HHS Public Access

Author manuscript

Int J Drug Policy. Author manuscript; available in PMC 2024 November 01.

Published in final edited form as:

Int J Drug Policy. 2023 November ; 121: 104206. doi:10.1016/j.drugpo.2023.104206.

A Survey of North American Drug Checking Services Operating in 2022

Ju Nyeong Park, Ph.D., M.H.S[1,2], **Jessica Tardif, B.A.**[1], **Erin Thompson, M.P.H.**[1], **Joseph G. Rosen, Ph.D., M.S.P.H.**[3], **Jaime Arredondo Sanchez Lira, Ph.D.**[4], **Traci C. Green, Ph.D. M.Sc.**[1,2,5]

[1]Harm Reduction Innovation Lab, Rhode Island Hospital, Providence, Rhode Island, United States

[2]Warren Alpert Medical School, Brown University, Providence, Rhode Island, United States

[3]Bloomberg School of Public Health, Johns Hopkins University, Baltimore, Maryland, United States

[4]Canadian Institute for Substance Use Research, University of Victoria, Victoria, British Columbia, Canada

[5]Heller School for Social Policy and Management, Brandeis University, Waltham, Massachusetts, United States

Abstract

Background: Drug overdose deaths have reached record-breaking levels in North America. Drug checking services (DCS) provide localized information on the contents of drugs to individuals and communities. Depending on the design, individuals can submit drug samples for onsite “real-time” testing or offsite testing. The results can shed light on emerging drugs in the community and support ongoing prevention and surveillance efforts. We sought to describe and report aggregate outcomes of DCS operating in North America.

Methods: The North American Drug Checking Survey was launched in 2022 to characterize and monitor DCS operating in the region. Sixteen organizations from the US (n=9), Canada (n=5), and

Corresponding author: Ju Nyeong Park, Ph.D., M.H.S, Division of General Internal Medicine, Warren Alpert Medical School, Brown University, Harm Reduction Innovation Lab, 1125 N Main St, Providence RI 02904, Rhode Island Hospital, ju_park@brown.edu.

Declaration and Ethics

The study was approved by the Lifespan Institutional Review Board (IRB). All participants had to provide informed oral consent before completing the Redcap survey and received a $25 VISA gift card for completing the survey. One program completed a focus group and received a $40 VISA gift card.

Declaration of interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Ethics approval

The authors declare that they have obtained ethics approval from an appropriately constituted ethics committee/institutional review board where the research entailed animal or human participation.

Lifespan Institutional Review Board (#1911766)

Mexico (n=2) responded to the survey. Each organization reported on their program's operations and provided service delivery outcomes (site- or program-level) in the aggregate.

Results: Participating organizations reported testing a total of 49,786 drug samples between 2014 to 2022. DCS were run by community-led organizations (44%), health departments (25%), universities (19%), or clinical/private laboratories (19%). The types of samples tested differed between programs (e.g., solids vs. liquids, drug paraphernalia accepted). While most organizations tested onsite using fentanyl test strips (88%) and Fourier-transform infrared (FTIR) spectroscopy (63%), many sent samples offsite for confirmatory testing (63%), most often with mass spectrometry. Common facilitators of operating a DCS included: interest of clients (69%), interest of service providers (63%), and receiving external technical assistance (63%). Barriers included: the lack of funding (81%) or staff (50%), gaps in technical expertise (38%), as well as laws banning the possession and/or distribution of illicit drug samples, drug paraphernalia, or drug checking equipment (38%).

Conclusion: DCS are scaling up in North America. Given the evolving and localized nature of illicit drug supplies, supporting the establishment and operations of DCS could enhance the public's understanding of local drug supplies to reduce drug-related harms over time.

Keywords

drug addiction; drug checking; drug overdose; fentanyl test strips; harm reduction; substance use

Introduction

Globally, millions of people use illegally-obtained drugs. Drug overdose deaths have reached record levels in the US and Canada, claiming over 100,000 and 8,006 lives in 2021 respectively (Ahmad et al., 2023, Government of Canada, 2023). For the same year, the Mexican government has not produced a reliable number due to insufficient overdose surveillance data (Romero et al., 2023). In addition to the toll of overdose, a wide range of medical consequences can stem from an unregulated and unpredictable drug supply. A recent example of this is the complex presentation of patients exposed to xylazine, a veterinary sedative associated with life-threatening central nervous system depression and necrotizing wounds, which has re-emerged in illicit fentanyl markets throughout the US (Bowles et al., 2021, Gupta et al., 2023, Karch et al., 2021).

Due to the high burden of fentanyl overdose, much attention in the North American region has been placed on fentanyl test strips, which are a quick, easy-to-use, and low-cost method of detecting fentanyl in illicit drugs (Krieger et al., 2018). Drug checking services (DCS) take a more comprehensive approach by allowing individuals and organizations to voluntarily submit drug samples for testing (including used drug paraphernalia) using more sophisticated instruments like mass spectrometry and infrared spectroscopy. DCS are designed to inform individuals and communities directly and rapidly about the local drug supply at the case level to reduce physical and psychological harms (Harper et al., 2017, Maghsoudi et al. 2021, Trans European Drug Information, 2022). These services may be run in partnership with a university or health department, or independently by grassroots community organizations. The data can also be summarized and used to inform wider public

health surveillance efforts, though their primary purpose should be to provide information back to service users (Barratt & Measham, 2022).

DCS differ from programs that only distribute or sell self-testing kits (e.g., fentanyl test strips, reagent tests), or those that only test drugs or bodily fluids after a negative event —such as an overdose or arrest—has occurred. Traditional drug testing and surveillance methods, such as clinical toxicology and forensic testing, are not explicitly designed to facilitate harm reduction practices among clients or arrestees, and typically do not provide information on the relative amounts of drugs, nor distinguish between intentional versus unintentional polysubstance use, though there are studies that have compared drug testing data to toxicology data to help discern these patterns (Lockwood et al., 2021). Conversely, DCS that collect drugs from people who use drugs (PWUD) are advantageous because they can ask PWUD questions about the expected contents of each submission, as well as behaviors (e.g., polysubstance use). Additionally, traditional systems are rarely timely enough for localized prevention efforts, as they rely on testing after a negative event occurs, and the information is typically unavailable to the public in a timely manner at the case level, including to public health agencies, service providers and health researchers working to reduce drug-related harms. Notably, drug seizure data from law enforcement typically represent drugs that are never used by the public, although some parts of the same batch of drugs may be used if left unseized, and the results from criminal investigations are not intended to inform PWUD about the contents of the drug supply. For these reasons, scaling up DCS is an important step forward in filling these data gaps.

DCS are being implemented throughout North America, though published literature on programs designed for PWUD outside of music festivals remain scarce, especially in the US and Mexico (Green et al., 2022, Karch et al., 2021, McCrae et al., 2020, Mema et al., 2018, Wallace et al., 2021). Though efforts to provide DCS are evident as early as the 1960s (Marshman, 1974), a survey conducted in 2017 identified two services operating in the US in 2017, one in Canada, and one in Mexico (Barratt et al., 2018). A recent systematic review identified 9 studies from the US (Maghsoudi et al., 2021), 9 studies from Canada, and one study from Mexico, calling for further scientific evaluations of this intervention.

In addition to providing information to individuals, their networks, and entire communities (Mema et al., 2018), some DCS support broader public health efforts to complement existing drug surveillance data sources (Green et al., 2022, Russell et al., 2023), and in many cases, DCS are provided at point-of-care alongside other key harm reduction services (e.g., needle exchange, safe consumption sites). A range of laboratory instruments that can detect fentanyl and other illicit drugs have also been validated for DCS and are being adopted, including spectroscopy- and spectrometry-based techniques (Brandeis University, 2020, Karch et al., 2021, Tupper et al., 2018). Survey-based research estimates DCS acceptability and utilization among people at risk of overdose to range between 49-95% (Sherman et al., 2019) and 1-84% (Karamouzian et al., 2018, Krieger et al., 2018, Long et al., 2020, Park et al., 2021, Sherman et al., 2019), respectively.

Tracking the collective progress of DCS across North America through a standardized survey could yield insights into the implementation, sustainment, and best practices of such

services, as well as common facilitators and barriers faced by implementing organizations (Volkow et al., 2023, Wallace et al., 2020), as conducted by other similar harm reduction networks (Trans European Drug Information, 2022). Accordingly, we launched the first wave of the North American Drug Checking Program Survey in 2022 to characterize and monitor the implementation of DCS in the region.

Methods

Eligibility

The survey was conducted between July and November 2022. Participant recruitment occurred through the Alliance on Collaborative Drug Checking Google Group that originated in the US (formerly known as the Spectrometer Google Group), which is comprised of an international coalition of DCS implementors and researchers. The Alliance is “a learning community for anyone working on drug checking initiatives or interested in expanding drug checking in their community regardless of the technologies that you are using” (Alliance for Collaborative Drug Checking, 2023). The study was restricted to organizations located in North America, due to funding limitations. Only one DCS program manager or staff per organization was eligible to participate. The DCS had to be operating at the time of the survey. Programs that were planning to implement a DCS in the future, or that only sold or distributed self-testing kits were not eligible to participate. Additionally, law enforcement drug testing programs were ineligible, and diagnostic laboratories that exclusively conducted human specimen testing were also ineligible. The survey was self-completed by staff online and only available in English.

Survey Data Collection

The survey was created and programmed in REDCap, a secure web application used for survey design and administration. It was drafted by the study team and piloted several times before it was distributed via email to the Google Group. Interested readers can contact the corresponding author for a full copy. The items were adapted from published research, and our experiences with prior drug checking projects (Green et al., 2022, Park et al., 2022). The final web-based version contained a total of 109 items and took 20-30 minutes to self-complete. The survey contained questions covering five domains: program location and attributes, operational characteristics, staffing and personnel, outcomes to date (total number of samples tested and total number of encounters with program clients were collected as aggregate counts), and barriers and facilitators faced during implementation. There was also an item asking whether their program would be interested in being listed on a public DCS directory. Survey data were securely downloaded from REDCap into Stata Version 16 (StataCorp LLC, College Station, Texas) for data management and analysis. The denominator was set to the total (N=16), and any refusals and unknown responses were included and were described for transparency. Frequency measures and summary statistics were descriptively calculated and summarized at the program level, which was the unit of analysis in the present study.

Ethics

The study was approved by the Lifespan Institutional Review Board. All participants had to provide informed oral consent before completing the REDCap survey and received a $25 VISA gift card for completing the survey. All programs that agreed to be screened and were eligible completed informed consent and the full survey.

Results

Programmatic Characteristics

In total, 16 unique programs from the US, Canada, and Mexico participated (Supplemental Figure 1a–1c). All 16 programs were active at the time of the survey. One DCS was initiated in 2014, and all other programs began in 2017 onwards. Most programs were primarily affiliated with a community-led organization (44%, n=7), health department (25%, n=4), university (19%, n=3), hospital/health center (6%, n=1), or a private laboratory (6%, n=1).

Some entities (13%) only provided testing services in an offsite capacity, often in partnership with area community organizations that interfaced with PWUD and collected samples. In contrast, most DCS (87%) were embedded within established community organizations and provided onsite testing. Within these sites, drug checking was one of many services offered by these organizations; other services provided included naloxone distribution (81%, n=13), syringe services (64% n=9), supervised drug consumption (38%, n=6), rapid HIV testing (38%, n=6), HIV pre-/post-exposure prophylaxis (31%, n=5), sexually transmitted infection testing (25%, n=4), rapid Hepatitis C testing (25%, n=4), mental health services (38%, n=6), case management (31%, n=5), medications for opioid use disorder (25%, n=4), other medical services (19%; n=3), recovery support groups (25%, n=4), peer coaching (25%, n=4), and housing/shelter services (13%, n=2).

Operational Characteristics

The operational characteristics of participating DCS are detailed in Table 1. Specimens tested included drug residue (e.g., solids: 100%, liquids: 69%) and drug paraphernalia (e.g., used packaging: 88%). Most programs collected samples in-person at the testing location (81%) or existing services and outreach (63%) while some used collection boxes (19%) or mail (19%). Though most programs conducted testing onsite (88%) using fentanyl test strips (88%) and Fourier-transform infrared spectroscopy (FTIR) (63%), many also distributed self-testing kits (63%) and sent samples offsite for confirmatory testing (63%). Other financial resources and supplies that were provided to program participants to facilitate sample collection included sealable packaging for sample collection (75%) and delivery materials/services (56%). Expedited testing was available for samples of concern at 69% of surveyed DCS. Most services offered results in person (88%) or over the phone (50%), though many used a public website (e.g., www.drugsdata.org) (38%), text messaging (38%), mail (25%), community bulletins/newsletters/flyers (18%), an online portal (e.g., www.streetcheck.org) (13%), or other methods (31%).

The personnel involved in staffing each DCS is displayed in Table 2. All programs required at least one full-time staff member; many also employed part-time staff (44%). The majority

employed staff with lived experience with substance use (63%). Three programs were supported by volunteers. Five programs employed a technician with a scientific degree or training in chemistry or pharmacology. Only 38% of drug checking technicians received training from the manufacturer of the instrument; many programs employed an external consultant (56%), attended a training at a university (38%), received training from a government agency (19%), or were self-taught (44%); these responses were not mutually exclusive. Funding came from a variety of sources including private foundations (31%), health departments (31%), the Centers for Disease Control and Prevention (25%), the Substance Abuse and Mental Health Services Administration (SAMHSA) (13%), High Intensity Drug Trafficking Areas (6%), other federal agencies (19%), and clients themselves (13%).

US, Canadian, and Mexican drug checking services contrasted in their official status; all five Canadian services were legally sanctioned to operate their programs through Health Canada's Section 56, Overdose Prevention Services (OPS) Designation called Urgent Public Health Need Sites, whereas eight of nine DCS in the US were unofficially delivering their services, often operating in legal grey areas. Additionally, US states varied widely in state laws for possessing drug checking equipment and drug paraphernalia. Mexican programs were operating under an ambiguous legal context, though one program received local authorization prior to providing services. Two programs (13%) reported that drug checking staff, volunteers, or clients had drug checking kits, strips, or devices confiscated by law enforcement in the past year; both programs were in the United States and reported either operating in an unsanctioned environment or unsure about their program's legal status.

Preliminary Outcomes

Since 2014, DCS have been utilized 125,737 times and collectively tested over 49,786 samples though these numbers were sometimes underestimated due to limited data collection practices (Table 3). Program participants have included people who use stimulants (94%), opioids (88%), psychedelics (63%), synthetic marijuana (38%), any other drug (13%), as well as people who sell drugs (7%), healthcare providers such as first responders (31%), and family and friends of PWUD (13%). DCS varied substantially in their average rates of samples tested per week and hour, with more than half testing up to 9 samples per hour.

Facilitators and barriers

Several facilitators and barriers to operating DCS were reported by survey respondents (Table 4). Common facilitators included interest of clients (69%), interest of service providers (63%), and receiving technical assistance (63%). Barriers included the lack of funding (81%), staffing (50%), technical expertise (38%), and laws (38%) banning the possession and distribution of illicit drug samples, drug paraphernalia and drug checking devices themselves.

Discussion

Across North America, 16 entities have served more than 125,000 individuals and tested almost 50,000 samples since 2014, despite substantial challenges to implementation and sustainment, including funding, staffing, and legal barriers. This study extends previous findings of a 2017 report, which identified four DCS operating in the region. These results from North America stand in stark contrast to the well-established network of European DCS, which have operated their services continuously for several decades often with governmental support (Trans European Drug Information, 2022). Our findings suggest that large-scale investment in North American DCS programs is sorely needed.

Our study shows that like in other parts of the world (Barratt et al., 2017, Maghsoudi et al., 2021, Park et al., 2022), DCS in North America vary widely in their design and operations, as well as their testing capacity. For example, the types of samples and specimens tested ranged from drug packaging, drug paraphernalia and bodily fluids. Similarly, a range of drug checking devices (i.e., immunoassay, spectroscopy, spectrometry) were employed, with sites in Mexico lacking financial resources to acquire more sophisticated technologies like their counterparts in Canada and the US, which we will explore in a future paper. Most services only permitted direct in-person sample collection, though some employed mail-based collection or drop-boxes. We also found that DCS may be one of many other health and harm reduction services offered by organizations, providing a well-suited addition to other services for PWUD. Based on these findings, researchers, health professionals, and policymakers in North America should consider building on fentanyl test strip distribution, naloxone, and syringe services program infrastructure by integrating DCS approaches that permit testing a wider range of samples, specimens, and collection modalities. Such harm reduction services should be a component of a comprehensive strategy (Park et al., 2020) to end overdose morbidity and mortality.

Participating programs noted several facilitators and barriers to DCS provision. The interest of service users and providers were a major facilitator of implementation, which concurs with previous literature on the acceptability, utilization and positive outcomes of these services among at-risk communities. For example, awareness of the precise contents of drugs has been shown to promote harm reduction practices (Krieger et al., 2018, Rouhani et all., 2019). The recent emergence of xylazine in the fentanyl supply provides another example of the potential value of DCS.

Organizations that currently run DCS require financial and policy support to continue their services. Although receiving technical assistance on drug checking emerged as a facilitator of operating a DCS, the lack of technical support available regarding device operation was a major barrier that was amplified by the major legal hurdles of criminalized drug paraphernalia, drug possession, and drug testing devices. The lack of sufficient legal support for this work undermines sufficient training options from entities like manufacturers, universities, and other technical experts and relegates it solely to overburdened community programs who recognize its potential and are willing to take on liability and professional censure for knowledge transfer. The legal barriers that DCS staff and clients face need to be addressed by policymakers, especially in the US and Mexico where they may not have

explicit federal, state, or local authorization to operate their services. It is evident that more needs to be done to protect program clients and staff from persecution.

Based on our own experiences with operating drug checking programs, we concur with participating programs that a formal university degree is not necessary to operate point-of-care devices such as the FTIR spectroscopy. However, it has been our experience that learning how to accurately use an FTIR can take several months of practice with ongoing technical consultation from an experienced trainer with some background in chemistry or pharmacology. These data suggest that ongoing investment in growing staffing at community harm reduction programs and workforce development interventions could help train and support staff, including people with lived experience to establish and conduct drug checking to ensure successful adoption. Removing discriminatory barriers to obtaining education and employment among people with lived experience will benefit the scale-up of community-led programs such as DCS (Park et al., 2020). Based on our experience (Green et al., 2022), setting up and operating point-of-care programs can take up scarce resources at community organizations and require substantial, sustained investment. One way of addressing this issue is to increase funding for these organizations, which is another major challenge to providing harm reduction services writ large in this region (Jones et al., 2019).

Tracking of key metrics is vital for regional and national coordination of drug monitoring efforts. Several data considerations emerged from the data; while some programs collected information on the number of clients and samples served, others did not. Many DCS also did not publicize their results, and some programs that were approached were also unwilling to participate in the survey. Tools to standardize data collection at DCS and encourage participation in surveys will help with future evaluation efforts. Punitive drug laws and the need to maintain confidentiality may perhaps explain some of these trends as penalties for operating a DCS vary between states (Davis et al., 2022). To address this issue, a Model Law has been developed for US states considering authorizing DCS, which includes a section on data and confidentiality considerations (Legislative Analysis and Public Policy Association, 2023).

Limitations

Due to the limited amount of funding available to support this research, recruitment only occurred through the Alliance for Collaborative Drug Checking email listserv; future waves of the survey could incorporate a wider range of networks if funded. The survey was limited in scope and only published in English; we plan to create a Spanish version of a more comprehensive survey in 2023. The small sample size precluded robust statistical analysis. With funding, we hope to collect case-level “administrative” data that can provide an objective snapshot of program outcomes. Further qualitative research could contextualize and enhance our understanding of the work being conducted by community-based organizations that often exist in legal grey areas.

Conclusions

DCS are scaling up in North America and require implementation, research, and policy support. Some of the participating entities agreed to be listed on a public directory, which

is now available online (Harm Reduction Innovation Lab, 2023). These data can help agencies and organizations looking to design similar programs and assist in monitoring the collective progress of this rapidly evolving field. These programs fill a critical gap for people who participate in the drug economy, friends, and family of PWUD, service providers, and public health agencies working to prevent drug-related harms, who often operate with drug data sources that are biased, incomplete, imprecise, or delayed. Given the burden of the intertwined and worsening opioid, xylazine, and polydrug epidemics across North America, more research and policy changes are needed to support the growth of DCS and the organizations that operate them, to understand best practices, costs, optimization, and sustainment strategies.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgements and funding:

We are grateful to the tireless efforts of drug checking staff and members of the Alliance for Collaborative Drug Checking for participating in this work. We thank Jocelyn Yang for assisting with data visualization. JNP and TCG were funded by the Center of Biomedical Research Excellence on Opioids and Overdose (P20GM125507) from the NIH. JGR was supported by the National Institute of Mental Health (F31MH126796). JASL was supported by the Canada Research Chair Program. Its contents are solely the responsibility of the authors and do not necessarily represent the official views of our funders.

Funding sources

This research received funding from the following sources

This research was funded by the Center of Biomedical Research Excellence on Opioids and Overdose (P20GM125507) from the National Institute of General Medical Sciences.

Disclosures:

JNP serves as a technical consultant for a modeling project funded by the U.S. Food and Drug Administration (FDA) (U01FD00745501).

References

Ahmad FB, Cisewski JA, Rossen LM, Sutton P. Provisional drug overdose death counts. National Center for Health Statistics. 2023.

Alliance for Collaborative Drug Checking. https://forms.gle/HwCeMKVDiA7uUm5s8

Bailey K, Abramovitz D, Artamonova I, Davidson P, Stamos-Buesig T, Vera CF, Patterson TL, Arredondo J, Kattan J, Bergmann L, Thihalolipavan S, Strathdee SA, Borquez A. Drug checking in the fentanyl era: Utilization and interest among people who inject drugs in San Diego, California. Int J Drug Policy. 2023 Jun 7; 118:104086. doi: 10.1016/j.drugpo.2023.104086. Epub ahead of print. [PubMed: 37295217]

Barratt M, Kowalski M, Maier L, Ritter A. Global Review of Drug Checking Services Operating in 2017. Sydney, Australia: National Drug and Alcohol Research Centre, UNSW Sydney; 2018. https://ndarc.med.unsw.edu.au/sites/default/files/ndarc/resources/Global%20review%20of%20drug%20checking%20services%20operating%20in%202017.pdf

Barratt M, Measham F. What is drug checking anyway? Drugs, Habits and Social Policy, 23(3) 176–187.

Bowles JM, McDonald K, Maghsoudi N, et al. Xylazine detected in unregulated opioids and drug administration equipment in Toronto, Canada: clinical and social implications. Harm Reduct J. 2021;18(1):104. [PubMed: 34645480]

Brandeis University (2020) Massachusetts Drug Supply Data Stream (MADDS). Retrieved on 1/13/22. https://heller.brandeis.edu/opioid-policy/pdfs/madds-dph-one-pager_113020.pdf

Brunt TM, Nagy C, Bücheli A, Martins D, Ugarte M, Beduwe C, Ventura Vilamala M. Drug testing in Europe: monitoring results of the Trans European Drug Information (TEDI) project. Drug testing and analysis. 2017 Feb;9(2):188–98. [PubMed: 26888408]

Carroll JJ, Mackin S, Schmidt C, McKenzie M, Green TC. The Bronze Age of drug checking: barriers and facilitators to implementing advanced drug checking amidst police violence and COVID-19. Harm reduction journal. 2022 Dec;19(1):1–3. [PubMed: 34996466]

Davis CS, Lieberman AJ, O'Kelley-Bangsberg M. Legality of drug checking equipment in the United States: A systematic legal analysis. Drug and alcohol dependence. 2022 May 1;234:109425. [PubMed: 35344879]

Government of Canada. Retrieved on 6/1/23 https://healthinfobase.canada.ca/src/doc/SRHD/Update_Deaths_2023-03.pdf

Green TC, Olson R, Jarczyk C, Erowid E, Thyssen S, Wightman R, Del Pozo B, Michelson L, Consigli A, Reilly B, Ruiz S. Implementation and Uptake of the Massachusetts Drug Supply Data Stream: A Statewide Public Health-Public Safety Partnership Drug Checking Program. Journal of Public Health Management and Practice. 2022 Nov 1;28(1):S347–54. [PubMed: 36194805]

Gupta R, Holtgrave DR, Ashbum MA. Xylazine—Medical and Public Health Imperatives. New England Journal of Medicine. 2023 Apr 26.

Harm Reduction Innovation Lab (2023). Directory of North American Drug Checking Programs. https://harmreductionlab.com/drug-checking-directory-1

Harper L, Powell J, & Pijl EM (2017). An overview of forensic drug testing methods and their suitability for harm reduction point-of-care services. Harm reduction journal, 14(1), 1–13. [PubMed: 28056990]

Jones CM. Syringe services programs: an examination of legal, policy, and funding barriers in the midst of the evolving opioid crisis in the US. International Journal of Drug Policy. 2019 Aug 1;70:22–32. [PubMed: 31059965]

Karamouzian M, Dohoo C, Forsting S, McNeil R, Kerr T, Lysyshyn M. Evaluation of a fentanyl drug checking service for clients of a supervised injection facility, Vancouver, Canada. Harm Reduction Journal. 2018;15(46):1–8. [PubMed: 29304871]

Karch L, Tobias S, Schmidt C, Doe-Simkins M, Carter N, Salisbury-Afshar E, & Carlberg-Racich S (2021). Results from a mobile drug checking pilot program using three technologies in Chicago, IL, USA. Drug and Alcohol Dependence, 228, 108976. [PubMed: 34536717]

Krieger MS, Goedel WC, Buxton JA, Lysyshyn M, Bernstein E, Sherman SG, Rich JD, Hadland SE, Green TC, Marshall BD. Use of rapid fentanyl test strips among young adults who use drugs. International Journal of Drug Policy. 2018 Nov 1;61:52–8. [PubMed: 30344005]

Legislative Analysis and Public Policy Association (LAPPA). Model Fentanyl Test Strip and Other Drug Checking Equipment Act. https://legislativeanalysis.org/model-fentanyl-test-strip-and-other-drug-checking-equipment-act/

Lockwood TE, Huynh P, Richard A, Sightes E, Bailey K, Ray B, & Lieberman M (2021). Community overdose surveillance: Comparing substances collected from the death scene investigation to toxicology results. Drug and alcohol dependence, 224, 108722. 10.1016/i.dmgalcdep.2021.108722 [PubMed: 33932743]

Long V, Arredondo J, Ti L, Grant C, DeBeck K, Milloy MJ, Lysyshyn M, Wood E, Kerr T, Hayashi K. Factors associated with drug checking service utilization among people who use drugs in a Canadian setting. Harm Reduction Journal. 2020 Dec;17(1):1–8. [PubMed: 31906957]

Maghsoudi N, Tanguay J, Scarfone K, Rammohan I, Ziegler C, Werb D, & Scheim AI (2021). Drug checking Services for People who use Drugs: a systematic review. Addiction.

Marshman JA, editor. Street drug analysis and its social and clinical implications. Alcoholism and Drug Addiction Research Foundation; 1974.

McCrae K, Tobias S, Grant C, Lysyshyn M, Laing R, Wood E, et al. Assessing the limit of detection of Fourier-transform infrared spectroscopy and immunoassay strips for fentanyl in a real-world setting. Drug Alcohol Rev. 2020;39(1):98–102. [PubMed: 31746056]

Mema S, Sage C, Xu Y, Tupper K, Ziemianowicz D, McCrae K, et al. Drug checking at an electronic dance music festival during the public health overdose emergency in British Columbia. Canadian Journal of Public Health. 2018;109:740–4. [PubMed: 30251119]

Park JN, Frankel S, Morris M, Dieni O, Fahey-Morrison L, Luta M, Hunt D, Long J, Sherman SG. Evaluation of fentanyl test strip distribution in two Mid-Atlantic syringe services programs. International Journal of Drug Policy. 2021 Aug 1;94:103196. [PubMed: 33713964]

Park JN, Rouhani S, Beletsky L, Vincent L, Saloner B, Sherman SG. Situating the Continuum of Overdose Risk in the Social Determinants of Health: A New Conceptual Framework. Milbank Q. 2020 Sep;98(3):700–746. [PubMed: 32808709]

Park JN, Sherman SG, Sigmund V, Breaud A, Martin K, Clarke WA. Validation of a lateral flow chromatographic immunoassay for the detection of fentanyl in drug samples. Drug and alcohol dependence. 2022 Nov 1;240:109610. [PubMed: 36115223]

Romero RB, Sánchez-Lira JA, Pasaran SS, Rivera AC, Corral LA, Salimian A, Vadilllo JJ, Goodman-Meza D. Implementing a decentralized opioid overdose prevention strategy in Mexico, a pending public policy issue. The Lancet Regional Health–Americas. 2023 Jul 1;23.

Rouhani S, Park JN, Morales KB, Green TC, Sherman SG. Harm reduction measures employed by people using opioids with suspected fentanyl exposure in Boston, Baltimore, and Providence. Harm reduction journal. 2019 Dec;16(1):1–9. [PubMed: 30611251]

Russell E. Rapid Analysis of Drugs: A Pilot Surveillance System To Detect Changes in the Illicit Drug Supply To Guide Timely Harm Reduction Responses—Eight Syringe Services Programs, Maryland, November 2021–August 2022. MMWR. Morbidity and Mortality Weekly Report. 2023;72.

Sherman SG, Morales KB, Park JN, McKenzie M, Marshall BD, & Green TC (2019). Acceptability of implementing community-based drug checking services for people who use drugs in three United States cities: Baltimore, Boston and Providence. International Journal of Drug Policy, 68, 46–53. [PubMed: 30991301]

Trans European Drug Information (TEDI) project (2022). TEDI guidelines, Drug Checking Methodology, available at: www.tedinetwork.org/wp-content/uploads/2022/03/TEDI_Guidelines_final.pdf. Retrieved on September 12, 2023.

Tupper KW, McCrae K, Garber I, Lysyshyn M, & Wood E (2018). Initial results of a drug checking pilot program to detect fentanyl adulteration in a Canadian setting. Drug and alcohol *dependence*, 190, 242–245. [PubMed: 30064061]

Volkow ND, Califf RM, Sokolowska M, Tabak LA, Compton WM. Testing for Fentanyl - Urgent Need for Practice-Relevant and Public Health Research. N Engl J Med. 2023 Jun 15;388(24):2214–2217. doi: 10.1056/NEJMp2302857. Epub 2023 Jun 10. [PubMed: 37306505]

Wallace B, van Roode T, Pagan F, Hore D, Pauly B. The potential impacts of community drug checking within the overdose crisis: qualitative study exploring the perspective of prospective service users. BMC public health. 2021 Dec;21(1):1–2. [PubMed: 33388037]

Wallace B, van Roode T, Pagan F, Phillips P, Wagner H, Calder S, Aasen J, Pauly B, Hore D. What is needed for implementing drug checking services in the context of the overdose crisis? A qualitative study to explore perspectives of potential service users. Harm reduction journal. 2020 Dec;17(1):1–4. [PubMed: 31906957]

Table 1:

Operational Characteristics of 16 Drug Checking Services in North America, 2022

Characteristics	n	%
Types of samples tested (select all that apply)		
i. Solids	16	100.0
Powders	16	100.0
Crystals	15	93.8
Pills	14	87.5
ii. Liquids	11	68.8
Liquid drug solutions	10	62.5
Urine	2	12.5
Blood	1	6.3
Wastewater	1	6.3
iii. Drug paraphernalia	14	87.5
Empty drug bags/capsules	14	87.5
Used cookers, cottons, other injection paraphernalia	11	68.8
Smoking paraphernalia (stems, pipes)	8	50.0
Used syringes	7	43.8
Snorting paraphernalia (straws, etc.)	6	37.5
Vape pods	1	6.3
Sample collection methods		
In-person drop off at testing location	13	81.3
Collected through existing services and outreach	10	62.5
Collection boxes	3	18.8
Mail	3	18.8
Testing location		
Fixed-site only	9	56.3
Fixed and mobile	5	31.3
Mobile only	1	6.3
Drug checking services offered		
i. Self-testing kits distributed	10	62.5
Fentanyl Test Strips	10	62.5
Benzodiazepine test strips	3	18.8
Colorimetric/Reagent test kits	1	6.3
ii. On site testing	14	87.5
Fentanyl Immunoassay Test Strips	14	87.5
Fourier-Transformed Infrared Spectroscopy: FT-IR	10	62.5
Reagent Testing	4	25.0
Benzodiazepine Immunoassay Test Strips	4	25.0
Raman Spectroscopy	2	12.5
Paper Spray Mass Spectrometry: PSMS	1	6.3
iii. Off-site testing	10	62.5

Characteristics	n	%
Gas Chromatography Mass Spectrometry: GCMS	7	43.8
Liquid Chromatography Mass Spectrometry: LCMS	5	31.3
Reagent Testing	1	6.3
High Performance Liquid Chromatography: HPLC	1	6.3
Paper spray mass spectrometry: PSMS	1	6.3
Nuclear Magnetic Resonance: NMR	1	6.3
iv. Distributed model, multiple community locations with offsite DCS	2	12.5
v. Music Festival-based testing	1	6.3

Table 2:

Personnel Involved in Operating Drug Checking Services in North America, 2022

Characteristics	n	%
Staff and volunteers		
Number of full-time staff involved in running of program		
One to Two	6	37.5
Three to Five	5	31.3
Six to Ten	4	25
Unknown	1	6.3
Number of part-time staff involved in running of program		
Zero	7	43.8
One to Two	4	25
Three to Five	2	12.5
Six to Eight	1	6.3
Unknown	1	6.3
Number of staff with lived experience with drugs		
Zero	1	6.3
One to Two	6	37.5
Three to Five	4	25
Unknown	2	12.5
Number of volunteers		
Zero	9	56.3
One to Three	2	12.5
Thirty	1	6.3
Unknown	3	18.8
Training		
Drug checking technician degrees or scientific training		
None	6	37.5
Chemistry	2	12.5
Lab Services	2	12.5
Pharmacology	1	6.3
Paramedics Training	1	6.3
Source of drug checking training (select all that apply)		
External consultant	9	56.3
Self-taught	7	43.8
Manufacturer	6	37.5
University program	6	37.5
Local/State agency	3	18.8
Federal agency	1	6.3

Table 3:

Outcomes of Drug Checking Programs in North America, 2022

Characteristics	n	%
Total number of program participants		
0 - 199	2	12.5
200 - 999	4	25.0
1000 - 99999	3	18.8
100,000+	1	6.3
Not tracked	6	37.5
Number of program participants, past year		
0 - 199	6	37.5
200 - 999	2	12.5
1000 - 99999	3	18.8
Not tracked	5	31.3
Program participant characteristics		
People who use stimulants	15	93.8
People who use opioids	14	87.5
People who use psychedelics	10	62.5
People who use synthetic marijuana	6	37.5
Providers/first responders who care for people who use drugs	5	31.3
Total number of samples tested		
0 - 199	2	12.5
200 - 999	5	31.3
1000 - 9999	4	25.0
10,000+	1	6.3
Not tracked	4	25.0
Number of samples tested in past year		
0 - 199	4	25.0
200 - 999	5	50
1,000+	3	18.7
Not tracked	4	25
Number of samples tested in past week		
0-15	5	31.2
16-50	4	25.0
51-99	2	12.5
100+	1	6.2
Not tracked	4	25.0
Average number of samples tested per hour		
0-9	8	68.2
10-19	4	12.5
20+	2	6.2
Not tracked	2	12.5

Table 4:

Facilitators and Barriers to Operating Drug Checking Programs in North America, 2022

Facilitators	**n**	**%**
Interest of clients	11	68.8
Interest of service providers	10	62.5
Technical assistance from partners or consultants	10	62.5
Trust in drug checking program	9	56.3
Funding	9	56.3
Interest of public health agencies	8	50.0
Health needs of clients	8	50.0
Staff with background in chemistry / pharmacology	7	43.8
Barriers	**n**	**%**
Funding	13	81.3
Staffing	8	50.0
Laws prohibiting possession of drugs, paraphernalia, DCS equipment	6	37.5
Technical expertise	6	37.5
Time	5	31.3
Trust in drug checking program	4	25.0
Lack of interest	3	18.8
Other competing priorities	2	12.5
Bureaucracy / Administrative	2	12.5