

BMJ Open Motivations for concurrent use of uppers and downers among people who access harm reduction services in British Columbia, Canada: findings from the 2019 Harm Reduction Client Survey

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ABSTRACT

Introduction An increase in crystal methamphetamine (methamphetamine) use during the overdose epidemic is being observed in British Columbia (BC), Canada, and across North America. Concurrent use (ie, using uppers and downers one after the other or together) can increase the risk of fatal and non-fatal opioid overdose.

Objectives We investigated motivations for concurrent use of uppers and downers, specifically how (eg, in what order) and why people use concurrently, to identify potential interventions to prevent overdose and other harms.

Setting and participants The 2019 Harm Reduction Client Survey was administered across 22 harm reduction supply distribution sites in BC (n=621). This thematic analysis examined 307 responses by people who affirmed concurrent use to classify order and reasons for using uppers and downers concurrently.

Results Of the 307 people who responded 'yes' to concurrent use, 179 (58.3%) used downers then uppers, 76 (24.8%) used uppers then downers and 184 (59.9%) mixed uppers and downers together. Four main reasons for concurrent use emerged: self-medication, availability and preference, drug effects/properties, and financial and life situation. People who mixed drugs together predominantly wanted to achieve desired drug effects/properties, such as a specific high or balancing stimulating and sedating effects.

Conclusions The ongoing rise in overdoses in BC is multifactorial, and the recent parallel increases in methamphetamine use and concurrent use with opioids may contribute. Qualitative interviews may further elucidate reasons for concurrent use. Addressing reasons for concurrent use identified in this study through harm reduction strategies and education may affect the rates of overdose morbidity and mortality.

INTRODUCTION

The current overdose crisis, driven by an increasingly toxic and unpredictable illicit drug supply, has had a high burden of morbidity and mortality in Canada. Between

Strengths and limitations of this study

- This cross-sectional survey of people who use substances includes sampling from harm reduction supply distribution sites across the province of British Columbia, from both rural and urban communities, and includes over 600 total participants.
- Input was received from people who use substances throughout survey development, piloting and manuscript writing to assess and improve validity.
- Open-ended survey questions do not yield as in-depth responses as other qualitative methods (eg, interview).
- Similar to other surveys with marginalised populations, findings are prone to survivor, recall and reporting biases plus generalisability is limited beyond study participants.

January 2016 and September 2021, over 26 500 opioid toxicity deaths, over 29 000 opioid-related poisoning hospitalizations, and nearly 13 000 stimulant-related poisoning hospitalizations were reported in Canada.¹ The province of British Columbia (BC) has been particularly affected; illicit drug toxicity death rates have sharply increased since 2016 and are the highest in the country. Concerningly, 2021 saw the highest number of illicit drug toxicity deaths in the province to date: 43.0 deaths per 100 000 population in BC.² This translates to an average of 6 deaths per day. In all of Canada, preliminary data (January through September 2021) suggests there were an average of 20 deaths per day across the country.¹ Fentanyl, a potent opioid found in the unregulated drug supply, has been the main driver of this increase in overdose deaths.³

In Vancouver, BC, the prevalence of reported past 6 months methamphetamine



use increased from 19% in 2006 to 36% in 2017.⁴ Among those who access harm reduction services across BC, having reported using methamphetamine in the past 3 days increased from 60% in 2018 to 72% in 2019.⁵ Additionally, BC provincial overdose mortality data from 2014 to 2017 indicates that of the deaths where methamphetamine was detected, 87% were found to have fentanyl present.⁶ Across North America, there has also been a reported increase in concurrent use of methamphetamine and opioids in recent years.^{5,7–11} In the USA, the proportion of opioid-related deaths co-occurring with methamphetamine use increased by 14.6% from July–December 2017 to January–June 2018.¹² Ellis and colleagues⁹ characterised the paralleled increase in methamphetamine use during the overdose epidemic as the ‘twin epidemic’. Specifically, they found past month use of methamphetamine increased significantly (from 18.8% in 2011 to 34.2% in 2017) among people who used opioids and were seeking treatment. Strickland *et al*¹¹ corroborated these findings using a nationally representative database in the USA, notably finding that for those who reported heroin use in the last month, methamphetamine use increased from 9% in 2015 to 30% in 2017. Increasing morbidity, as evidenced by overdose deaths where both methamphetamine and opioids are present, reflects the harms associated with the ‘twin epidemic’.⁶

Among those who access harm reduction sites in BC, self-reported past 3-day stimulant use included 71.7% identifying crystal meth, 22.7% crack cocaine, 16.9% powder cocaine and 6.8% other stimulants (including Ritalin, Adderall or other stimulants).⁵ Therefore, people who use stimulants or ‘uppers’ who access harm reduction sites in BC, mainly refers to methamphetamine use with a smaller proportion of crack/powder cocaine use and only a small portion of participants using other types of stimulants.

While data have shown methamphetamine use trends increasing, use of other stimulants such as crack/powder cocaine has been decreasing in recent years. Three multi-year studies in Vancouver, the Vancouver Injection Drug Users Study, the AIDS Care Cohort to Evaluate Access to Survival Services, and the At-Risk Youth Study, have all shown increasing trends in methamphetamine use and decreasing trends in crack/powder cocaine use.¹³

When stimulants or ‘uppers’ (eg, methamphetamine or crack/powder cocaine) and depressants or ‘downers’ (eg, heroin, fentanyl or prescribed opioids) are used concurrently, the effects are unique and the harms can be additive.⁸ Methamphetamine can lead to increased energy, agitation, anxiety and paranoia, while opioids can lead to calming and drowsiness. Stimulants such as methamphetamine activate the sympathetic branch of the autonomic nervous system leading to increased heart rate, blood pressure, respiratory rate and body temperature. Conversely, opioids lower blood pressure, heart rate and respiratory drive. While research investigating the harms of using concurrently is relatively limited, studies have suggested that concurrent methamphetamine and opioid

use is associated with an increased risk of overdose^{8,14} and syringe sharing.¹⁵

Determining motivations for concurrent stimulant and opioid use is critical to addressing how best to reduce the associated harms including identifying interventions and education to dispel myths. A qualitative study of 39 people prescribed methadone in Vancouver, BC investigated concurrent stimulant use and found three primary themes: (1) stimulants countered the sedation of methadone and facilitated engagement in survival activities, (2) increased stimulant use to compensate for reduced stimulant intoxication while on methadone and (3) desire for stimulant intoxication.¹⁶ A recent qualitative study among people in treatment in Oregon, found reasons for concurrent methamphetamine and opioid use included strategies to mitigate the symptoms associated with heroin withdrawal and as an attempt to detox or titrate the effects of heroin.¹⁷ Also in Oregon, a survey (n=144) and interviews (n=52) conducted across two rural counties found reasons for concurrent methamphetamine and opioid use included methamphetamine being more widely available, less expensive and less stigmatised compared with heroin; methamphetamine improving work-life functioning; and because concurrent use produced an enjoyable high.¹⁸ An Australian study of 14 people found reported reasons for concurrent methamphetamine and opioid use were: (1) reduce withdrawal side effects, (2) prolong intoxication, (3) provide more desirable intoxication than either substance alone and (4) methamphetamine provided high when on opioid substitution therapy.¹⁹

Because of the compounded risks associated with concurrent use of stimulants with opioids, it is important to further explore trends and motivations of use. The current literature on motivations for concurrent use of stimulants (eg, methamphetamine or crack/powder cocaine) and opioids (eg, fentanyl, heroin or prescribed opioids) includes relatively small sample sizes and is localised to a few sites. Based on national and BC provincial data indicating that methamphetamine use has increased substantially in recent years. Therefore we leveraged an existing annual provincial survey of people who use drugs in BC to investigate how people use uppers and downers concurrently (eg, in what order) and the reasons why people use concurrently. Our study aims to add to the literature by identifying areas for improved harm reduction and education efforts related to concurrent use and therefore improve public health and social outcomes for individuals using uppers and downers concurrently.

METHODS

Data collection

The study data were collected through the 2019 iteration of the BC Harm Reduction Client Survey (HRCS). The HRCS is a cross-sectional survey of people who use substances, which is administered at harm reduction supply distribution sites across the province by the BC Centre for Disease Control (BCCDC) Harm Reduction

Services. The survey collects information on substance use patterns and associated harms, stigma and utilisation of harm reduction services. The survey was initially administered annually from 2012 to 2015. In 2018, the survey was updated and administered, marking the first such survey since the dramatic rise in overdose deaths due to fentanyl-containing drugs in BC. Dependent on ongoing funding, the survey continues to be administered annually to assess emerging issues, inform harm reduction planning, and evaluate and improve quality of harm reduction services. Data collection methods for past iterations have been previously described in detail.^{20–22}

The survey is modified for each iteration to include questions relevant to changes in the emerging drug market, issues identified by people who use drugs (PWUD), and to reflect feedback from other stakeholders. The following question was added to the 2019 HRCS, referred to as the ‘question regarding concurrent use of uppers and downers’:

In the last 3 days, did you use both uppers (eg, crystal meth) and downers (eg, heroin) one after the other or together? (Select all that apply)

No

Yes, downers then uppers. If so, specify why:

Yes, uppers then downers. If so, specify why:

Yes, I mix uppers and downers together. If so, specify why:

Other, specify:

Prefer not to say

Input was received from PWUD to assess validity. Specifically, the question regarding concurrent use was developed, piloted and received input from PWUD to ensure it was clear and was asking what PWUD consider ‘concurrent use’. Thus not just identifying polysubstance use in the past 3 days but what PWUD consider as concurrent use.

Participating study sites were selected from a network of sites which distribute safer sex and substance use harm reduction supplies through the provincial Harm Reduction Program. A two-stage convenience sampling approach was implemented when identifying participating sites. Regional Harm Reduction Program coordinators helped identify sites suitable for participation in each of the five health regions in BC (Fraser Health, Interior Health, Island Health, Northern Health and Vancouver Coastal Health). Harm reduction sites were found within primary care, public health, not-for-profit and community-based settings. In the second stage, sites were consulted and recruited based on willingness to participate, logistics and capacity constraints. At the designated survey sites, trained staff and volunteers were responsible for recruitment of participants and survey administration. Sites were provided 2 weeks for completion of data collection before surveys were mailed back to BCCDC for data entry and analysis.

Eligibility criteria for survey participation included: (1) age ≥ 19 years old, (2) self-reported using drugs other than cannabis in the past 6 months and (3) ability to provide verbal informed consent. The survey was English based, interviewer administered, paper based and took approximately 10 min to complete at four pages long (<http://www.bccdc.ca/Health-Professionals-Site/Documents/Harm-Reduction-Reports/2019BCHarmReductionClientSurvey.pdf>). Survey questions collected information regarding PWUD’s demographics, substance use patterns, harm reduction service use and experiencing or witnessing a drug overdose. Participants were provided \$10 CAD for their participation and sites were provided \$5 CAD for each participant enrolled at their site which could be used for additional participant incentives, survey-related supplies, etc.

Study variables

Participants were asked about their concurrent use of uppers and downers over the past 3 days. Concurrent use was categorised as (1) downers then uppers, (2) uppers then downers and (3) mixed downers and uppers. Qualitative responses were captured in short answer form in response to the ‘If so, specify why’ portions of the question regarding concurrent use. Further, the option ‘other, specify’ captured additional comments. Participants could identify any order of using and ‘specify why’ for each order selected.

Demographic variables included gender (man, woman, non-binary (non-binary includes transman, transwoman, gender non-conforming and other not specified)); Age; Indigenous self-identification (yes/no (Indigenous self-identification includes First Nation, Metis and Inuit)); paid work (yes/no (paid work includes full-time employment, part-time employment and paid volunteering)); stable housing (yes/no fixed address (stable housing includes private residence including rented apartment and other residences (eg, hotels, motels, rooming houses, single room occupancy, shelters, social/supportive housing, recovery housing) and No fixed address includes couch surfing, motor homes, recreational vehicle, trailers, tents, outside, street, etc)); Urbanicity (medium and large urban cities; small urban and rural communities) and regional health authority (Fraser, Interior, Island, Northern, Vancouver Coastal Health).

Data analysis

Data from questions regarding demographics and concurrent use of uppers and downers were extracted from the Redcap database. Demographic variables were analysed using R statistical software, V.4.0.2 (2020-06-22) and R studio V.1.3.1056.²³ Thematic analysis of written responses to the question regarding concurrent use was performed in Microsoft Excel.

Survey participants who did not respond to the question regarding concurrent use of uppers and downers were excluded from the analysis. Written comments were checked for consistency against chosen response

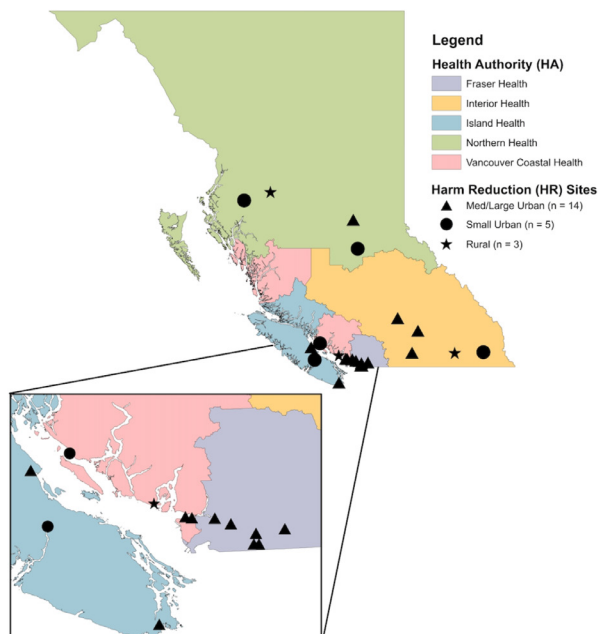


Figure 1 2019 Harm Reduction Client Survey map of participating HR distribution sites by HA and urbanicity.

options (whereby ‘downers then uppers’, ‘uppers then downers’ and ‘mix uppers and downers together’ are each a response option). Where a comment clearly indicated a way of using drugs that was not consistent with the chosen response option, the response option was manually adjusted; this was done for 11 values across the three response options.

An inductive thematic analysis process was used, whereby a pre-existing coding frame was not established.²⁴ A first reviewer (HS) reviewed and coded all data followed by a second reviewer (AS) independently reviewing and coding the dataset. Themes emerged from the coding framework. Themes and subthemes were further developed through an iterative and reflexive process. The themes and subthemes were discussed with the research team and consensus reached.

Patient and public involvement: review by persons with lived and living experience

Persons with lived and living experience (PWLLE) with using substances employed as Professionals for Ethical Engagement of Peers (PEEP) at the BCCDC Harm Reduction Services provided feedback and validation. Consulting PEEP was important to informing the analysis as PWLLE provide important perspectives. PEEP used their own experiences to interpret the quotes provided by survey participants and helped contextualise the emergent themes. Consulting PEEP was an iterative process throughout survey development, data analysis and manuscript writing. PEEP was presented with drafts and provided review and feedback that was incorporated into at all stages of development. For example, consensus on themes and subthemes was reached only after consultation by PEEP.

Table 1 Demographic information of the 307 participants who responded ‘yes’ to the question ‘In the last 3 days, did you use both uppers (eg, crystal meth) and downers (eg, heroin) one after the other or together?’

	N=307
Gender*	
Man	181 (59.0%)
Woman	115 (37.5%)
Non-binary	8 (2.6%)
Missing	3 (1.0%)
Age group	
19–29 years	68 (22.2%)
30–39 years	114 (37.1%)
40–49 years	69 (22.5%)
50–59 years	42 (13.7%)
60–75 years	7 (2.3%)
Missing	7 (2.3%)
Age (years)	
Mean (SD)	37.9 (10.9)
Indigenous self-identification†	
Yes	124 (40.4%)
No	165 (53.8%)
Missing	18 (5.9%)
Paid work‡	
Yes	57 (18.6%)
No	239 (77.9%)
Missing	11 (3.6%)
Stable housing§	
Yes	182 (59.3%)
No fixed address¶	121 (39.4%)
Missing	4 (1.3%)
Urbanicity	
Medium and large urban cities	217 (70.7%)
Small urban and rural communities	90 (29.3%)
Health authority	
Fraser Health	94 (30.6%)
Interior Health	56 (18.2%)
Island Health	33 (10.8%)
Northern Health	55 (17.9%)
Vancouver Coastal Health	69 (22.5%)

Missing includes no response, ‘other’ and ‘prefer not to say’.

*Gender non-binary includes transman, transwoman, gender non-conforming and other not specified.

†Indigenous identity includes First Nation, Metis and Inuit.

‡Paid work includes full-time employment, part-time employment and paid volunteering.^{3.2}

§Stable housing includes private residence including rented apartment and other residences (eg, hotels, motels, rooming houses, single room occupancy, shelters, social/supportive housing, recovery housing).

¶No fixed address (eg, couch surfing, motor homes, recreational vehicle, trailers, tents, outside, street).

RESULTS

Demographic information

The 2019 HRCS was completed by 621 participants at 22 harm reduction distribution sites across 20 communities within BC (figure 1). These numbers were reached after 43 sites were approached, of which the 22 sites had capacity to participate. In response to the question about using uppers and downers one after the other (in any order) or together in the past 3 days: 300 (48.3%) responded ‘no’, 11 (1.8%) left the question blank, 3 (0.5%) responded ‘prefer not to say’ and 307 (49.4%) participants responded ‘yes’ indicating that they used uppers and downers concurrently in the past 3 days. The characteristics of these participants are presented in table 1. Of the 307 participants who responded ‘yes’ to the question regarding concurrent use of uppers and downers, 181 (59.0%) identified as men and 115 (37.5%) identified as women. The average age of participants among this cohort was 37.9 years. A total of 124 (40.4%) participants identified as Indigenous, 57 (18.6%) reported they had paid work, 182 (59.3%) reported they had stable housing, 217 (70.7%) reported living in a medium or large urban area, and distribution was spread across the five regional health authorities.

Pattern of use

Of the 307 participants who reported using uppers and downers concurrently in the past 3 days, 179 (58.3%) reported they used downers then uppers; 76 (24.8%) used uppers then downers and 184 (59.9%) mixed uppers and downers together. These responses are not mutually exclusive as survey participants were prompted to select all that apply.

Responses to three options resulted in seven categories shown in figure 2. Of the 307 survey participants

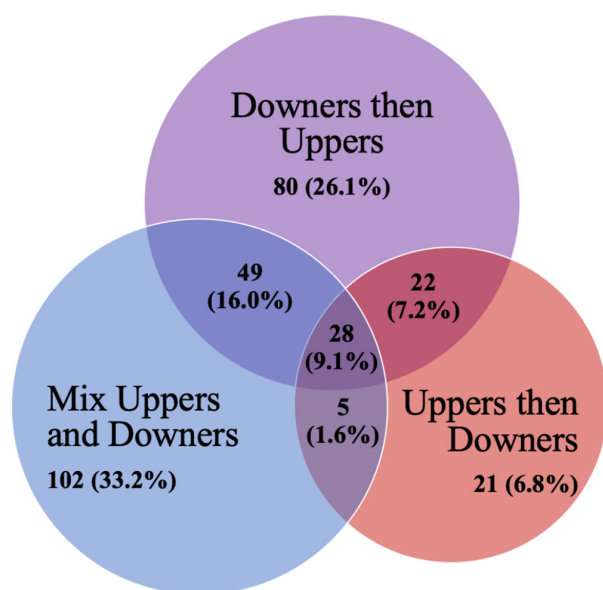


Figure 2 Distribution of responses by number and percentage of participants who reported they used uppers and downers concurrently in the past 3 days (n=307).

Table 2 Distribution of responses within response options and across themes and subthemes for those who reported that they used uppers and downers concurrently in the past 3 days

Themes and subthemes	Percentage of comments reflective of theme or subtheme for each response option		
	Downers then uppers (n=96)	Uppers then downers (n=44)	Mix uppers and downers (n=129)
Self-medication	34.4	27.3	17.1
Management of mood disorders and self-medication	25.0	27.3	14.7
Physical dependence	5.2	–	–
Avoiding overdose	4.2	–	2.3
Availability and preference	25.0	31.8	10.9
Habit or preference	17.7	15.9	7.8
Availability	7.3	15.9	3.1
Drug effects/properties	32.3	36.4	62.0
Desire for a specific type of high	20.8	15.9	51.9
Balance and levelling out	11.5	20.9	6.2
Mixture properties	–	–	3.9
Financial and life situation	8.3	4.5	10.1
Cost-effectiveness	4.2	4.5	7.8
Environmental factors	4.2	–	2.3

who reported using uppers and downers concurrently, the majority of their responses fell into three categories. Over one-third (33.2%) reported they mixed uppers and downers together only, over one-quarter (26.1%) reported using downers then uppers only, while about one-sixth (16.0%) reported using downers then uppers and mixing uppers and downers together.

Thematic findings

The thematic analysis was based on survey participant open ended responses to ‘specify why’ they use uppers and downers concurrently and in a particular order. Of the 179 participants who reported they used downers then uppers, 96 left comments; of the 76 who used uppers then downers, 44 left comments; and of the 184 who mixed uppers and downers, 129 left comments. Comments in response to the option ‘Other, specify’ were not relevant to concurrent use and were therefore not applicable to this analysis. Thematic analysis revealed four major themes: (1) self-medication, (2) availability and preference, (3) drug effects/properties and (4) financial and life situation. The distribution of participant responses within the various response options and across themes and subthemes are summarised in table 2. The distribution of comments across these four themes was similar among participants who used downers then uppers,

or uppers then downers; between 25% and 36% of participant responses reflected that they use uppers and downers due to self-medication, availability and preference, or drug effects/properties. Contrastingly, 62% of participants who specified why they mix uppers and downers reported doing so due to drug effects/properties. Across all three response options, 10% or less of comments were reflective of the theme financial and life situation.

Downers then uppers

Thematic analysis revealed 34.4% of comments were reflective of using downers then uppers for self-medication, 25.0% based on availability and preference, 32.3% due to drug effects/properties, and 8.3% related to financial and life situation. Subthemes were identified among participants who reported using downers then uppers as displayed in [table 2](#). Related to self-medication, responses to why survey participants used downers then uppers in that particular order included 'have used for so long need it or I get sick', 'stops the pain' and 'not get sick and wake up'. Of those who used downers then uppers, 4.2% reported using in this order to avoid overdose. Related to availability and preference, reasons for using downers then uppers included 'because it was there', 'because that's how it's done' and 'just because that's what I do'. Related to drug effects/properties, reported reasons for using downers then uppers included 'because of the high', 'side (methamphetamine) makes the down last longer' and 'relaxing then energised'. Finally, related to financial and life situation, participants reported using downers then uppers for the following reasons: 'more of a bang for your buck', 'because of my situation' and 'don't want to get robbed'.

Uppers then downers

Thematic analysis revealed 27.3% of comments were reflective of using uppers then downers for self-medication, 31.8% based on availability and preference, 36.4% due to drug effects/properties, and 4.5% related to financial and life situation. Subthemes were identified among participants who reported using uppers then downers as displayed in [table 2](#). Related to self-medication, comments entered by participants who used uppers then downers included 'pain management', 'use downers last to get some sleep' and 'depressed'. Related to availability and preference, reported reasons for using uppers then downers included 'able to get it', 'that's just how I do it', and 'I like it like that'. Related to drug effects/properties, reported reasons for using uppers then downers included 'I like the high', 'better feeling' and 'better, stronger high'. Related to financial and life situation, reported reasons for using uppers then downers included 'cheaper for meth than down'.

Mix uppers and downers

Thematic analysis revealed 17.1% of comments were reflective of mixing uppers and downers together for self-medication, 10.9% based on availability and preference, 62.0% due to drug effects/properties, and 10.1% related to financial and life situation. Subthemes were identified

among participants who reported mixing uppers and downers together as displayed in [table 2](#). Notably, within the theme drug effects/properties, 51.9% of the total comments were reflective of the subtheme 'desire for a specific type of high'. Related to self-medication, reported reasons for mixing uppers and downers together included 'stops the voices better', 'no pain' and 'to maintain balance staying awake and relaxed also'. Of those who mixed uppers and downers, 2.3% reported using this way to avoid overdose. Related to availability and preference, comments included 'they are both available', 'just used to it' and 'because I use both frequently'. Related to drug effects/properties, comments included 'it's a different high; speed ball effect', 'don't want to get too high or too low—cancels it out' and 'speed makes (fentanyl) last longer and bigger kick'. Related to financial and life situation, reported reasons for mixing downers and uppers included 'better value', 'takes less time meth overrides the heroin nod effect lets me keep doing my stuff' and 'efficient use of my time'.

DISCUSSION

Using data from the 2019 BC HRCS to explore how and why people use uppers and downers concurrently, we found approximately half of study participants reported using uppers and downers concurrently in the past 3 days. Of those participants, nearly two-thirds used downers then uppers, a quarter used uppers then downers, and nearly two-thirds mixed uppers and downers together. Interestingly, the majority of those who used concurrently used just one order; however, about a third used concurrently in more than one order. During the thematic analysis, four themes emerged: self-medication, drug availability and preference, drug effects/properties and financial and life situation. Notably, distribution of responses across themes was similar among participants who used downers then uppers and uppers then downers; around a third of comments reflected use due to self-medication, availability and preference, or drug effects/properties. In contrast, nearly two-thirds of participants who specified why they mix uppers and downers reported doing so due to drug effects/properties. Across all three response options, a small proportion of comments were reflective of the theme financial and life situation.

We found patterns and themes that were previously unknown within the demographic surveyed. To our knowledge, an analysis of the order of concurrent upper and downer use has not been previously explored. Our study builds on previous studies^{16–19} that have conducted thematic analyses investigating motivations for concurrent upper and downer use by also considering order of use. Our study adds to the knowledge base in this area by providing key findings on how and why people have used uppers and downers concurrently across a relatively large and diverse sample of people who use substances in BC.

Among participants who reported mixing uppers and downers together, drug effects/properties were identified

as reasons for mixing by nearly two-thirds of respondents. The subtheme ‘desire for a specific type of high’ was most prominent with over half of total responses reflective of that subtheme. Similarly, among PWUD in rural Oregon, concurrent use of uppers and downers was found to provide an enjoyable high; the combination enhanced euphoria.¹⁸ When uppers and downers are mixed together, they are often referred to as a ‘speedball’ (most often the combination of cocaine and heroin) or ‘goofball’ (most often the combination of methamphetamine and heroin). The first described reference to simultaneous coinjection of methamphetamine and heroin as ‘goofballs’ was from a young San Francisco cohort between 2000 and 2001²⁵ and we are now seeing concurrent use of uppers (eg, methamphetamine or crack/powder cocaine) and downers (eg, heroin, fentanyl or prescribed opioids) increase across North America.^{5 7–11} As the illicit drug supply in BC continues to contain the potent opioid fentanyl, this combination is even more toxic than the historically known ‘goofballs’ of methamphetamine and heroin.

Some participants reported using uppers and downers concurrently (in both orders and mixed) due to cost-effectiveness. As methamphetamine has infiltrated the drug markets in North America, low cost has been suggested as a contributing factor.⁹ While opioid prices are high after generally being shipped from international suppliers, methamphetamine can be produced using domestically available supplies.

Participants reported using uppers and downers concurrently for reasons of general safety and well-being. This included self-medication, protecting belongings and preserving daily functioning. Using uppers and downers concurrently to avoid overdose was also reported by several participants. In other studies, PWUD have reported that methamphetamine is viewed as a safer alternative to heroin¹⁷ and that methamphetamine provides overdose prevention or reversal benefits.¹⁸ The findings within our study indicate that concurrent use confers some benefits by way of general safety and well-being, though it is concerning that several participants in our study, as well as those in other recent studies, report the view that concurrent use helps avoid overdose when evidence indicates concurrent use may contribute to overdose risk.^{8 14}

Our study has a number of limitations. The question regarding concurrent use of uppers and downers used examples methamphetamine (upper) and heroin (downer). Within the study population, individuals generally use the term ‘upper’ for stimulants such as methamphetamine, or crack/powder cocaine; the term ‘down’ or ‘downer’ is generally used for heroin, fentanyl or prescribed opioids. The question regarding concurrent use was piloted by PWUD from Vancouver Area Network of Drug Users, who confirmed appropriate understanding of the question. Additionally, we found past 3 day use of stimulants was 72% methamphetamine vs 23% crack and 17% powder cocaine. However, there is a possibility that bias was introduced due to the way the question regarding

concurrent use was worded. This thematic analysis was based on open-ended survey questions that did not yield as in-depth responses as other qualitative methods (eg, interview). Generalisability is limited beyond our study participants for a number of reasons. The results reflect past 3 day drug use during the period when the survey was administered in 2019. We used a convenience sample that was recruited from 22 participating sites of the 43 sites that were approached to participate. Further, a subset of survey participants provided comments for the thematic analysis. Indeed, with the cross-sectional nature of the HRCS, and the ever-changing environment of the illicit drug market, substance use and harm reduction, our findings provide a snapshot. Similar to other surveys with marginalised populations, our findings are prone to survivor, recall and reporting biases. In an attempt to address recall bias, we asked about concurrent use of uppers and downers in the past 3 days only.

CONCLUSIONS

Future research efforts should be focused on further elucidating the details around motivations for mixing uppers and downers and the predictors of concurrent use. Our findings suggest specific harm reduction and education efforts around mixing uppers and downers are a future direction to explore. For example, options include providing information with harm reduction supplies to support safer practices of administration when mixing uppers and downers and education to counter the perception that concurrent use decreases overdose risk. In response to the findings of this study, an infographic was created to dispel the myth that using methamphetamines with opioids reduces the risk of overdose (<https://towardtheheart.com/assets/uploads/1625757471oavQXKgEoBI6km3HWYJUhoDI0N6Z1En3E57RsK6.pdf>). Less clear from this thematic analysis is the reason for the increase in concurrent use of uppers and downers over the past several years. Additional qualitative studies utilising in-depth interviews would be well suited to collect data to aid in this understanding. As concurrent use of uppers and downers has increased and the ‘twin epidemic’ of methamphetamine and opioid use has emerged, it is important to further investigate the motivations associated with concurrent use over time. From our thematic analysis, it became clear that it is important to promote education specifically around using uppers and downers concurrently.

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REFERENCES

- 1 Opioid- and Stimulant-related Harms in Canada, 2022. Available: <https://health-infobase.canada.ca/substance-related-harms/opioids-stimulants> [Accessed 12 April 2022].
- 2 Illicit Drug Toxicity Deaths in BC, 2022. Available: <https://www2.gov.bc.ca/assets/gov/birth-adoption-death-marriage-and-divorce/deaths/coroners-service/statistical/illicit-drug.pdf> [Accessed 12 April 2022].
- 3 Fentanyl-Detected Illicit Drug Toxicity Deaths, 2020. Available: <https://www2.gov.bc.ca/assets/gov/birth-adoption-death-marriage-and-divorce/deaths/coroners-service/statistical/fentanyl-detected-overdose.pdf> [Accessed 9 Feb 2021].
- 4 Bach P, Hayashi K, Milloy M-J, et al. Characterising the increasing prevalence of crystal methamphetamine use in Vancouver, Canada, from 2006-2017: a gender-based analysis. *Drug Alcohol Rev* 2020;39:932-40.
- 5 Papamihali K, Collins D, Karamouzian M, et al. Crystal methamphetamine use in British Columbia, Canada: a cross-sectional study of people who access harm reduction services. *PLoS One* 2021;16:e0252090.
- 6 Ministry of Public Safety and Solicitor General Illicit Drug Deaths with Methamphetamine Involved, 2019. Available: <https://www2.gov.bc.ca/assets/gov/birth-adoption-death-marriage-and-divorce/deaths/coroners-service/statistical/methamphetamine.pdf> [Accessed 9 Nov 2020].
- 7 Glick SN, Burt R, Kummer K, et al. Increasing methamphetamine injection among non-MSM who inject drugs in King County, Washington. *Drug Alcohol Depend* 2018;182:86-92.
- 8 Al-Tayyib A, Koester S, Langegger S, et al. Heroin and methamphetamine injection: an emerging drug use pattern. *Subst Use Misuse* 2017;52:1051-8.
- 9 Ellis MS, Kasper ZA, Cicero TJ. Twin epidemics: the surging rise of methamphetamine use in chronic opioid users. *Drug Alcohol Depend* 2018;193:14-20.
- 10 LaRue L, Twillman RK, Dawson E, et al. Rate of fentanyl positivity among urine drug test results positive for cocaine or methamphetamine. *JAMA Netw Open* 2019;2:e192851.
- 11 Strickland JC, Havens JR, Stoops WW. A nationally representative analysis of "twin epidemics": Rising rates of methamphetamine use among persons who use opioids. *Drug Alcohol Depend* 2019;204:107592.
- 12 Gladden RM, O'Donnell J, Mattson CL, et al. Changes in Opioid-Involved Overdose Deaths by Opioid Type and Presence of Benzodiazepines, Cocaine, and Methamphetamine - 25 States, July-December 2017 to January-June 2018. *MMWR Morb Mortal Wkly Rep* 2019;68:737-44.
- 13 Canadian Centre on Substance Use and Addiction. Changes in Stimulant Use and Related Harms: Focus on Methamphetamine and Cocaine (CCENDU Bulletin), 2019. Available: <https://www.ccsa.ca/sites/default/files/2019-05/CCSA-CCENDU-Stimulant-Use-Related-Harms-Bulletin-2019-en.pdf> [Accessed 18 Mar 2021].
- 14 Meacham MC, Strathdee SA, Rangel G, et al. Prevalence and correlates of Heroin-Methamphetamine Co-Injection among persons who inject drugs in San Diego, California, and Tijuana, Baja California, Mexico. *J Stud Alcohol Drugs* 2016;77:774-81.
- 15 Harris JL, Lorvick J, Wenger L, et al. Low-Frequency heroin injection among out-of-treatment, street-recruited injection drug users. *J Urban Health* 2013;90:299-306.
- 16 McNeil R, Puri N, Boyd J. Understanding concurrent stimulant use among people on methadone: a qualitative study. : 2020.
- 17 Lopez AM, Dhatt Z, Howe M, et al. Co-use of methamphetamine and opioids among people in treatment in Oregon: a qualitative examination of interrelated structural, community, and individual-level factors. *International Journal of Drug Policy* 2021;91:103098.
- 18 Baker R, Leichtling G, Hildebran C, et al. "Like Yin and Yang": Perceptions of Methamphetamine Benefits and Consequences Among People Who Use Opioids in Rural Communities. *J Addict Med* 2021;15:34-9.
- 19 Palmer A, Scott N, Dietze P, et al. Motivations for crystal methamphetamine-opioid co-injection/co-use amongst community-recruited people who inject drugs: a qualitative study. *Harm Reduct J* 2020;17:14.
- 20 Moustaqim-Barrette A, Papamihali K, Crabtree A, et al. Correlates of take-home naloxone kit possession among people who use drugs in British Columbia: a cross-sectional analysis. *Drug Alcohol Depend* 2019;205:107609.
- 21 Karamouzian M, Papamihali K, Graham B, et al. Known fentanyl use among clients of harm reduction sites in British Columbia, Canada. *International Journal of Drug Policy* 2020;77:102665.
- 22 Kuo M, Shamsian A, Tzemis D, et al. A drug use survey among clients of harm reduction sites across British Columbia, Canada, 2012. *Harm Reduct J* 2014;11:13.
- 23 R: a language and environment for statistical computing, 2020. Available: <https://www.r-project.org/>
- 24 Braun V, Clarke V. Using thematic analysis in psychology. *Qual Res Psychol* 2006;3:77-101.
- 25 Ochoa KC, Davidson PJ, Evans JL, et al. Heroin overdose among young injection drug users in San Francisco. *Drug Alcohol Depend* 2005;80:297-302.