

Accessibility gaps of physical supervised consumption sites in Canada motivating the use of overdose response technology/ phone based virtual overdose response services: a retrospective cohort study



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Summary

Background Overdose response technology or virtual overdose response services are an evolving complementary harm reduction intervention which may overcome certain accessibility barriers of physical supervised consumption sites (SCS) and overdose prevention sites (OPS). We sought to characterize SCS/OPS accessibility barriers among clients accessing a nationwide overdose response phone-based hotline in Canada.

Methods We performed a retrospective cohort analysis using anonymized call logs of the National Overdose Response Service (NORS) between December 2020 to July 2023. De-identified caller locations were cross-referenced with the locations, policies and operational hours of existing physical SCS/OPS. The primary outcome was accessibility of physical SCS/OPS defined hierarchically according to alignment with caller postal code, substance use routes reported, and calling times.

Findings Our cohort comprised 4501 calls from 331 unique clients. Despite always having nearby SCS/OPS open and supporting substance use routes of choice, 100 clients (30.2%) preferentially utilized NORS. Among 191 clients (57.7%) who never had access to physical SCS/OPS at time of calling, 92 (27.8%) lacked a nearby site, 58 (17.5%) called outside of operational hours, and 41 (12.4%) would not be permitted to smoke on premises. Secondary analyses identified correlations between accessibility and the urbanicity and geographical region of callers within Canada.

Interpretation Overdose response technology or virtual overdose response services are a novel complementary harm reduction strategy both for clients with access barriers to physical SCS/OPS and those who prefer virtual services. System-level correlates of client location urbanicity and inter-provincial variation indicate actionable targets for expanding harm reduction services both physical and virtual to better engage with people who use drugs.

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Introduction

In response to the growing morbidity and mortality associated with use of the unregulated illicit drug supply,¹ harm reduction initiatives including supervised consumption sites (SCS) have emerged as an integral harm reduction initiative.² SCS and overdose prevention

sites (OPS), largely distinguished by different exemptions under the Controlled Substances and Substances Act in Canada,³ were spearheaded as grassroots movements among communities of people who use drugs (PWUD) and have later seen increasing acceptance in health policy and political spheres, given the

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Research in context

Evidence before this study

We searched PubMed for articles published from inception to October 31, 2023, regarding accessibility for supervised consumption sites and mobile overdose response services using individual or combined search terms of “accessibility”, “supervised consumption site”, “mobile overdose response services”, and “harm reduction”. In summary, various studies have described factors affecting access to physical supervised consumption sites such as stigma, convenience, and limitations of preferred practices of substance use particularly smoking despite evidence that opioid overdoses and mortality are increasingly driven by smoking of substances in Canada. One study from Vancouver, Canada, identified proximity as another key factor with mortality reduction occurring only for postal codes within 500 m of the supervised consumption site. Few studies have assessed overdose response technologies, and none have compared accessibility relative to physical supervised consumption sites. Research finds half or more of people who use drugs have phones and among this population, virtual phone-based services are acceptable. Results from a nationwide mobile overdose response service have documented positive outcomes with zero mortality among 77 overdoses and several thousands of phone calls as well as cost-effectiveness of over \$8.50 saved for every dollar invested in the program for early overdose response.

Added value of this study

Among clients utilizing a Canadian overdose response hotline, one third of clients preferentially utilized virtual services even

when physical sites were nearby, available at all call times, and permitted their preferred route of substance use. The remaining majority of clients faced accessibility barriers in terms of a lack of nearby physical supervised consumption site, limitations on substance use particularly the prohibition of smoking, and limited operational hours particularly during evenings and overnight. We further identify correlations with urbanicity and geographic caller region within Canada.

Implications of all the available evidence

Overdose response technologies represent a promising complementary harm reduction strategy that overcomes certain key access barriers of physical supervised consumption sites including presence in the community particularly those rural and remote, limited operational hours, and permitted routes of substance use particularly smoking which increasingly drives opioid poisoning morbidity and mortality. A significant proportion of people who use drugs with access to physical supervised consumption sites in fact preferentially accessed virtual services likely reflective of diverse psychosocial access barriers. The current evidence now highlights not only actionable targets for improving accessibility of physical supervised consumption services but also the value and opportunity for upscaling novel overdose response technologies to connect people who use drugs with life-saving harm reduction services.

mounting body of observational evidence demonstrating reductions in drug-related harms as well as a range of other health and community benefits.^{4,5}

As physical spaces, concerns arise for stigma and privacy, vulnerability to policing, gender discrimination and violence, limitations on routes and practices of substance use particularly with social use and smoking, convenience, and physical proximity.^{6–14} Physical proximity is known to influence SCS/OPS outcomes given data that health benefits may extend to only a 500-m radius,¹⁵ and PWUD in Canada have indicated not wishing to travel more than 1000 m for SCS/OPS.¹⁶ Furthermore, opioid overdoses and mortality are increasingly driven by smoking of substances in Canada,^{17–19} which until recently was generally not allowed in Canadian SCS/OPS due to multiple factors including local indoor smoking legislations, the lengthy and cumbersome SCS/OPS application process, and a lack of infrastructure to ensure staff safety.²⁰ Taken together with data indicating the majority of substance use and overdose deaths occur alone,^{8,17} alternative low-barrier strategies to connect PWUD with harm reduction services are urgently needed.

Overdose response technology (ORT) also known as virtual overdose prevention services and mobile overdose response services, are one proposed strategy to address such accessibility gaps and deliver cost savings with less reliance on brick-and-mortar sites, as identified by the Stanford-Lancet Commission report on responding to the opioid crisis.¹ PWUD with telephone or internet access have indicated interest in accessing harm reduction services on these platforms.^{21,22} In this context, a specific ORT, the National Overdose Response Service (NORS), an overdose response hotline, was recently created in Canada offering 24/7 toll-free phone-based substance use monitoring by trained people with lived or living experience of substance use, or previous work within harm reduction spaces. NORS was implemented initially as a pilot project in the province of Ontario to determine the feasibility of using basic phone hotline software with operators experienced in providing peer-to-peer support and trained by an existing not-for-profit organization Grenfell Ministries with messaging to PWUD through a mix of advertising, word of mouth, and community outreach.²³ NORS recently reported data from Dec 2020 to April 2023,²⁴ during which 6528 calls were received from 445 unique callers primarily in

urban areas distributed across Canada, with callers reporting opioid use in 76% of calls with injection use in 52%, and smoking in 38% overall. In total, 77 calls required emergency response activation and no fatalities occurred. Additional analyses have recently shown NORS to render cost-savings with early overdose response.²⁵ Qualitative evaluations indicate reasonable acceptability of this intervention by people who use substances as well as front line health care providers and harm reduction workers.^{26–30}

Although accessibility barriers to physical SCS/OPS are known and increasingly elaborated, scant research has examined the potential ease of access to phone based ORTs as virtual services or moreover compared accessibility between physical and virtual options in settings where both are available. This study aimed to understand which proportion of NORS clients primarily accessed the service due to physical barriers to physical SCS/OPS and to further characterize major factors of physical inaccessibility.

Methods

Study design

This study follows Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines. We performed a retrospective cohort study of anonymized NORS call log data between December 2020 to July 2023 in comparison to the availability and operational hours of local physical SCS/OPS to identify use patterns and potential accessibility barriers.

NORS data collection

As previously described,^{24,31} NORS is a 24/7 toll-free phone-based peer-led overdose response hotline with operators who receive standardized training to monitor callers during substance use and contact emergency medical services if callers become unresponsive. Operators reconnect with clients and other stakeholders to document outcomes data of overdose events, emergency medical services activation, intervention with naloxone, and mortality. Further details regarding the early phases of NORS implementation including stakeholder involvement, operator training, logistics, and legal considerations were recently reviewed.²³

As standard practice, NORS operators generate a call log by creating a unique anonymized caller ID and collecting above outcomes data as well as call time, caller location, age and gender, and substances used, route, and quantity. While NORS operators request accurate exact locations of callers to direct emergency medical personnel in case of overdose, only the city was initially recorded in logs to protect privacy and build trust. For better location data granularity, NORS operators transitioned in spring of 2023 to reporting the forward sortation area (FSA), the first three values of postal code in Canada. FSA size varies greatly from spanning a large

rural region to a section of a major metropolitan area.³² FSA were applied retroactively to prior location data if single unambiguous values could be used, typically for rural communities represented by a single FSA.

For the purposes of this analysis, we included all anonymized data from call logs between service launch in December 2020 until the most recent data cycle in July 2023. We excluded clients if their location was unknown or outside of Canada.

Physical SCS/OPS data collection

Based on client locations recorded in call logs, DV and VM searched for existing physical SCS/OPS within the same city or town including mobile “pop-up” sites when their exact locations, hours and timeline of operation were clearly documented. Potential sites were identified using peer reviewed Canadian SCS/OPS literature, discussion with Health Canada staff involved in granting SCS/OPS exemptions, and online searches including review of public health authority websites and gray literature as guided by local advocacy groups, public health staff, SCS/OPS staff, and NORS peers. DV and VM then attempted to connect with SCS/OPS staff at potential sites via telephone and email over at least three separate attempts over two months to confirm operation between December 2020 to July 2023, their location, hours of service, and routes of substance use permitted. Only official stated policies of SCS/OPS were considered and compassionate workarounds such as indirect supervision of smoking were not considered. In rare circumstances when site staff could not be contacted, the SCS/OPS was considered non-operational. All SCS/OPS data collected were included in the analysis.

Variable definitions

The primary outcome was the proportion of NORS calls with physical SCS/OPS available to clients. SCS/OPS availability was defined stepwise as 1) the presence of an operational physical SCS/OPS within city or FSA recorded for NORS callers, 2) SCS/OPS permission of all substance use route(s) as reported by NORS callers, particularly smoking, and 3) overlap of NORS call time with SCS/OPS operational hours. Additional variables of interest included client age, gender, Indigenous self-identification, community size and geographic region within Canada, presence of SCS/OPS in their community, and whether clients reported smoking. In terms of community size, this was defined as rural, medium, or urban for population sizes of <10,000, 10,000–100,000, or >100,000, respectively, consistent with prior research.²⁴

Data analysis

We applied a hierarchical process to establish physical SCS/OPS availability for each call from NORS clients as defined above. Sequentially at each of the three steps, calls failing to meet the respective criterion were labeled as lacking SCS/OPS accessibility. As well we performed

an analysis of each key access barrier to physical SCS/OPS in isolation. When FSA data were unavailable, we assumed access to any SCS/OPS within the community could be possible as the exact client location could not be known. The proportion of calls with physical SCS/OPS accessibility was then calculated by dividing the number of calls flagged at each step by the total number of calls from each unique client.

We present demographic characteristics stratified by the proportion of calls with accessibility to physical SCS/OPS. We also present SCS/OPS accessibility for unique NORS clients stratified by sequential access barriers, each barrier in isolation, and by 6-h intervals of daily call times. Lastly, we calculated odds ratios for each variable of interest, and calculated 95% confidence intervals and p-values using the chi-square test for independence. If a group within a variable had less than 5 expected counts then we used the Fisher's exact test instead of the chi-square test for independence. Only variables with at least 1 count in each group had an odds ratio calculated. Analyses were performed using Microsoft SPSS (Version 28, IBM Corporation, Armonk, NY, USA) and R (Version 4.1.2, R Foundation for Statistical Computing, Vienna, Austria). The statistical significance threshold was $p < 0.05$ based on 2-sided testing.

Role of the funding source and ethics

Health Canada, the Canadian Institutes of Health Research and Grenfell Ministries had no role in the design, conduct, analysis, reporting or decision to submit results. The views expressed herein do not necessarily represent the views of Health Canada. This study obtained ethics approval from the University of Calgary Conjoint Health Research Ethics Board (REB21-1966).

Results

The STROBE flow diagram of total and unique NORS clients between December 2020 to July 2023 is presented in Fig. 1. NORS received 4599 drug consumption calls from 378 unique clients, of which 47 clients were excluded for being outside of Canada or not having location data. A total of 4501 calls from 331 unique users with an average of 13.6 calls each (SD 80.0) and majority having 10 calls or less in the 30-month study period were ultimately included in the analysis.

Demographic characteristics of NORS clients stratified by the proportion of calls with physical SCS/OPS accessibility are presented in Table 1. The geographic distribution of unique clients with SCS/OPS accessibility is illustrated in Fig. 2. The majority of unique clients were 18–39 years old (69.1%) calling from urban settings (83.9%) in Ontario (59.2%). Rural locations were reported for 18 unique clients (5.4%). A total of 12 clients (3.6%) self-identified as Indigenous. Smoking was reported for 1488 (33.1%) of calls and 118 unique clients (35.6%). While 13.2% of unique callers identified as women, 12.0% as men and 1.8% reported being gender diverse, most clients did not have a gender recorded in call logs (72.8%) and thus gender was not used in our analysis.

NORS clients were located in 78 communities across Canada, mostly in Ontario (48.7%) and British Columbia (19.2%), of which 35 (44.9%) had operational physical SCS/OPS during the study period. The SCS/OPS identified across Canada for the present analysis are presented in Supplemental Table S1. Stepwise accessibility barriers for unique NORS clients are presented in Fig. 3. Among NORS clients, 191 (57.7%) always experienced an accessibility barrier to physical SCS/OPS including 92 (27.8%) clients with no nearby

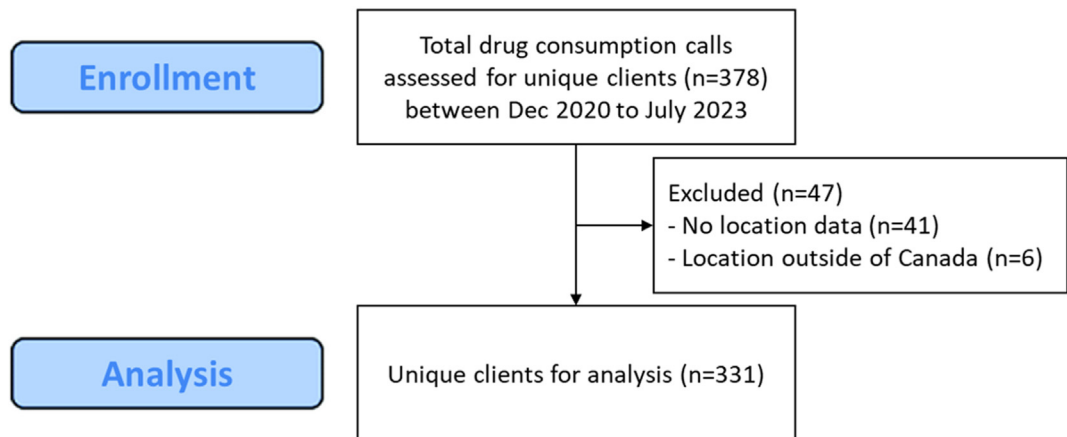


Fig. 1: Strengthening the reporting of observational studies in epidemiology (STROBE) flow diagram of total and unique clients of the national overdose response service overdose response hotline across Canada between December 2020 and July 2023.

Characteristic	Unique users with physical SCS/OPS accessibility ^a , n (%)						
	Total unique users	0% (never available)	1–25%	26–50%	51–75%	75–99%	100% (always available)
Total	331 (100)	191 (57.7)	5 (1.5)	22 (6.6)	8 (2.4)	5 (1.5)	100 (30.2)
Gender							
Men	40 (12.0)	25 (62.5)	0 (0)	0 (0)	1 (2.5)	2 (5.0)	12 (30.0)
Women	44 (13.2)	26 (59.0)	0 (0)	7 (15.9)	1 (2.3)	0 (0)	10 (22.7)
Gender diverse	6 (1.8)	5 (83.3)	1 (16.6)	0 (0)	0 (0)	0 (0)	0 (0)
Gender data missing	241 (72.8)	135 (56.0)	4 (1.7)	15 (6.2)	6 (2.5)	3 (1.2)	78 (32.3)
Indigenous identity	12 (3.6)	7 (58.3)	0 (0)	1 (8.3)	1 (8.3)	0 (0)	3 (25.0)
Age							
Under 18	3 (0.9)	1 (33.3)	0 (0)	0 (0)	0 (0)	0 (0)	2 (66.6)
18–29	111 (33.5)	64 (57.6)	4 (3.6)	4 (3.6)	2 (1.8)	3 (2.7)	34 (30.6)
30–39	118 (35.6)	61 (51.6)	0 (0)	10 (8.5)	6 (5.1)	0 (0)	41 (34.7)
40–49	47 (14.1)	33 (70.2)	1 (2.1)	5 (10.6)	0 (0)	0 (0)	8 (17.0)
50–59	20 (6.1)	11 (55.0)	0 (0)	1 (5.0)	0 (0)	1 (5.0)	7 (35.0)
60–69	7 (2.1)	6 (85.7)	0 (0)	0 (0)	0 (0)	0 (0)	1 (14.2)
Age data missing	25 (7.6)	15 (60.0)	0 (0)	2 (8.0)	0 (0)	1 (4.0)	7 (28.0)
Community size ^b							
Rural (<10 k)	18 (5.4)	17 (94.4)	0 (0)	0 (0)	0 (0)	0 (0)	1 (5.6)
Medium (10–100 k)	35 (10.5)	25 (71.4)	0 (0)	3 (8.6)	1 (2.9)	0 (0)	6 (17.1)
Urban (>100 k)	278 (83.9)	149 (53.5)	5 (1.8)	19 (6.8)	7 (2.5)	5 (1.8)	93 (33.4)
Region							
British Columbia	27 (8.2)	13 (48.1)	1 (3.7)	3 (11.1)	0 (0)	1 (3.7)	9 (33.3)
Prairie region (AB, SK, MB)	61 (18.4)	38 (62.2)	0 (0)	1 (1.6)	2 (3.3)	1 (1.6)	19 (31.1)
Ontario	196 (59.2)	117 (59.6)	4 (2.0)	17 (8.7)	4 (2.0)	2 (1.0)	52 (26.5)
Quebec	28 (8.5)	10 (35.7)	0 (0)	1 (3.6)	1 (3.6)	1 (3.6)	15 (53.5)
Atlantic Canada (NS, NB, NL, PE)	12 (3.6)	10 (83.3)	0 (0)	0 (0)	0 (0)	0 (0)	2 (16.6)
Northern Territories (YT, NT, NU)	7 (2.1)	3 (42.8)	0 (0)	0 (0)	1 (14.2)	0 (0)	3 (42.8)
SCS/OPS in community	262 (79.1)	122 (46.5)	5 (1.9)	22 (8.4)	8 (3.1)	5 (1.9)	100 (38.1)
Inhalational use	118 (35.6)	85 (72.0)	4 (3.4)	13 (11.0)	6 (5.1)	3 (2.5)	7 (6.0)
Prior overdose on NORS telephone line	24 (7.3)	2 (8.3)	3 (12.5)	0 (0)	5 (20.8)	1 (4.2)	13 (54.2)

AB, Alberta. MB, Manitoba. NB, New Brunswick. NL, Newfoundland and Labrador. NORS, National Overdose Response Service. NS, Nova Scotia. NT, Northwest Territories. NU, Nunavut. OPS, overdose prevention site. PE, Prince Edwards Island. SCS, supervised consumption site. SK, Saskatchewan. YT, Yukon. ^aPhysical supervised consumption sites were considered accessible to callers of the overdose response hotline if all three criteria were satisfied including: callers having an operational supervised consumption site present within their reported city or forward station address within 500 m; the supervised consumption site permitted route(s) of substance use reported by callers; and time of call overlapped with operational hours of the supervised consumption site. ^bCommunity size for rural, medium, or urban settings defined as population sizes of <10,000, 10,000–100,000, or >100,000, respectively.

Table 1: Proportion of calls from 331 unique clients of the National Overdose Response Service overdose response hotline with a physical supervised consumption site available at time of call between December 2020 to July 2023.

physical site, 41 (12.4%) clients with substance use routes, especially smoking, which conflicted with SCS/OPS policies, and 58 (17.5%) clients with call times outside of SCS/OPS operational hours. Variable degrees of SCS/OPS accessibility were present for another 40 (12.1%) clients largely due to variability in substance use calls involving smoking or coinciding with SCS/OPS operational hours. Only 100 clients (30.2%) were considered to have SCS/OPS accessibility at all times of calling NORS. Although there was a wide variance in call frequency between unique users, accessibility trends were similar with respect to total calls as for unique users. As presented in [Supplemental Fig. S1](#), when access barriers were analyzed individually assuming other key barriers were resolved in total calls

to NORS, the largest barrier remained the lack of nearby SCS/OPS (1327 calls, 34.8%), followed by calls occurring outside of operational hours (1227 calls, 32.2%), and finally SCS/OPS not permitting routes of use as reported by clients, particularly smoking (1008 calls, 26.4%).

As presented in [Supplemental Fig. S2](#), stratified by time of day, NORS experienced the largest call volumes during 1800–2400 h (1751 calls, 38.9%), during which time the greatest total number, 1035 (59.1%), also had no access to physical SCS/OPS. Notably, the 0000–0600 h period represented the smallest total call volume, 500 (11.1%), but the greatest proportion of calls without SCS/OPS accessibility, 411 (82.2%). The most coverage with physical SCS/OPS instead occurred

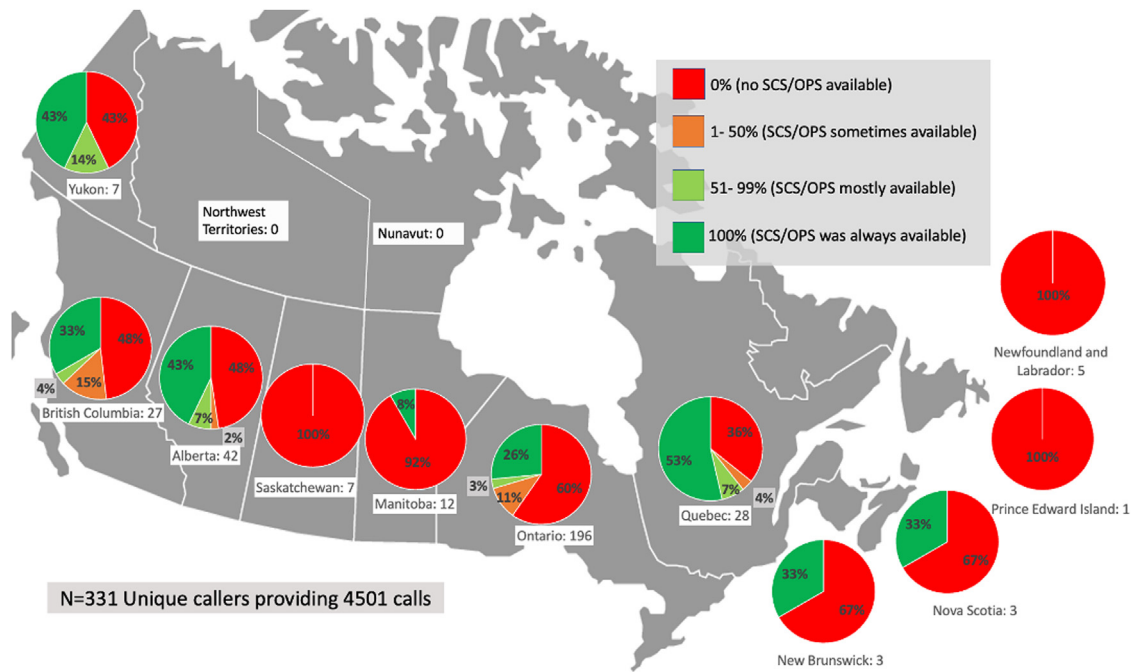


Fig. 2: Average accessibility of physical supervised consumption sites for 331 unique callers utilizing the National Overdose Response Service overdose response hotline across Canada between December 2020 and July 2023. OPS, overdose prevention site. SCS, supervised consumption site.

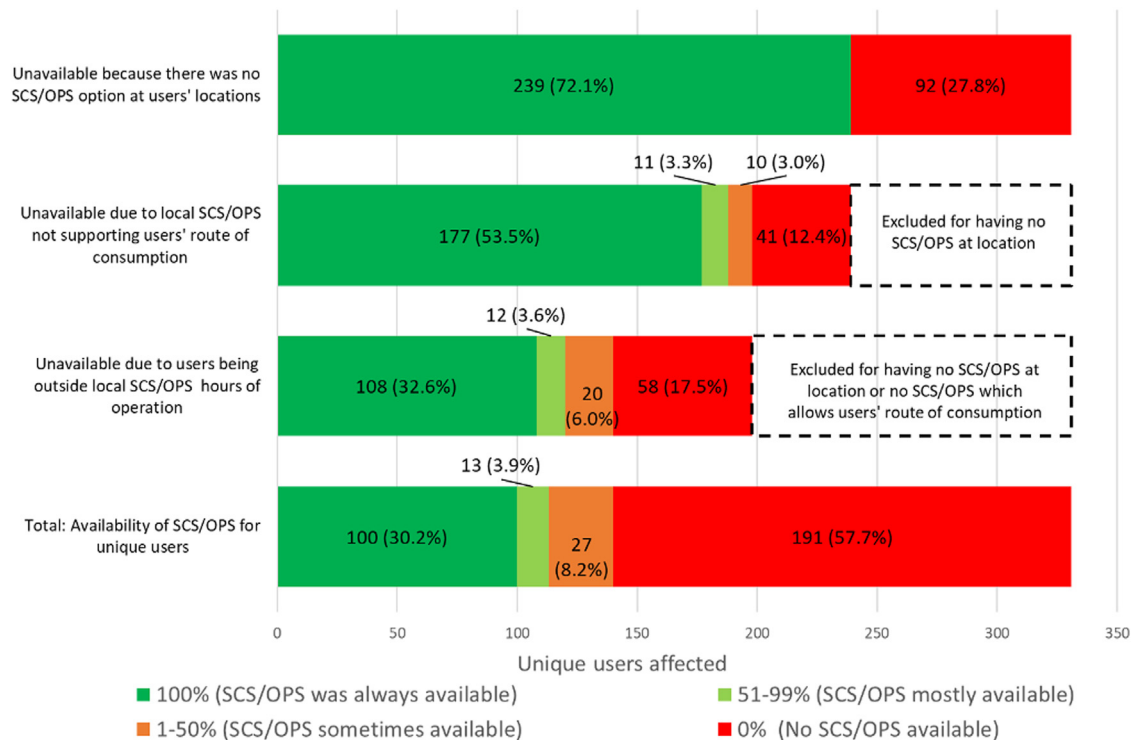


Fig. 3: Physical availability, substance use route restrictions, and operational hour limitations as causes for accessibility barriers to physical supervised consumption sites for 331 unique callers to the National Overdose Response Service overdose response hotline between December 2020 to July 2023. OPS, overdose prevention site. SCS, supervised consumption site.

during 0600–1200 h (578 calls, 61.2%) and 1200–1800 h (784 calls, 60.0%).

Correlates of physical SCS/OPS accessibility for NORS clients in their majority of calls are summarized in Table 2 (chi-square and Fisher exact test results are available upon request). Positive predictors included urban settings (OR = 3.41, 95% CI 1.54–7.52) and Quebec (OR = 3.33, 95% CI 1.50–7.38), whereas negative predictors included calls from rural settings (OR = 0.11, 95% CI 0.01–0.80) and Ontario (OR = 0.61, 95% CI 0.38–0.96).

Discussion

In this retrospective cohort study of PWUD in Canada utilizing the overdose response hotline NORS between December 2020 to July 2023, we found one third of clients who never had physical barriers to accessing SCS/OPS preferentially utilized the virtual option, and for those who did experience physical barriers, more than half of situations could be accounted by three key factors: presence of a nearby SCS/OPS in their community, permission of smoking/inhalation route, and operational hours. Relevant correlates of physical SCS/OPS accessibility included urbanicity and geographical region of callers within Canada. These data may serve to inform further research, program implementation, and policy for harm reduction interventions particularly in addressing current access barriers for physical SCS/OPS and recognizing the value of upscaling complementary virtual services to better connect PWUD with life-saving harm reduction interventions.

To our knowledge, this is the first study to examine accessibility barriers of physical SCS/OPS for PWUD who instead sought monitoring for substance use via ORT, phone based virtual overdose prevention services. Although physical SCS/OPS represent progress for PWUD to access harm reduction strategies that are compassionate, lifesaving and render other societal benefits, there are known access barriers which remain and are underscored by our data. The presence and proximity of physical SCS/OPS in communities, particularly in a radius of 500 m and potentially up to 1000 m,^{15,16} are evidently key factors in accessibility and outcomes. Moreover the process of opening and operating an SCS/OPS is known to be mired in political and public health hurdles, evidenced by the Canadian experience with SCS/OPS,³³ and similarly extending across the globe.² If SCS/OPS are granted permission to operate, research has shown that individuals accessing these facilities may face stigma, discrimination, and vulnerability to law enforcement targeting in the vicinity of SCS/OPS among other deterrents.^{6–14} As well, no supervised smoking facilities existed in Canada until recently and as of 2023, remain largely unavailable (three in Canada) despite increasing recognition of their utility and long-standing PWUD interest, which

Characteristic ^a	Proportion of clients with >50% average accessibility	Odds ratios (95% CI) ^f
Indigenous identity	33.3	0.96 (0.28–3.27)
Age ^b		
Age 18–29	35.1	1.07 (0.66–1.72)
Age 30–39	39.8	1.47 (0.92–2.35)
Age 40–49	17.0	0.35 (0.15–0.77) ^d
Age 50–59	40.0	1.31 (0.51–3.29)
Age data missing	32.0	0.9 (0.37–2.15)
Community size		
Rural community (<10 k)	5.6	0.11 (0.01–0.80) ^d
Medium (10–100 k)	20.0	0.45 (0.18–1.06)
Urban (>100 k)	37.8	3.41 (1.54–7.52) ^d
Region		
British Columbia	37.0	1.15 (0.50–2.59)
Prairie region (AB, SK, MB)	36.1	1.11 (0.62–1.98)
Ontario	29.6	0.61 (0.38–0.96) ^c
Quebec	60.7	3.33 (1.50–7.38) ^d
Atlantic Canada (NS, NB, NL, PE)	16.7	0.38 (0.08–1.74)
Northern Territories (YT, NT, NU)	57.1	2.63 (0.57–11.9)
SCS/OPS in community	3.4	3.4 (1.69–6.71) ^e
Inhalational use	13.6	0.19 (0.10–0.33) ^e
Prior overdose on NORS telephone line	20.8	0.49 (0.17–1.33)

AB, Alberta. MB, Manitoba. NB, New Brunswick. NL, Newfoundland and Labrador. NORS, National Overdose Response Service. NS, Nova Scotia. NT, Northwest Territories. NU, Nunavut. OPS, overdose prevention site. PE, Prince Edwards Island. SCS, supervised consumption site. SK, Saskatchewan. YT, Yukon. ^aGender was not used in this analysis due to the degree of incomplete gender-based data. ^bThe age categories of under 18 years old and 60–69 years old were both excluded from this analysis due to their small sample size which would result in unreliable estimates. ^c $p < 0.05$. ^d $p < 0.01$. ^e $p < 0.001$. ^fOdds ratios were calculated using univariate logistic regression with the respective reference group being the negative variable (e.g. no SCS in community) for binary variables and the overall cohort for variables with more than 3 categories.

Table 2: Odds ratios for accessibility of physical supervised consumption sites during the majority of calls to the National Overdose Response Service overdose response hotline for 331 unique clients between December 2020 to July 2023.

increased during the COVID-19 pandemic.^{20,34} Lastly, limited operational hours and wait times can pose barriers, especially for the most vulnerable PWUD with unstable housing and recent overdoses.³⁵ Some PWUD consequently choose not to access these facilities and use substances elsewhere which raises concern given evidence of substance use and overdose deaths increasingly occurring when people use alone.^{8,17} Taken together, our findings paired with current data of smoking/inhalation routes of substance use increasingly contributing to opioid overdoses and mortality in Canada,^{17–19} calls for the urgent expansion of both physical SCS/OPS and other low-barrier solutions including ORT and phone based virtual overdose prevention services to address unmet need due to current physical access barriers with adapted operational hours including overnight coverage, ability to reach into more rural and remote areas, and practicality of accommodating for safe smoking/inhalation practices virtually.

Our study further identifies several systems-level factors which may guide targeted efforts to expand

harm reduction services in both physical and virtual spaces to address current limitations in terms of physical access barriers. Firstly, our results underscore the stark rural-urban divide of physical SCS/OPS availability. In Canada, the majority of operational physical SCS/OPS are located in communities with more than 100,000 residents and all are present in communities with greater than 50,000 residents.³⁶ Increased and sustained investment in harm reduction strategies for rural communities is needed particularly given recent data suggesting a shift of higher overdose mortality rates from urban to rural regions.³⁷ As such, phone based virtual overdose response services may prove to be lower cost, nimbler, and more efficient to implement swiftly via public awareness campaigns compared to physical SCS/OPS which individually require an often-protracted approval process, set-up including confirmation of a physical address with community approval, and ongoing maintenance for each site.

Secondly, our findings indicate systems-level factors with respect to the inter-regional variation observed with clients from Ontario less likely and clients from Quebec conversely more likely to have greater access to physical SCS/OPS. Our group has previously reported data in which Ontario accounts for a large proportion of call volume and unique callers, potentially due to earlier project implementation and greater awareness of the service with greater presence of NORS staff and leadership in the area.²⁴ Interestingly in this study, despite Ontario proportionally having more SCS/OPS outside of major urban centers compared to anywhere else in Canada,³⁶ Ontario clients were less likely to have access to physical SCS/OPS at time of calls which suggest NORS is achieving sufficient public awareness to address accessibility gaps of physical SCS/OPS in the region. Conversely, clients in Quebec were more likely to have access to physical SCS/OPS at times when calling NORS which instead suggests greater preference of PWUD to connect with virtual services. This phenomenon may be due to other factors not captured in our analysis such as stigma, convenience, and ability to follow substance use practices not permitted at their local SCS/OPS.⁶ Indeed, additional nuanced reasons are documented in the literature for avoiding the use of SCS/OPS despite physical accessibility such as gender-based stigma, the need for child care, and lack of transportation.³⁸

In addition, the preference for virtual services by a substantial proportion of clients represents a novel finding that contributes to mounting evidence for ORT as low-risk, low-barrier complementary tools for harm reduction. Although not all PWUD have access to phones and this equity issue requires further study,^{22,39} these services are acceptable and welcomed by PWUD who do have access to phones.^{9,21,22} Our data add to the current literature by demonstrating that certain PWUD indeed prefer virtual services when considering the

approximate one-third of clients who did not experience access barriers to physical SCS/OPS yet consistently opted for NORS during our 30-month study period. This finding suggests additional factors other than physical accessibility barriers motivate PWUD to access virtual services and may include psychosocial factors such as client concerns around stigma, social anxiety, violence, and policing at physical SCS/OPS.⁵⁻¹³ Virtual services may therefore serve a complementary role in harm reduction strategies which is supported by promising early outcomes data suggesting similar outcomes to physical SCS/OPS with zero mortality in the experience of ORT thus far,²⁴ and collated data estimating over 100 opioid overdose related deaths have been prevented among nearly 300 documented overdose response events.⁴⁰ Recent estimates have also found NORS to be cost-beneficial with early community-based intervention mobilized by NORS estimated to deliver a net healthcare savings of \$4500 per overdose event and an overall benefit upwards of \$8.50 for every dollar invested in the program.²⁵ In sum, the findings of the present study and current literature highlight the value and urgent need for greater investment in virtual overdose prevention services in terms of research, implementation, and public health policy.

Our results should be understood in the context of several strengths and limitations of our approach. We present novel data regarding accessibility barriers for clients utilizing virtual services, specifically in a Canadian context with a 24/7 nation-wide overdose response hotline although major themes of these findings may translate with caution to other settings with ORT. Associations with geographic region and urbanicity are moreover based on limited unadjusted odds ratios and adjustment for potential confounders would serve to strengthen findings in future research. Furthermore, our cohort data with an average of 13–14 calls from unique clients over nearly 30 months provides longitudinal resolution of accessibility barriers, particularly for operational hours, compared to a single cross-sectional observation. Nonetheless, the cohort population itself, acknowledging NORS was in early growth phases, was relatively small with only 378 unique clients which further limits generalizability and highlights the need for sustained investments in spreading awareness of virtual services to reach the far larger population of PWUD with creative solutions such as promotional inserts in naloxone kits.⁴¹ It should be noted however that each client has one-on-one time with an operator and each call averages 15–30 min duration such that operational pressures for ORT are different than physical SCS/OPS and smaller populations served nonetheless amount to significant operational workload. Our data represent only the choice of clients to use NORS at specific timepoints which is not mutually exclusive with using physical SCS/OPS other times or not seeking supervised consumption at all, a dynamic

deserving further research to understand health-seeking behavior among PWUD as well. Although still limiting accessibility and considered as such in our study definition, clients who preferred to smoke substances could conceivably still attend SCS/OPS to use by other routes and some SCS/OPS may offer informal compassionate workarounds for clients who wish to smoke outdoors off premises but remain within line of sight or enter SCS/OPS afterwards for monitoring. Client location self-report and NORS call log anonymization protocol prior to our analysis also limits the accuracy of estimating proximity between client and physical SCS/OPS. Although more accurate with urban settings, FSA remains a limited metric due to variability in postal code size, shape, and location of clients within this space. Notably in the study by Marshall et al. which found a decrease of fatal overdoses within a radius of 500 m of the Insite physical SCS/OPS,¹⁵ the FSA of this region in Vancouver is V6A which spans approximately 2 square km. As such, use of FSA in our study likely represents an overestimation of proximity and physical SCS/OPS are generally less accessible. Future work will continue balancing client privacy versus accuracy of programmatic data collection and perhaps utilize full postal code of nearby landmarks if acceptable to PWUD involved. Lastly, our approach is limited by the inherent difficulty of ascertaining real-time precise information over the course of follow-up for all clients, their substance use patterns, and all physical SCS/OPS in a region as large as Canada, especially through different waves of COVID-19 pandemic. Informal grassroots or “pop-up” SCS/OPS which may allow smoking on premises or have operational hours better tailored to their clients likely existed but were not included.³⁴ Despite available formal and informal SCS/OPS, PWUD in our cohort still chose to utilize NORS which speaks to the meaningful role for ORT in harm reduction.

Conclusion

In a retrospective cohort study of PWUD accessing the Canadian nationwide overdose response hotline NORS between December 2020 to July 2023, one-third of clients who never had access barriers to physical SCS/OPS opted for virtual services and otherwise three physical factors of SCS/OPS proximity, operational hours, and prohibition of smoking on premises accounted for access barriers for the remaining majority of clients. Correlations with system-level factors including urbanicity and inter-regional variability indicate targets for expanding harm reduction services. In this context, the complementary role of mobile overdose response services such as NORS is increasingly recognized. Our findings highlight the urgent need to not only reduce barriers and expand access to physical SCS/OPS but also the opportunity to upscale novel virtual options such as NORS for PWUD address barriers to harm reduction services.

Contributors

Victor Mocanu: Conceptualization; Methodology; Investigation; Data access and curation; Writing–Original Draft; Writing–Review & Editing; Visualization. **Dylan Viste:** Conceptualization; Methodology; Investigation; Software; Data verification; Data access and curation; Formal analysis; Writing–Review & Editing; Visualization. **William Rioux:** Writing–Review & Editing. **Sumantra Monty Ghosh:** Conceptualization; Methodology; Validation; Investigation; Resources; Software; Data verification; Data access and curation; Formal analysis; Writing–Review & Editing; Visualization; Supervision; Project administration; Funding acquisition; Final responsibility for the decision to submit for publication.

Data sharing statement

De-identified participant data and the study protocol are available upon reasonable request following publication with a research proposal and data access agreement to be approved by principal investigator S. Monty Ghosh and the steering committee of the National Overdose Response Service.

Editor note

The Lancet Group takes a neutral position with respect to territorial claims in published maps and institutional affiliations.

Declaration of interests

M.G. is involved in senior leadership and evaluation for the National Overdose Response Service. D.V. serves as an employee of the Health Canada Substance Use and Addictions Program. All other authors declare no competing interests.

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Appendix A. Supplementary data

Supplementary data related to this article can be found at <https://doi.org/10.1016/j.lana.2024.100770>.

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