0.09 – 3.08)	0.65	(0.24 – 1.78)
Minimum HS education	0.71*	(0.54 – 0.95)	0.95	(0.69 – 1.32)	1.06	(0.44 – 2.56)	0.92	(0.57 – 1.49)
Social and Structural								
DTES residence [†]	1.21*	(1.05 – 1.40)	1.40**	(1.13 – 1.73)	0.86	(0.50 – 1.48)	2.05***	(1.60 – 2.62)
Homelessness [†]	1.25**	(1.08 – 1.46)	1.10	(0.89 – 1.36)	1.78*	(1.05 – 3.03)	1.06	(0.85 – 1.33)
Substance use								
Daily opioid use [†]	1.37***	(1.18 – 1.59)	1.25*	(1.02 – 1.54)	0.62	(0.34 – 1.13)	1.36**	(1.10 – 1.69)
Daily cocaine use [†]	1.25	(0.99 – 1.57)	1.26	(0.93 – 1.70)	0.41	(0.10 – 1.64)	1.58**	(1.15 – 2.18)
Daily methamphetamine use [†]	1.26*	(1.00 – 1.58)	2.01***	(1.48 – 2.73)	3.52***	(1.81 – 6.86)	2.15***	(1.50 – 3.07)
Daily crack-cocaine use [†]	1.38***	(1.18 – 1.61)	1.55***	(1.28 – 1.87)	1.67	(0.91 – 3.09)	2.74***	(2.22 – 3.37)
Daily cannabis use [†]	1.34***	(1.15 – 1.56)	1.43**	(1.12 – 1.82)	0.98	(0.52 – 1.85)	0.98	(0.73 – 1.32)
Heavy alcohol use [†]	1.24*	(1.01 – 1.51)	1.26	(0.99 – 1.62)	1.08	(0.51 – 2.27)	1.45**	(1.12 – 1.88)
Public injection [†]	1.67***	(1.44 – 1.95)	1.33**	(1.07 – 1.64)	2.67**	(1.53 – 4.67)	1.69***	(1.35 – 2.11)
Non-fatal overdose [†]	1.14	(0.93 – 1.40)	1.21	(0.91 – 1.59)	1.66	(0.89 – 3.10)	1.11	(0.81 – 1.52)

*
$p < .05$,

**
$p < .01$,

***
$p < .001$

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Table 3c.

Multivariable GLMM analysis of factors associated with income generation activities among people who use drugs in Vancouver, Canada, 2006–2017 (n=2231)

	Drug dealing				Illegal activities			
	Model 9: Men		Model 10: Women		Model 11: Men		Model 12: Women	
Characteristic	AOR	95% CI	AOR	95% CI	AOR	95% CI	AOR	95% CI
Sociodemographic								
Age (per 10 years)	0.55***	(0.49 – 0.62)	0.67***	(0.57 – 0.79)	0.38***	(0.31 – 0.45)	0.75*	(0.58 – 0.97)
Indigenous (vs. white)	0.84	(0.62 – 1.12)	0.93	(0.66 – 1.31)	0.78	(0.53 – 1.13)	0.75	(0.43 – 1.29)
Non-Indigenous POC (vs. white)	1.21	(0.80 – 1.83)	0.63	(0.30 – 1.30)	0.55*	(0.30 – 0.99)	0.61	(0.19 – 1.94)
Minimum HS education	1.05	(0.82 – 1.35)	1.14	(0.81 – 1.59)	1.27	(0.91 – 1.76)	0.78	(0.46 – 1.34)
Social and Structural								
DTES residence†	1.45***	(1.24 – 1.69)	1.66***	(1.34 – 2.06)	1.44**	(1.14 – 1.82)	1.98**	(1.34 – 2.91)
Homelessness†	1.52***	(1.30 – 1.77)	1.47***	(1.20 – 1.80)	2.20***	(1.78 – 2.72)	1.61**	(1.15 – 2.23)
Substance use								
Daily opioid use†	2.42***	(2.08 – 2.81)	2.22***	(1.83 – 2.70)	1.85***	(1.49 – 2.30)	2.04***	(1.47 – 2.85)
Daily cocaine use†	1.56***	(1.23 – 1.98)	1.36*	(1.02 – 1.82)	1.92***	(1.41 – 2.61)	1.27	(0.78 – 2.08)
Daily methamphetamine use†	1.98***	(1.56 – 2.53)	2.04***	(1.48 – 2.82)	1.42*	(1.01 – 1.99)	1.51	(0.91 – 2.49)
Daily crack-cocaine use†	3.60***	(3.09 – 4.21)	4.10***	(3.40 – 4.95)	2.92***	(2.33 – 3.66)	1.39*	(1.00 – 1.92)
Daily cannabis use†	1.26**	(1.07 – 1.49)	1.49**	(1.15 – 1.92)	0.88	(0.68 – 1.13)	1.43	(0.92 – 2.22)
Heavy alcohol use†	1.39**	(1.12 – 1.72)	1.32*	(1.03 – 1.69)	0.99	(0.72 – 1.38)	1.07	(0.71 – 1.61)
Public injection†	2.77***	(2.37 – 3.23)	2.12***	(1.74 – 2.59)	2.66***	(2.14 – 3.33)	1.80**	(1.29 – 2.52)
Non-fatal overdose†	1.64***	(1.33 – 2.02)	1.45**	(1.10 – 1.91)	1.77***	(1.34 – 2.32)	1.62*	(1.07 – 2.45)

*
  p <.05,

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  p <.01,

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  p<.001

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†In the 6 months prior to follow-up; AOR, Adjusted Odds Ratio; CI, Confidence Interval; POC, Person of Color; HS, high school; DTES, Downtown Eastside