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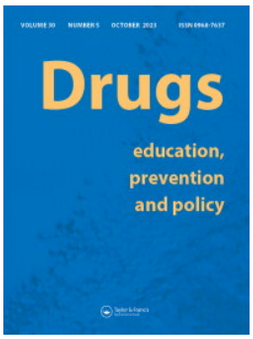

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Implementing drug checking as an illicit drug market intervention within the supply chain in a Canadian setting

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ABSTRACT

This research explored drug checking as a market intervention with a potential role in supporting a safer supply within the overdose crisis. We sought the perspectives of potential service users, including those who sell substances. Twenty-six semi-structured interviews were conducted in Victoria, British Columbia (BC), Canada with research guided by the Consolidated Framework for Implementation Research (CFIR). We identified five overarching themes for implementation: 'Understanding the role of conflicting policies and market pressures,' 'Increasing relative advantage of drug checking through quality results and written reports,' 'Establishing safe, discrete locations without the risk of arrest or public knowledge,' 'Partnering peers with drug knowledge and skilled technicians,' and 'Engaging peers and word of mouth to ensure trust and reputation.' We heard that criminalization and being responsive to market pressures are the most critical factors in implementing drug checking as a market intervention. To operate within this context, drug checking services need to ensure the provision of high-quality services and products, provided by peers and scientists, with established trust and safety. Promotion of drug checking to facilitate quality products and novel strategies were identified, but pose challenges. Continued development of drug checking technologies and methods is required to be relevant and responsive.

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Introduction

The overdose crisis in North America continues unabated and is worsening within the concurrent COVID-19 pandemic (Collins et al., 2020; Grebely et al., 2020). The introduction of illicit fentanyl in the unregulated drug market is associated with an unprecedented number of overdose events and deaths (Ciccarone et al., 2017; Karamouzian et al., 2020). This crisis is being fueled by drug prohibition and societal stigmatization, as well as structural violence experienced by people who use and sell substances (Bonn et al., 2020; Del Pozo & Beletsky, 2020). Key harm reduction interventions include scale-up of naloxone distribution with related overdose response programs (Dwyer et al., 2018; Moustaqim-Barrette et al., 2020), expansion of supervised consumption sites including overdose prevention sites (Pauly et al., 2020; Wallace et al., 2019), increased 'peer' roles in overdose response (Greer et al., 2019; Olding et al., 2021; Pauly et al., 2021) and greater support for drug user organizations. Drug checking has also emerged as a potential overdose response that may provide greater consumer protection and market reporting on the volatile drug supply (Barratt et al., 2018; Betsos et al., 2021; Green et al., 2020; Maghsoudi et al., 2020; Measham, 2020; Wallace, van Roode, et al., 2021).

Drug checking can have a role in detecting both the presence and concentration of fentanyl and other ingredients that may be unwanted or have unintended effects. Fentanyl test strips are the most widespread drug checking response to the crisis as they are affordable and useful in detecting fentanyl in substances not expected to be an opioid (Park et al., 2021). Weicker et al. (2020) depict fentanyl test strips as tools of engagement in an otherwise disempowering context of harm, anxiety, and uncertainty about the illicit drug market. Increasingly, drug checking technologies, such as spectrometers are being piloted within overdose interventions as they can exceed the capacity of strip tests and provide information on the full composition of substances with potential for quantification to indicate potency (Green et al., 2020; McCrae, Tobias, et al., 2020). Current drug checking programs focused on fentanyl-related overdose confirm that detection of fentanyl can be less critical than reporting concentrations which can vary widely within an unpredictable supply (Borden et al., 2022; Gozdzialski, Ramsay, et al., 2021; Ramsay et al., 2021).

As the overdose crisis continues, the need for upstream actions appears critical, namely interventions in, and alternatives to, the unregulated, criminalized drug supply (Park et al., 2020; Wallace, van Roode, et al., 2021). Drug checking

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can be considered an immediate intervention that can be introduced into the supply chain of the illegal drug market with an objective of mitigating harm through a safer supply (Wallace, van Roode, et al., 2021). Beletsky and Davis (2017) describe how enforcement has used supply-side interventions to disrupt the drug market which only pushes the market in increasingly dangerous directions (Ciccarone, 2019). An alternative could be interventions aimed at improving supply quality and information. Ciccarone (2017; 2019) lists drug checking as one such supply-side intervention with possible positive impacts that requires more evidence. Unfortunately, public health largely ignores or prohibits the drug market within its sites, services, and responses (Kolla & Strike, 2020).

This study was part of a community-based research project that includes implementing and operating community drug checking in Victoria, British Columbia (BC), Canada (Wallace, Hills, et al., 2021; Wallace, van Roode, et al., 2021; Wallace et al., 2020). The province of BC is considered the epicenter of the overdose crisis in Canada where overdose fatalities exceed 39 deaths per 100,000 individuals as approximately five people a day die after consuming unregulated substances (BC Coroners Service, 2020). These are typically due to potent opioids, often with multiple active ingredients including benzodiazepines (Laing et al., 2021). The objective of our research was to explore drug checking as a possible illicit drug market intervention within the context of the overdose emergency. We sought the perspectives of potential service users, including those who sell substances, to better understand how drug checking services would need to be designed to best respond to the needs of people within the supply chain and to improve the unregulated and unpredictable supply.

Methods

The research was led by BW and included the primary researchers (DH, BP) a university-based research associate (TvR), and six community-based researchers. The community-based researchers included four members of the local drug user organization and two facilitators; one from a collaborating harm reduction agency and one from the drug checking project (PB). All had previously established working relationships including involvement in multiple university-community research collaborations.

Our objective was to engage a research team with academic research training and skills as well as community researchers with trusted relationships in the community. The university-based researchers initially developed the research design that was reviewed and approved by the team, and secured ethical approval from the Health Research Ethics Board at the Island Health Authority (J2018-069). Collaborative sessions were led by BW and the community researchers on recruitment strategies, review and pre-testing of the interview guide, developing relevant prompts, and developing protocols for consent, data security, and confidentiality. These sessions provided opportunities for interview training, orientation to the interview guide, and responding to questions around the guide and process, as we initiated data collection together.

Sampling

A prior pre-implementation study from this project considered how best to design drug checking for those accessing inner-city harm reduction sites and services. Here we sought to extend our reach to understand what might be needed for people who may not access these sites and services, as well as people who make or distribute substances. Our selection criteria were people who had thoughts about drug checking and our recruitment material specifically invited people who use substances, their family or friends, and/or people who make or distribute substances. Multiple recruitment processes were employed including distributing handbills, posters, and emails to collaborating services not specifically dedicated to harm reduction or substance use services. This enabled third-party recruitment as collaborators shared these with potential participants. Furthermore, our recruitment email to these agencies specified our interest to connect, in particular, with people who do not typically access downtown health and social services, and who live outside of the downtown core. Word-of-mouth recruitment also facilitated participation as people contacted the interviewers within the drug user organization seeking to be included. Study participants were provided a CDN$20 honorarium. While our recruitment strategies were purposeful to extend reach beyond inner-city service users, the sampling was convenience based, and we interviewed everyone who expressed interest.

In total, twenty-six semi-structured interviews were conducted in early 2020. Almost all interviews were in person, while the last scheduled interviews were switched to the phone because data collection was completed just as COVID-19 was restricting research activities. Eleven were conducted by the lead researcher (BW), eight by interviewers from the drug user organization, and seven by the interviewer with the collaborating harm reduction organization. The participants selected their preferred interview location, and we offered confidential location options within several service sites and also on campus. Demographic questions and several survey questions about substance use and overdose were also asked using a structured form at the end of the interviews. While most interviews were about 30 min in duration, there was considerable variation (15 min–1.5 h). Audio recordings were transcribed verbatim by graduate research assistants working with the drug checking project who produced memos for each interview. Data was stored on a secure shared drive at the University of Victoria and managed in NVivo 11.

Data analysis

The research was guided by the Consolidated Framework for Implementation Research (CFIR) (Damschroder et al., 2009). Our previous pre-implementation study utilized CFIR to explore how to implement drug checking from the

perspectives of potential service users (Wallace et al., 2020). Here we utilized CFIR to explore potential barriers and facilitators for the implementation of drug checking as an illicit drug market intervention within the supply chain (Wallace, van Roode, et al., 2021). CFIR aids the investigation of the complexity of implementation processes by exploring the influences of relevant constructs organized into five domains: intervention characteristics of community drug checking, the outer setting in which community drug checking operates (such as government policies and laws, societal attitudes, the drug market, and needs of service users and communities), the inner setting of the drug checking service (such as location, policies, and practices of the service), characteristics of individuals implementing community drug checking, and the implementation process for community drug checking. The five domains and the constructs within each domain are discussed in more detail elsewhere (Damschroder et al., 2009) or viewed at https://cfirguide.org/constructs. We utilized CFIR to construct the interview guides and as an analytical tool. For example, interview questions were designed to explore relevant influences on implementation within different CFIR domains. We asked people what matters about how drug checking is set up, where it should be located, who should staff the service, and how a service could meet or fail to meet expectations. We also asked about potential barriers to the use of drug checking services and what would make people never want to come or return to service. We specifically probed about how this might be different for different groups of people (such as for youth, or people living in the suburbs and not accessing harm reduction services) and who might be reached or missed. We also asked how drug checking could operate within the current drug market and the context of the criminalization of substances.

We aimed to understand what is needed to implement drug checking within the supply chain from the perspective of potential service users, including those who sell substances. The transcripts were analyzed following an iterative process between BW and TvR who had considerable immersion in the data through reading transcriptions, transcribers' reflective memos, and BW having conducted several interviews. Throughout the data collection process, potential and reoccurring themes were identified and discussed by the research team. Initial themes were inductively developed on a subset of transcripts with attention to potential influences on implementation from CFIR as a sensitizing concept. The emerging themes were examined in relation to CFIR domains to understand factors related to implementation and assess how well initial themes fit with the CFIR framework. Deductive analysis was then conducted using a priori categories based on CFIR's five domains. All transcripts were coded within NVivo to identify potential barriers and facilitators within each domain. Themes were then identified inductively within each domain informed by the initial analysis. Following this, the research team brought together both inductively and deductively derived themes as described by Corbin and Strauss (1990) to facilitate a more detailed thematic analysis. This identified overarching themes and associated implementation strategies within each domain, and how these fit with CFIR constructs.

Table 1. Characteristics of the sample ($N = 26$).

Characteristic	Number (*n*)
Gender	
Male	8
Female	17
Other (gender queer)	1
Age in years	
20–24	1
25–29	2
30–44	12
45–60	10
>60	1
Identify as indigenous (First nations, Métis, Inuk (Inuit))	
No	20
Yes	6
Sexual orientation	
Lesbian, gay, or bisexual	8
Heterosexual or straight	16
Other	2
Frequency of illicit substance use	
Daily	11
Weekly	7
Occasionally, not every week	4
Never	4

Results

Table 1 presents the demographic characteristics of the participants. Of the 26 people interviewed, 17 identified as a woman, 8 as a man, and one as non-binary. Most (22) participants were between the age of 30 and 60 years. Six participants identified as Indigenous with most (16) identifying as white and four with other ethnicities. Sixteen identified as heterosexual or straight, and eight as lesbian, gay, bisexual, or other. Most (22) reported using substances daily, while four reported no substance use. Only one participant reported accessing a safe consumption site and two a needle distribution program. Thus, this sample reflected a group who do not typically access harm reduction services.

In exploring how drug checking could best function as a market intervention within the supply chain, we constructed an overarching theme for each CFIR domain and identified associated strategies for implementation within each domain (Table 2). Overarching themes identified were: 'Understanding the role of conflicting policies and market pressures, 'Increasing relative advantage of drug checking through quality results and written reports,' 'Establishing safe, discrete locations without the risk of arrest or public knowledge,' 'Partnering peers with drug knowledge and skilled technicians,' and 'Engaging peers and word of mouth to ensure trust and reputation.'

Outer setting: understanding the role of conflicting policies and market pressures

We sought participants' perspectives on contextual influences on barriers and facilitators to implementing drug checking as part of the supply chain. Critical influences on drug checking include conflicting drug policies and potential motivations within the supply chain related to market pressures. Participants emphasized the need for strategies to respond to this prohibitive policy context, as well as focusing on the market benefits of selling a checked supply.

Table 2. Strategies for drug checking within the supply chain as a market intervention.

Domain	Relevant constructs	Strategies
Outer setting	External policy and incentives	Advocate for policy changes
	Patient needs and resources	Explicit priority to and design to be a market intervention and not just to inform drug use behavior.
	Peer pressure	Focus on messaging around higher demand for quality products
Intervention characteristics	Relative advantage	Ensure outcomes of the intervention exceed the potential risks of criminalization.
	Evidence strength and quality	Provide accurate results with less uncertainty and high confidence
		Be capable of providing quantification—percentage and potency of ingredients
	Adaptability/design quality and packaging	Provide written print-outs of results rather than only verbal
		Provide encrypted messaging of results
Inner setting	Structural characteristics	Strive for safe locations without the risk of arrest or public knowledge
	Culture	Ensure cultural safety with services grounded in principles of harm reduction.
Characteristics of individuals	Individual stage of change	Combine knowledgeable, trustworthy peers with knowledgeable, skilled technicians as the individuals implementing the service.
Process	Engaging	Ensure trust and reputation based on peers and through word of mouth
		Accommodate people testing for sellers (runners)

Participants noted that the criminalization of substances is an overwhelming barrier for people accessing drug checking services that are accentuated at every step in the supply chain. One participant indicated that for drug checking to work in this context, it needed to *'find a loophole or change the laws and stop making stupid shit illegal' (45 year old male participant)*. Another participant noted the need for decriminalization to facilitate drug checking: *'We need to push for decriminalization for small amounts and stuff like that' (39 year old female participant)*. This highlights prohibition as a key barrier to drug checking. While drug policy reform and an end to prohibition would facilitate drug checking.

Further, we were told that if drug checking services were to prioritize serving people who produce and sell drugs that should be clearly communicated, and services designed accordingly. To this end, it is important to consider the attitudes, needs, and resources of those within the supply chain. Some participants noted that many people who sell substances care about those who purchase and consume their products, and many are people who use substances themselves and would welcome opportunities for knowledge of quality and assurances. However, other participants noted this is not always the case and that those higher up within the supply chain may be more fiscally motivated and less likely to access drug checking or care about those using their supplies. For example, as this participant distinguished, *'the higher-ups may not care' (58 year old female participant)*. Another suggested that some people who sell substances may feel hesitant to test, or discourage their clients from doing so if it threatens their business or puts them at risk:

> *"one seller that I know is like if any of my customers give any indication whatsoever that they're getting their drugs tested they are off, they are gone, get out of here. … because he doesn't want anything coming back to him being the source. And he is very clear. You know, he's been in the business long enough, he's got his connections, he does the drugs himself. So, it's like, just fuck off if you don't trust me and my sources." (55 year old female participant)*

However, the drug market was recognized as being competitive and profit-driven. We heard that strategies that promote having a superior quality of the product may counter this and be more effective than those which rely solely on reporting risks and public safety alerts. They suggested there could be pressure to test if everyone is marketing their product as tested and buyers are expecting or valuing that information. As this participant indicated:

> *"before you purchase a kilo of CBD from anyone they fully lab test it and we have lab results and you know like that's just became market standard as soon as it became a marketable item. I think it's kind of finding a way to make that the same deal you know for people downtown like oh I'm not going to purchase yours unless you have the fact sheet on it. Right?" (45 year old male participant)*

Another participant stated that such reports may help command a better price: *'There may be a way where we could convince users to pay a little bit more. To pay a little bit more for the drugs purchased from somebody that can hand you a readout form' (55 year old female participant)*. Drug checking was described as potentially providing an advantage and higher market value if people promoted their product as tested, with written reports to support this.

This highlights that strategies are required that attend to safety from the harms of criminalization, and position drug checking to be of sufficient value within the supply chain. Services need to be designed explicitly to operate as an illicit drug market intervention. Promoting drug checking as a way to increase the market value of substances may fit better within this context. Advocating for policy changes to ensure safety from criminalization when accessing services is also required.

Intervention characteristics: increasing relative advantage of drug checking through quality results and written reports

We asked participants about the characteristics of the drug checking intervention required to facilitate service use within the supply chain. We frequently heard that the perceived benefits of drug checking must be greater than the risks of criminalization. Participants identified multiple aspects of the drug checking intervention that were required to increase

this relative advantage including the perception of the quality and validity of the results, the form of the results, and how these can facilitate a checked product for sale and ensure safety.

Participants defined quality as accurate, trustworthy drug checking results that not only identified the full sample composition but also quantification, notably for potent fentanyl analogs. This was important as participants noted that people who sell substances also do not always know what is in the substances they have. Providing the percentages of the ingredients (such as fentanyl) was critical to the utility as a market intervention as this information could denote quality as well as safety:

> *"That's the most important. I don't just wanna know what's in it. I wanna know what percentage of what is in it" (29 year old female participant).*

Drug checking results could inform how to further prepare substances for purchase to achieve the desired product and avoid unknown, unpredictable, and potentially fatal products. As one participant stated, '*You need to be able to tell the percentages in the product so that you can level them off and make sure that what you're dealing isn't killing people' (46 year old male participant)*. This need to know the concentration of fentanyl as well as the overall composition to produce safer products was reiterated by others:

> *"I guess for selling purposes I'd want to know how much, you know? Sometimes I'll make a mix myself using caffeine and some of this brown stuff some of this fent. And it's like I know what I put in there and because the brown stuff is so strong, I'm trying to do it, tailor it to be safer, right? So I guess that's handy knowledge to know what the quantity is and everything." (43 year old male participant)*

Overall, perceived excellence in the ability to provide trustworthy, consistently accurate results that report both full composition as well as quality and potency was described by both people who sell and people who use substances as critical to enhancing the safety of the supply.

We heard that drug checking could be tailored to be more effective within supply chains by attending to the form in which results are provided and can be used to create a checked product for sale. Providing written, rather than verbal results was described as an adaption that could be used to demonstrate the quality of the substance as this quote highlights;

> *"I know that everybody in the game compares; oh yeah it's this, or, it's this percentage, or, we tested you know this that and the other but realistically that's just word of mouth. If you're able to produce a sample that says look here it is and your printout that says here it is printed out, here's how valid it is, you've got a quarter million dollar machine here that tells you this, you know. This is exactly what's going on in it. Well then, people would believe in that. They'd believe those facts and that's what they would look for." (29 year old female participant)*

Participants mentioned that being able to package and label products with drug checking results that could act as a certificate of authenticity would be ideal within the supply chain. The use of encrypted messaging was perceived as a facilitator for communicating results, potentially with a log-in code. As this participant indicated this would help to verify results and enhance safety:

> *"We could do it like a log in on the computer type of thing I was thinking. Like again, you get a code which is like your name, get a login. You get like a prefabricated login, like a password, right? So, like and then you keep checking to see it, log into it somehow, and see what the results are in an hour. That would work right? 'cause your names not necessarily attached to it. And if you're really worried you can go like use some public WIFI or whatever. You know what I mean you can untrace your steps." (39 year old female participant)*

Participants highlighted ways drug checking could be designed to function as an illicit drug market intervention. Providing accurate results with information on quantification is critical. The importance of written results, and encrypted messaging were strategies recommended to increase relative advantage and thus improve uptake and impact. Further, specific attention to how drug checking could facilitate the packaging and labeling of substances for sale would further this aim.

Inner setting: establishing safe discrete locations without the risk of arrest or public knowledge

We asked participants about sites or settings that could act as a barrier or facilitators for those within the supply chain. We heard that establishing safe locations that attend to risks from criminalization was of primary importance, with participants noting a need for sites that are public, yet discreet and anonymous.

Discrete settings, providing complete anonymity, were desirable to offset the risk of arrest or identification. For example, one participant stated: *'people higher up in the game, let's say, don't want to be caught downtown'* and that: *'I know more people would use services in the supply chain if much more readily accessible and contained low risk of identification, prosecution, and knowing where to get to' (45 year old male participant)*.

Participants suggested drug checking could be provided within larger settings, such as a pharmacy, similar to set ups for blood pressure kiosks. Sites, such as pharmacies were seen as beneficial in serving the general public and therefore less identifiable as a service for illegal substances. Many other potential sites were suggested although recognized as less realistic due to limits of current drug checking technologies that require staff or time for testing. A mail-in service had perceived benefits for anonymity. However, the time required was described as a significant barrier. One participant related that people who sell *'want test results before they buy something in mass quantities … if I get the results a week later, that batch is already gone by then (29 year old female).*' This highlights the need for immediate results in this context.

We also heard that participants perceived many of these potential sites as lacking the cultural safety and awareness of substance use stigma that harm reduction and drug user organizations could provide. In a perfect world, we were told how people could test their own substances and not depend on accessing a service site. As this participant noted: *'I'm thinking that the option should be that you could do it*

yourself, yeah. And be anonymous. Especially for people selling drugs, right?' (43 year old male participant).

Private testing arrangements were discussed as an arrangement that might work to establish safety for those within the supply chain. Participants highlighted that it is important that the service, and such arrangements, be offered to everyone along the supply chain. When discussing potential implementation, this participant indicated the importance of including everyone not just selected individuals:

> *"Well, we can help anybody, right? Like we're all inclusive in that way. As long as a person's not like an abusive angry. Like the same rules as any workplace, right? Like stuff won't be tolerated. Otherwise people probably value the service. They're going to be like civil people who like are able to talk to someone. Like we're not excluding people, right?" (39 year old female participant).*

This further suggests that care is needed to ensure safety for staff and other service users within these arrangements.

Tensions were identified as participants noted challenges when suggesting sites to balance the need for services that are highly anonymous and discrete, fast and convenient, and respectful and culturally safe for those who use substances. Safe services that are suitably discreet, and grounded in principles of harm reduction and cultural safety are needed to address these tensions.

Characteristics of individuals: partnering peers with drug knowledge and skilled technicians

We asked participants what characteristics of staff were most important for implementing drug checking within the supply chain. Participants indicated a need for staff that is trustworthy and knowledgeable about both substances and drug checking. We heard that a partnering of peers and skilled technicians would work best to this end.

Participants indicated that two roles were important to the delivery of drug checking for this context: one being a trustworthy peer with substance knowledge and the other a skilled, knowledgeable chemist/technician, working together to facilitate a good environment and provide accurate and useful results. This quote captures these different roles and aspects that are required for the delivery of drug checking:

> *"I think people from different drug experiences, so I think having people with experience in injection drug use. Obviously having scientists, people who know what they're doing involved. Also people that are compassionate and anti-stigma themselves and really believe in what they're doing. (29 year old female participant)"*

This participant reiterated the need for such partnering when asked who should staff drug checking: *'Peers that have been involved in the illicit activities of illegal drugs. And known trustworthy testers of the laser spectrometers that you know are legit' (46 year old male participant)*. Those providing services should be known to the community or work closely with other trusted service providers including drug user organizations. To provide pragmatic results, staff should have substantial knowledge and/or experiences that reflect the range of the substances being tested (not only fentanyl/opioids for example) as this participant noted:

> *"people that use all different kinds of drugs as well so I think the people that use, you know somebody that just use psychedelics like just somebody involved with that, somebody who uses ketamine and GHB, and somebody that uses stimulants, I think just having, for all of it just having all experiences included in that process." (29 year old female participant)*

For both roles, participants highlighted the need for respectful and nonjudgmental staff.

Thus, different aspects related to service delivery were highlighted as critical when considering necessary characteristics for staff. These included relational aspects, as well as knowledge of substances and technical skills required to operate necessary technologies. The pairing of peers and technicians, both trained in principles of harm reduction, would facilitate staff who are well versed to deliver drug checking in this context.

Process of implementation: engaging peers and word of mouth to ensure trust and reputation

We asked participants about barriers and facilitators in the process of implementing drug checking as part of the supply chain. In the illicit, underground market, word-of-mouth perceptions of the service and peer involvement were identified as critical aspects of the implementation process that would influence success. Participants indicated that strategies for engaging peers outside of the intervention, as well as engaging knowledgeable peers as staff were important.

We heard the importance of having a good reputation and word of mouth in establishing trust and safety. People who sell substances would be more willing to access drug checking once others had already accessed and expressed benefitting from the service, as this participant noted:

> *"Once the service has a reputation for being like a drug user organization and not a cop or whatever, you know, word of mouth, you know, it just has to be established a bit first. Other dealers would be like 'hey where did you get that done?' and they would be like 'I want to do that'" (39 year old female participant)*

We also heard the importance of engagement of peers within drug checking, both as staff and in facilitating interactions and trust. This quote highlights the critical importance of peer engagement to facilitate such trust:

> *"Drug checking machines should be located only in an environment where there are peer to peer transactions happening … places where a trust has been developed. There's no point putting drug testing machines in a pharmacy, or government building because people simply won't feel safe using them. There's always a level of paranoia with certain types of drugs, and the people using those drugs will think it's a scam. You need a peer to peer environment to make sure there's a trust. Without trust there would be no point in testing the drugs because people would not believe it. (46 year old male participant)"*

Furthermore, people who sell substances may not personally access services but send others, so-called runners, to bring samples for testing and maintain anonymity. As this participant stated: *'I know that people who sell …. They don't go out of their way to, but they would like it done. They would*

delegate a friend or somebody to go do it for them. Or go get it done for them or whatever, but obviously they don't want to attract attention. Or potentially get busted. Obviously, that's a big concern' (39 year old female participant). Or, as this participant reiterated: *'the dealers will send someone else in' (52 year old female participant)*.

This highlights the critical involvement of peers within drug checking services to facilitate trust within the supply chain. Word of mouth support, and engaging peers as staff, were noted as critical for establishing trust and reputation. People were interested in sending others to access services on their behalf. Drug checking could accommodate this with written reports provided to the messengers to best ensure accurate communication. Moreover, runners could be employed as part of the service, if they have suitable trust within the community.

Discussion

This research sought the perspectives of people involved in the unregulated drug market on how drug checking could be implemented as a market intervention within the current context of a highly unpredictable drug supply and unprecedented rates of overdose. Currently, drug checking is positioned as a public health intervention promoted to people who use drugs within supervised consumption sites while being averse to aiding people who sell or produce drugs. Drug checking does not need to be limited to an individual-level behavioral intervention targeted at the end user of a substance, but holds the potential to also function as a supply-side intervention within the drug market linked to overdose. However, careful consideration is needed to design and deliver appropriate drug checking services within the context of the criminalization of substances and the drug market. The demand for quality and product assurance within the illicit supply may operate as a potential driving force to facilitate drug checking and we identified several novel strategies to this end; however, there are also significant implementation challenges.

We heard that criminalization was the most critical barrier to accessing drug checking services for those within the supply chain. While unsurprising, there are particular considerations and intervention design factors to be addressed to engage sellers and potentially function at a market level. Overall, the benefits of drug checking services need to ensure high-quality services that enable quality products, provided by knowledgeable peers and scientists, and establish trust and safety to outweigh the risks of arrest for accessing services. Promoting drug checking for marketing quality products may be more successful than relying on traditional health promotion messages. Safer settings within the context of criminalization are critical and yet not clearly defined and vary depending on the person and context. Trust was identified as central to successful implementation and may be enhanced through engaging peers and word of mouth.

In Canada and likely elsewhere, drug checking exists within a conflicting policy context in which exemptions and sanctions enable drug checking as a public health intervention in response to overdose, while drug laws prohibit use and possession. Therefore, safety cannot be guaranteed for those accessing drug checking services. This barrier is particularly pronounced for people who sell substances where the repercussions are likely highest. While we sought to understand strategies that can increase the safety and benefits of drug checking within this context, these external policies are the most critical barrier to the successful implementation of drug checking services.

How drug checking can operate within the confines of current drug policy and criminalization is a challenge (Carroll, 2021). Such potential benefits are conditional on programs being explicitly defined to be responsive to criminalization and tailored to purposefully engage people who sell substances to test their supplies. Discrete locations without the risk of arrest or public knowledge, including private testing arrangements, as well as employing or facilitating runners to test for others are strategies that may be useful. Encrypted messaging of results is another strategy to this end. Currently, drug checking is most often being integrated within sanctioned harm reduction services, such as OPS (Wallace et al., 2020), while our results here suggest such sites may not work as well here because of the high need for discretion. It is of interest that participants identified public places, such as pharmacies could potentially be more discrete as they are more anonymous.

This study also highlights the need to understand the needs and resources of the supply chain to position drug checking for this aim. Kolla and Strike (2020) and others (Betsos et al., 2021) challenge the assumption of people who sell substances as predatory and explore the ways that people who are selling can enact practices of care. Their recommendations include seeking ways to incorporate people who sell substances (notably street or low-level sellers) in harm reduction programs and overdose responses including drug checking and in communicating substance information, such as potency. Our findings support engaging peers in the implementation process to establish trust, potentially as staff, runners (Larnder et al., 2021), and through word of mouth promotion of the service. However, we also noted that many indicated that messaging around harm reduction, health promotion and care may not be the most relevant here as in other circumstances. Instead, focusing on being able to establish product quality and higher market value may be more relevant in this context and should be considered in promotion and messaging.

We also heard that drug checking needs to provide accurate results confirming composition, strength, and quality to inform ongoing purchasing and possible cutting/dilution before selling to improve the safety of supply. The need for technologies and methods that can go beyond the detection of fentanyl is essential and yet limited and the complexity and variability in highly concentrated opioids put high demands on drug checking technologies (Borden et al., 2022; McCrae, Wood, et al., 2020; Ti et al., 2021) and requires highly skilled technicians (Lockwood et al., 2021; Wilson et al., 2021). Our research raises questions surrounding what technologies and technical skills would be required to respond to the current complexities of the synthetic opioid supply (Bowles

et al., 2021) often with multiple active ingredients at varying concentrations (Gozdzialski, Aasen, et al., 2021) and provide the level of reporting to be useful as a supply-side intervention. Meanwhile, participants suggested automated technologies similar to blood pressure machines that could facilitate quick and discrete testing. Thus, there is a need for user-friendly drug checking methods and technologies that are more accessible to lay people and more affordable to allow for scale-up of drug checking services.

Providing written confirmation of results to inform sales, possibly with the potential to allow for product labels that could identify higher quality products was identified as important in this context. Even more so in the context of the supply chain, people are seeking very low levels of detection, quantification to report potency, and written results to clearly communicate the findings to others (Betsos et al., 2021; Wallace, Hills, et al., 2021). Implementation of this service design faces multiple challenges, limitations, and risks to be navigated. Public health organizations may support upstream interventions but not accept this level of engagement in illegal activities. There are risks, notably, the service cannot ensure the reports remain linked to the product tested, and 'false advertising' is possible. In addition, the consistency of a product tested can vary in concentration and the test report may not accurately reflect the full composition of a bulk product being sold with these written results. There could be potential unintended impacts of such quality control measures in a competitive, unregulated market, such as violence and fake or altered reports. And to repeat, such detailed reporting requires significant technologies and skills, and uncertainties and limitations must be conveyed which could diminish the impacts of printed confirmatory results. Future research is required to explore how best to operationalize this.

Previously, drug checking has most often been discussed and implemented as a micro intervention—a harm reduction service for individuals who use substances to access information on the composition and messaging to inform and influence behaviour (Groves, 2018). We sought instead to investigate how drug checking concurrently functions for those selling and producing drugs within the unregulated drug market. Our findings build on other research indicating the benefits of implementing drug checking services for people who sell substances. Betsos et al. (2021) recent research also confirm that people who sell substances will access drug checking to modify their products to minimize harms related to fentanyl and thereby hold some potential in regulating the drug market. Bardwell et al. (2019) describe the level of trust that people have for their dealers and the potential for drug checking if people who sell substances access services to test supplies and inform purchasers. Furthermore, where people are not likely to access drug checking services and other harm reduction services themselves (Larnder et al., 2021), or are unlikely to test before use, this could be a mechanism for drug checking results to reach the end user of the substance.

While we perceive this response to be a more upstream intervention with the potential to improve the supply, it remains limited by the context of ongoing criminalization, stigmatization, and the impacts of structural violence and inequities (Collins et al., 2019; Csete et al., 2016). Increasingly, decriminalization is viewed as a necessary piece of the overdose response (Bonn et al., 2020; Henry, 2019; Virani & Haines-Saah, 2020) but such system-level responses have been slow, limited, and inconsistent to date. As the overdose crisis continues, the need for upstream action appears critical, namely interventions and alternatives to the unregulated, criminalized drug supply (Park et al., 2020; Wallace, van Roode, et al., 2021). Drug checking arguably sits on a continuum of safer supply responses, not as a unique regulated, controlled supply but rather as providing greater quality control and identifying safer and riskier supplies within the unregulated market which can be assumed to continue within decriminalization and expanded drug regulation. This potential for drug checking as an intermediate response remains important given the current limitations and scope of other safer supply interventions.

Strengths and limitations

A strength of this study is that we were able to include the perspectives of people who sell and use substances to inform what is needed to implement drug checking within the supply chain. Our collaborative research team had long-established relationships working in this area facilitating trust and recruitment of those within the supply chain. Our sample includes more women than men which reflects the role of women in the supply chain as well as caring roles, such as peer work and accessing drug checking on behalf of family and friends (Larnder et al., 2021). The study was based in Victoria, BC, where the burden of overdose is high and community-wide drug checking is currently operating as part of the overdose response. A well-established implementation framework was used to support design and analysis and ensure consideration of factors known to influence implementation. There were several limitations. Recruitment of people engaged in the illegal drug market is challenging and while we were able to include both people who sell and use substances, we expect the sample to be limited and less inclusive of those without interest in drug checking and our findings do not likely reflect those higher-ups in the drug market. Notably, we were unsuccessful in recruiting men in the trades and youth. While we were able to recruit participants beyond the inner-city and include suburban residents, there is a need for more research focused on rural and remote settings. Some participants had limited knowledge of drug checking which limited their ability to fully respond to questions about potential barriers and facilitators in implementing such a service. Some of the community researchers with the local drug user organization were no longer affiliated with these organizations or their roles changed during COVID-19 which interrupted and lessened the engagement post-data collection. Also, while training in interviewing and support were provided, there was variation in the interviewing abilities and some interviews were shorter and lacked depth. Drug checking is a relatively new intervention within the overdose responses related to synthetic opioids, such as

fentanyl, and as drug checking continues to be implemented future research with those implementing and providing drug checking services would bring new perspectives on these questions.

Conclusions

This study highlights several considerations and challenges for drug checking to operate as an unregulated drug market intervention. Safer settings within the context of criminalization are critical and yet not clearly defined and may vary depending on the person and context. While we offer strategies that may help within the current context, conflicting policies are at the root of the lack of safety, and addressing these would be the most effective way to improve safety. Trust was clearly identified as central to successful implementation and facilitated by peer engagement and environments. Promoting drug checking as a way to facilitate quality products, and other novel strategies related to this were identified but are challenging to implement and require careful consideration. The need for technologies and methods that can go beyond the detection of fentanyl is essential and further innovation of new drug checking technologies and methods to quantify results is required, as well as building capacity within drug checking to enable such testing.

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