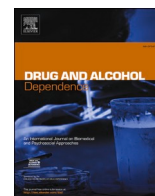




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Factors associated with perceived decline in the quality of drugs during the COVID-19 pandemic: Evidence from community-recruited cohorts of people who use drugs in Vancouver, Canada

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ABSTRACT

Objectives: Driven by an increasingly toxic drug supply, drug toxicity deaths in the United States and Canada have risen to unprecedented levels during the COVID-19 pandemic. This study aimed to characterize the prevalence of and the factors associated with a perceived decline in the quality of drugs during the COVID-19 pandemic among community-recruited cohorts of PWUD in Vancouver, Canada.

Methods: Data collection took place between July and November 2020. In adherence with COVID-19 safety protocols, questionnaires were administered by interviewers through remote means (e.g., phone or videoconference). Using multivariable logistic regression, we characterized the prevalence of and factors associated with a perceived decline in drug quality during the start of the COVID-19 pandemic in Vancouver, Canada.

Results: Of the 738 individuals included in this analysis, 272 (36.9%) reported that the quality of drugs declined during the COVID-19 pandemic. In multivariable analysis, perceived decline in the quality of drugs was significantly associated with: recent non-fatal overdose (adjusted odds ratio [AOR]=2.01, 95% Confidence Interval [CI]: 1.29–3.15), at least weekly injection drug use (AOR=1.94, 95% CI: 1.40–2.71), at least weekly crack use (AOR=1.61, 95%CI: 1.10–2.36), and at least weekly crystal methamphetamine use (AOR=1.46, 95%CI: 1.03–2.08).

Discussion: Over a third of PWUD perceived that the quality of drugs declined during the COVID-19 pandemic and these individuals were significantly more likely to report experiencing a recent non-fatal overdose, engaging in frequent injection drug and stimulant use. Study findings indicate the need for interventions to address the toxic drug supply, including providing a regulated supply.

1. Introduction

The United States and Canada are in the midst of an unprecedented toxic drug supply crisis that accelerated during the ongoing COVID-19 pandemic (Centers for Disease Control and Prevention, 2020; Government of Canada, 2021). In Canada, the province of British Columbia (B.C.) is currently experiencing the highest rates of drug toxicity deaths in

the country at an unprecedented rate of 41.2 per 100,000 as of October 31, 2021 – more than double that of the death rate in 2016 when the province first declared a state of emergency (20.4 per 100,000) (BC Coroners Service, 2021). Fentanyl and analogues have been detected in 86.8% of drug poisoning fatalities from January 2018 to October 31, 2021 (BC Coroners Service, 2021).

It has been suggested that COVID-19 infection control measures such

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as border closures and travel bans may have strained traditional drug supply chains. These measures left an opening for an increased flow of fentanyl and other highly potent analogues that are more easily trafficked via mail (United Nations Office on Drugs and Crime UNODC, 2020). This flow is thought to have accelerated the further contamination of the unregulated drug supply and increased the risk of fatal overdoses (CCSA, 2020a, 2020b; Government of Canada, 2020; Public Health Agency of Canada, 2020; United Nations Office on Drugs and Crime UNODC, 2020). Reports from the United Nations Office on Drugs and Crime have indicated that there have been interruptions in methamphetamine production and trafficking, and heroin shortages during the COVID-19 pandemic, which may have led to increases in adulteration/substitution with synthetic opioids, such as fentanyl (United Nations Office on Drugs and Crime UNODC, 2020, 2021).

Research including the perspectives of people who use drugs (PWUD) and their perceptions of the quality of drugs they have used during the COVID-19 pandemic is limited. Emerging qualitative data from PWUD from multiple settings in Canada indicates that some PWUD report a decline in the quality and/or potency of their substances during the COVID-19 pandemic (Ali et al., 2020, 2021; CCSA, 2020a). It is unclear, however, if a perceived decline is associated with any particular sub-populations of PWUD, as well as drug-related risk factors, particularly overdose. To address this gap, we sought to understand the perceived changes in the drug supply and characterize the prevalence of and factors associated with reporting a perceived decline in the quality of drugs during the COVID-19 pandemic among community-recruited cohorts of PWUD in Vancouver, Canada. Understanding factors associated with a perceived decline in the quality of drugs can assist in targeting interventions to those who are most at risk for experiencing drug-related harms.

2. Material and methods

Data for this study were derived from three ongoing prospective cohorts of PWUD in Vancouver, Canada: the At-Risk Youth Study (ARYS), the Vancouver Injection Drug Users Study (VIDUS), and the AIDS Care Cohort to Evaluate Exposure to Survival Services (ACCESS). Details of these studies and their harmonized procedures have been described in detail previously and published elsewhere (Strathdee et al., 1997; Tyndall et al., 2001; Wood et al., 2006). In brief, to be eligible for enrolment, participants must have used drugs (other than or in addition to cannabis, alcohol, or tobacco) within the previous 30 days, reside in the Greater Vancouver area, and provide written informed consent. The ARYS cohort includes participants who are between the ages of 14–26 years at enrolment and are street-involved, defined as being without stable housing or utilizing services for youth who are experiencing homelessness within the last month. The VIDUS cohort includes participants who are 18 years or older, who are HIV-negative, and have injected drugs within the last month. The ACCESS cohort includes participants who are aged 18 years or older and living with HIV.

Participants from all three cohorts complete an interviewer-administered questionnaire at baseline and every six months thereafter. The questionnaire collects data on demographics, substance use patterns and associated risks, income generation activities, and health and social service engagement, among others. All participants receive a \$40 CAD honorarium at each study visit. The University of British Columbia/Providence Health Care Research Ethics Board has approved all cohorts.

Due to the COVID-19 pandemic, all in-person data collection activities for the cohort studies were halted in March 2020. New COVID-19 safe study protocols were developed, and the study instrument was revised to include items specific to the COVID-19 pandemic. In July 2020 data collection for those already enrolled in the cohorts was resumed. Study interviews were no longer hosted in person but were conducted remotely via telephone or videoconferencing. Participants were initially contacted via telephone, email, and/or social media to

inform them that they were due for a remote study follow-up visit. Those interested in participating were provided the option to complete the interview via telephone or videoconferencing and were asked if they had access to a phone with minutes or a phone/computer/tablet with internet access and a private space to complete the interview (for approximately 1 h). Participants who did not have access to a telephone were provided the option to utilize a study-owned pre-paid cellphone for the purposes of conducting the interview. If a participant required the use of a study-owned cellphone they could pick-up the cellphone from the study office located in downtown Vancouver. Participants who had access to online banking or a bank account received their honorarium via e-transfer. For participants who do not have access to a bank account, arrangements were made to pick up the cash honorarium in person at the study office.

Participants who completed an interview between July to November 2020 were included in the present study.

To assess the prevalence and correlates of reporting a perceived decline in the quality of drugs since the start of the COVID-19 pandemic, we defined our primary outcome of interest based on the question “What have you noticed regarding the quality of the drug you most frequently use from before the COVID-19 public health emergency to now?”. Participants who responded “it is worse in quality” were coded as yes for perceived decline in the quality of drugs. Respondents who answered “it is better in quality” or “it is about the same in quality” were coded as no. It was hypothesized that participants may have different degrees of sensitivity to changes in the drug supply that occurred at the start of the COVID-19 pandemic. For example, PWUD that did not have a source of stable income may have less access to higher-quality substances, or conversely, those that are more engrained in illicit substance use and drug markets (i.e., those who engage in drug dealing and sex work, and have not been separated from the drug scene due to addiction treatment engagement), may have access to “good dealers” and a supply of substances that is more reliable. Drug type and drug mode (i.e., injection), may similarly be associated with different sensitivities to drug supply changes. Furthermore, we hypothesized that individuals who experienced a non-fatal overdose would be more likely to report a perceived decline in the quality of drugs. As such, independent variables of interest that we hypothesized to be associated with a perceived decline in the quality of drugs at the start of the COVID-19 pandemic included: self-identified gender (male vs. female or other; this category included participants who identify as transgender, Two-Spirit,¹ and those who preferred to self-describe in an ‘other’ category); age (per year older); cohort membership (VIDUS vs. ACCESS vs. ARYS); ethnicity (Black, Indigenous or Persons of Colour [BIPOC] vs. white); experiencing homelessness (yes vs. no); Downtown Eastside (DTES) residence, a neighbourhood in Vancouver with a well characterized open drug scene (Wood et al., 2004) (yes vs. no); regular employment, defined as having a regular job, temporary work or self-employed (yes vs. no); at least weekly drug injection (yes vs. no); at least weekly cocaine use (yes vs. no); at least weekly crack cocaine use (yes vs. no); at least weekly heroin/fentanyl/down use (yes vs. no); at least weekly crystal methamphetamine use (yes vs. no); at least weekly nonmedical prescription opioid (PO) use, defined as taking POs that were not prescribed or taking POs only for the experience or feeling they caused (yes vs. no); non-fatal overdose, defined as an acute reaction or overdose following drug use (yes vs. no); any drug or alcohol treatment, defined as having engaged with any drug or alcohol treatment programme, including detox, a recovery house, a treatment centre, a counsellor, Narcotics Anonymous/Cocaine Anonymous/Alcoholics Anonymous/SMART, opioid

¹ Two-Spirit is a gender identity specific to Indigenous peoples. Persons who identify as Two-Spirit are a part of a cross-gender identity, and have cross-gender roles (Laframboise and Anhorn, 2008). The exact definitions of Two-Spirit differ from nation to nation (Provincial Health Services Authority, 2022).

agonist therapy, out-patient treatment, or drug treatment court (yes vs. no); involvement in drug dealing, defined as receiving money in exchange for drugs (yes vs. no); and sex work involvement, defined as receiving money, gifts, food, shelter, clothes, or drugs for sex (yes vs. no). With the exception of gender and ethnicity or unless otherwise specified, all variables referred to the six-month period before the interview.

As a first step in the analysis, the bivariable associations between our primary outcome of interest and independent variables of interest were estimated using logistic regression. Factors with $p < 0.10$ threshold in the bivariable analysis were included in a backward elimination procedure to construct a multivariable model with the best subset selection based on the Akaike information criterion (Bozdogan, 1987). We used a conservative p -value of 0.10 as the threshold for the inclusion of

variables in the model building process to ensure that all variables of potential importance were captured and included.

With respect to our hypothesis that individuals who experienced a non-fatal overdose would be more likely to report a perceived decline in the quality of drugs during the start of the COVID-19 pandemic, we wanted to confirm that our measure for non-fatal overdose reflected the COVID-19 pandemic period. Given that some study participants were seen for an interview in July 2020, self-reports of having experienced a non-fatal overdose in the last six months could potentially reflect overdose events that occurred prior to the start of the COVID-19 pandemic in Canada. To ensure that the relationship between a perceived decline in the quality of drugs and potential increased risk of overdose reflected only the experiences of overdose in the COVID-19 pandemic era, we conducted a sub-analysis where the variable

Table 1

Bivariate and multivariate logistic regression analysis of factors associated with reporting a perceived decline in the quality of drugs during the COVID-19 pandemic among PWUD in Vancouver, Canada ($n = 738$).

Characteristic	Reduction in Drug Quality		Odds Ratio (95% CI)	p - value	Adjusted Odds Ratio (95% CI)	p - value
	Yes $n = 272$ n (%)	No $n = 466$ n (%)				
Age [†] (median, IQR)	45.2 (32.6–54.5)	44.6 (31.4–55.4)	1.00 (0.99 – 1.01)	0.754		
Cohort						
ACCESS	85 (31.3)	137 (29.4)	0.93 (0.75–1.15)	0.492		
ARYS	72 (26.5)	161 (34.6)	1.29 (1.03–1.60)	0.026		
VIDUS	115 (42.3)	168 (36.1)				
Self-identified gender						
Male	140 (55.1)	282 (63.2)	0.71 (0.52–0.98)	0.035		
Female or other [‡]	114 (44.9)	164 (36.8)				
Ethnicity						
BIPOC	164 (64.6)	275 (61.9)	1.12 (0.81–1.54)	0.489		
White	90 (35.4)	169 (38.1)				
Homelessness*						
Yes	51 (19.0)	63 (13.6)	1.49 (0.99 – 2.23)	0.055		
No	218 (81.0)	400 (86.4)				
DTES residency*						
Yes	127 (46.7)	212 (45.5)	1.05 (0.78 – 1.42)	0.753		
No	145 (53.3)	254 (54.5)				
Employment*						
Yes	101 (37.1)	163 (35.1)	1.09 (0.80 – 1.49)	0.570		
No	171 (62.9)	302 (65.0)				
≥ Weekly injection drug use*						
Yes	153 (56.3)	165 (35.6)	2.32 (1.71–3.15)	< 0.001	1.94 (1.40–2.71)	< 0.0001
No	119 (43.8)	298 (64.4)				
≥ Weekly cocaine use*						
Yes	21 (7.8)	32 (6.9)	1.13 (0.64–2.00)	0.678		
No	250 (92.3)	430 (93.1)				
≥ Weekly crack use*						
Yes	75 (27.7)	93 (20.1)	1.52 (1.07–2.16)	0.019	1.61 (1.10–2.36)	0.0133
No	196 (72.3)	370 (79.9)				
≥ Weekly heroin/fentanyl use*						
Yes	149 (55.0)	167 (36.2)	2.16 (1.59–2.93)	< 0.0001		
No	122 (45.0)	295 (63.9)				
≥ Weekly crystal meth use*						
Yes	109 (40.2)	127 (27.5)	1.77 (1.29–2.44)	0.000	1.46 (1.03–2.08)	0.036
No	162 (59.8)	335 (72.5)				
≥ Weekly non-medical PO use*						
Yes	18 (6.7)	18 (3.9)	1.77 (0.91 – 3.47)	0.094		
No	252 (93.3)	447 (96.1)				
Non-fatal overdose*						
Yes	58 (21.5)	43 (9.4)	2.65 (1.73 – 4.07)	< 0.001	2.01 (1.29–3.15)	0.002
No	212 (78.5)	417 (90.7)				
Drug/alcohol treatment*						
Yes	178 (66.2)	276 (60.3)	1.29 (0.94 – 1.77)	0.113		
No	91 (33.8)	182 (39.7)				
Drug dealing*						
Yes	95 (34.9)	103 (22.1)	1.89 (1.36 – 2.64)	0.000	1.41 (0.98–2.02)	0.062
No	177 (65.1)	363 (77.9)				
Sex work*						
Yes	36 (13.2)	34 (7.3)	1.93 (1.18 – 3.17)	0.009		
No	236 (86.8)	431 (92.7)				

[†] Per one-year increase.

IQR = interquartile range.

[‡] Includes participants who identify as transgender, Two-Spirit and 'other'.

* Activities reported in last 6 months.

‘experiencing non-fatal overdose in the last six months was replaced with ‘experiencing non-fatal overdose in the last month’.

All statistical analyses were performed using SAS software version 9.4 (SAS Institute, USA). All *p*-values are two-sided.

3. Results

Overall, 884 participants completed a study visit between July and November 2020. Given pandemic conditions and changes in data collection procedures to align with COVID-19 safety protocols, study follow-up visits were not able to be arranged for all participants enrolled in the cohorts. Among the surveys that were completed, there were 77 missing values for our outcome of interest (perceived decline in quality of drugs) and 69 participants answered “don’t know” to the main outcome of interest. These individuals were excluded from the analysis. Among the remaining 738 participants included, 422 (60.3%) identified as male, 439 (62.9%) identified as BIPOC, and the median participant age was 45 years (interquartile range: 32–55). Overall, 272 (36.9%) participants indicated that they perceived a decline in the quality of drug they most frequently used, while 425 (57.6%) reported that there was no change and 41 (5.6%) reported that there was an improvement in the quality of drug they most frequently used during the COVID-19 pandemic.

Factors associated with reporting a decline in the quality of drugs in the bivariable and multivariable analyses are shown in Table 1. In bivariate analysis, male gender (odds ratio [OR]=0.71 [95% Confidence Interval [CI]: 0.52–0.98]); ARYS vs. VIDUS cohort membership (OR=1.29 [95% CI: 1.03–1.60]); experiencing a non-fatal overdose in the last six months (OR=2.65 [95% CI: 1.73–4.07]); at least weekly injection drug use (OR=2.32 [95% CI: 1.71–3.15]); at least weekly crack use (OR=1.52 [95% CI: 1.07–2.16]); at least weekly heroin/fentanyl use (OR=2.16 [95% CI: 1.59–2.93]); at least weekly crystal methamphetamine use (OR=1.77 [95% CI: 1.29–2.44]); drug dealing (OR=1.89 [95% CI: 1.36–2.64]); and sex work (OR=1.93 [95% CI: 1.18–3.17]) were all significantly associated with reporting a perceived decline in the quality of drugs (all *p* < 0.05). In the multivariable analysis, experiencing a non-fatal overdose in the last six months (adjusted odds ratio [AOR]=2.01 [95% CI: 1.29–3.15]); at least weekly injection drug use (AOR=1.94, [95% CI: 1.40–2.71]); at least weekly crack use (AOR=1.61 [95% CI: 1.10–2.36]), and at least weekly crystal methamphetamine use (AOR=1.46 [95% CI: 1.03–2.08]), were all independently and significantly associated with reporting a perceived decline in the quality of drugs among study participants (all *p* < 0.05).

In sub-analysis, of 101 participants that reported experiencing a non-fatal overdose in the last six months, 45 reported experiencing a non-fatal overdose in the last month. When replacing the variable experiencing non-fatal overdose in the last six months to last month in the multivariate analysis, the positive relationship between perceived decline in the quality of drugs and non-fatal overdose remain significant (AOR=2.56, [95% CI = 1.32–4.95] *p* = 0.005).

4. Discussion

A perceived decline in the quality of the substance most frequently used was common among PWUD in our setting and associated with at least weekly injection drug use, crack cocaine use, crystal methamphetamine use, and non-fatal overdose during the COVID-19 pandemic.

Experiencing a non-fatal overdose is well documented to be an important risk factor for a future fatal overdose (Caudarella et al., 2016; Powis et al., 1999; Stooé et al., 2009; Werb et al., 2008). While the frequency and mode of substance use are known to drive overdose risk (Fairbairn et al., 2007; Kerr et al., 2006; Mitra et al., 2015), the source of substances is increasingly central for overdose risk. Indeed, one of the proximate drivers of the increase in overdose deaths in the United States and Canada during the COVID-19 pandemic is an increasingly toxic unregulated drug supply (BC Coroners Service, 2021). Data from B.C.’s

Community Drug Checking programme highlights the degree to which the drug supply has been contaminated. Of the drug samples collected and analyzed between January 2020 and October 2020, fentanyl was detected in 89% of opioid samples (Long et al., 2020). Furthermore, the increased presence of adulteration with benzodiazepines in the unregulated drug supply in B.C. is a substantial concern and heightens fatal overdose risk (Laing et al., 2021). Our findings support the interpretation that a decline in the quality of drugs, in addition to the frequency and mode of drug use, are impacting overdose risk and contributing to increased overdose fatalities during the COVID-19 pandemic. Moreover, a decline in the quality of drugs in the supply may also lead to an increased frequency of use, which is associated with increased overdose risk. Alternatively, it is possible that some sub-groups of PWUD may have less established access to the drug supply and therefore be more vulnerable to toxic drugs.

Research conducted by the International Network of People Who Use Drugs during the pandemic found that between 50% and 70% of respondents globally reported that the quality of drugs declined during the pandemic (International Network of People Who Use Drugs INPUD, 2020). Our study findings are consistent with previous calls for meaningful policy interventions to address the toxic drug supply and prevent further overdose, including the provision of a regulated supply of drugs (Tyndall, 2020a, 2020b). Safer supply initiatives involve providing PWUD with regulated opioids and stimulants to prevent or reduce consumption of unregulated drugs that are of unknown composition and potency (Tyndall, 2020a, 2020b). While other harm reduction measures, such as supervised consumption facilities and naloxone distribution programmes, are vital to saving lives, they do not substantially address the ultimate cause of toxic drug poisoning deaths (Irvine et al., 2019). In light of these research findings and reports that the supply of unregulated substances continues to become more toxic, low-barrier and accessible models for regulated safer supply should be implemented in order to be effective for broad populations of PWUD.

The B.C. government in March of 2020 released interim clinical guidance titled “Risk Mitigation in the Context of Dual Public Health Emergencies” which allowed for the prescribing of pharmaceutical substances to “support self-isolation or physical distancing” for PWUD (British Columbia Centre on Substance Use, 2020). The new guidance allowed for medical professionals to prescribe a variety of pre-determined medications, including two stimulant medications, Dexedrine SR and Methylphenidate SR (British Columbia Centre on Substance Use, 2020). To be eligible a person must be at risk of COVID-19 infection, or confirmed positive with a COVID-19 infection, have a history of ongoing active substance use, and deemed to be at a high risk of withdrawal or overdose. Based on preliminary data from the BCCSU from July to November of 2020, which has not yet been peer-reviewed, there has been a very low uptake of the risk mitigation prescribing: over 80% of participants (*n* = 577) “never tried” to access the safe supply (BC Centre on Substance Use, 2021). At the time of data collection for this analysis, the risk mitigation prescribing was not a robust programme and therefore, likely did not impact or had very little impact on the results of this study.

This study also found that individuals who regularly use stimulants were significantly more likely to report a decline in the quality of drugs. This finding is concerning given that data from the B.C. Coroners Service finds that cocaine was present in 46.2% of deaths from 2019 to 2021 (BC Coroners Service, 2021). These collective observations highlight the importance of making safer supply options accessible for people who use stimulants. Echoing previous calls, investigating the feasibility of utilizing prescription psychostimulant medications, such as methylphenidates or high doses of extended-release amphetamines as a safe supply for people who use stimulants is warranted (Fleming et al., 2020). To be effective, safe supply initiatives for people who use stimulants must meet people where they are at by offering doses that meet consumption patterns of unregulated drugs and offer a range of consumption methods, including injectable formulas (Fleming et al., 2020).

There are several limitations associated with this study. Firstly, as a result of the cross-sectional nature of this study, it is not possible to make causal inferences. Despite adjustment for sociodemographic and behavioural factors, the association between perceived decline in the quality of drugs and overdose could be due to unmeasured confounding. Secondly, study participants were not a random sample, therefore findings may not be representative of all PWUD either locally or in other settings. Next, all data within the study is self-reported, which may lead to recall or social desirability bias; however, previous research has determined that self-reported drug use behaviours are valid and reliable (Darke, 1998). Finally, given the COVID-19 pandemic, it is possible that cohort participants without access to phones and the internet and who typically frequent the frontline study office drop-in spaces and/or receive reminders for study follow-up through community services which were more restrictive or closed due to the pandemic at the time of the study were less likely to have been included in this current study sample. However, we took a number of steps to reduce the possible influence of this selection bias, including loaning participants mobile phones to complete remote study assessments. Similarly, we were unable to identify participants in the cohort who have recently deceased as a result of the toxic drug supply. It is anticipated that these individuals would be exposed to more risks than the current study sample thereby suggesting that our estimated prevalence is likely conservative. However, it serves to strengthen our findings on the significant association between experiences of non-fatal overdose and the perceived decline in the quality of drugs.

In summary, the present study found that in Vancouver, Canada more than one third of PWUD in our study perceived a decline in the quality of drugs during the ongoing COVID-19 pandemic and was associated with an increased risk of overdose, at least weekly injection drug use, and at least weekly crystal methamphetamine use among our sample PWUD. Findings highlight the urgent need for interventions, including a regulated safer supply of drugs to address issues connected to the toxic drug supply and prevent further deaths. Notably, people who use stimulants were more likely to report a perceived decline in drugs, which highlights the importance of making a regulated safer supply available to people who use stimulants.

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CRedit authorship contribution statement

Erica McAdam, Kanna Hayashi and Kora DeBeck conceptualized and designed the study. Erica McAdam, Huiru Dong, Zishan Cui, and Kora DeBeck analyzed the data. Erica McAdam wrote the first draft and integrated suggestions from all other authors. All authors made significant contributions to the interpretation of the data and drafting of the manuscript. All authors critically revised the manuscript and approved the final draft.

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