

Research Paper

Supervised consumption service use and high-frequency public injecting among people who inject drugs in Toronto: A cross-sectional analysis (2018–2020)

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ABSTRACT

Background: Public injecting increases the risk of adverse drug-related outcomes. Supervised consumption services (SCS) have been associated with improvements in individual and public health outcomes. However, evidence of their impact on public injecting within current risk environments remains limited.

Methods: We analyzed cross-sectional survey data from people who inject drugs in Toronto, Canada, between 2018 and 2020. We used modified Poisson regression with robust standard errors to estimate the associations between recent (past 6-month) SCS use and high-frequency public injecting, defined as usually/always versus sometimes/occasionally/never injecting in public, overall and stratified by housing instability.

Results: Among 700 participants, 15% ($n = 108$) reported high-frequency public injecting. In descriptive analyses, compared with infrequent or no public injecting, high-frequency public injecting was associated with younger age (median 36 vs. 40 years), lower educational attainment, housing instability, and needle/syringe sharing; all with 95% CIs excluding the null. Recent SCS use was reported by 87% ($n = 608$) of participants and was associated with a 51% lower prevalence of high-frequency public injecting (adjusted prevalence ratio (aPR) = 0.49; 95% CI: 0.32–0.77). In analyses stratified by housing instability, this association was observed among participants experiencing mostly unstable housing (aPR = 0.47; 95% CI: 0.29–0.75); among those with some or no unstable housing, precision was limited due to sparse events.

Conclusion: Recent SCS use was associated with lower prevalence of high-frequency public injecting overall and among individuals experiencing housing instability, underscoring the need for integrated interventions that address housing needs and harm reduction service access.

Introduction

Injecting drugs in public spaces, such as parks, streets, alleyways, or public bathrooms, can increase the risk of drug-related harms for people who inject drugs (Khezri et al., 2025). Public injecting impedes sterile drug preparation (Small et al., 2007) and is associated with unsafe

injecting practices, including rushed injecting and needles/syringes sharing (Khezri et al., 2025). Public injecting also increases the risk of fatal (Bohnert et al., 2009) and non-fatal overdose (Khezri et al., 2025), HIV and hepatitis C transmission (Khezri et al., 2025), and injection drug use-related bacterial and fungal infections (Khezri et al., 2025). In addition to individual health consequences, public injecting can

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negatively impact public order outcomes, such as discarded needles/syringes and injection-related litter (Wood et al., 2004).

Public health-oriented strategies to address the harms of public injecting include the provision of needle and syringe programs, sharps disposal boxes in public venues, and supervised consumption services (SCS) that provide private, staff-supervised alternatives to public spaces for injecting (Rhodes et al., 2006; Strike & Watson, 2019). SCS are spaces where people can inject pre-obtained drugs under medical supervision and access sterile drug use equipment (Rhodes et al., 2006). In addition to the primary goals of reducing the risk of fatal overdoses, preventing infectious disease transmission, and improving access to health and social support services, SCS also aim to improve community safety and public order outcomes by shifting public injecting practices into safe and supervised settings (Kennedy et al., 2017).

In Toronto, SCS implementation began in 2017 and expanded rapidly to nine operating sites by 2018 (Scheim et al., 2021). During 2020–2025, Toronto SCS sites recorded 502,613 visits and responded to 13,264 non-fatal overdoses with no overdose deaths reported on site, in addition to providing 158,548 services and referrals to clients (Government of Canada, 2026). Despite two decades of SCS implementation in North America, few studies have examined the association between SCS and public injecting and although the available evidence suggests that SCS use is associated with reduced public injecting in other settings (Dow-Fleisner et al., 2022; Kennedy et al., 2017; Potier et al., 2014), no comparable studies are yet available for Toronto. This gap is particularly important given that Toronto has faced a persistent drug toxicity crisis for the past decade (Public Health Ontario, 2026), coupled with worsening housing instability and homelessness in recent years (City of Toronto, 2024), as well as reductions in the availability of SCS due to shifting provincial drug policy. Given this rapidly evolving risk environment, it is critical to assess how SCS use is associated with public injecting practices.

We therefore examined the association between self-reported SCS use and public injecting among a community-recruited sample of people who inject drugs in Toronto using cross-sectional data collected between 2018 and 2020. Our objectives were to (1) compare the prevalence of high-frequency public injecting between participants who reported recent SCS use and those who reported no recent SCS use, and (2) assess whether this association differed by housing instability status. We hypothesized that by providing a safer alternative setting to public injecting, SCS use would be associated with a lower prevalence of high-frequency public injecting, and that the magnitude of this association would differ by severity of housing instability.

Methods

Study design, setting, and participants

We conducted a cross-sectional analysis of baseline survey data from the Ontario Integrated Supervised Injection Services cohort study in Toronto (OiSIS-Toronto), collected between November, 2018, and March, 2020. The analytic period was restricted to surveys completed before the implementation of COVID-19 lockdown measures in Ontario, which impacted SCS access (Kolla et al., 2025) and data collection. As described elsewhere, OiSIS-Toronto is a prospective cohort study of people who inject drugs in Toronto, Canada (Scheim et al., 2021). To be eligible, individuals must have reported injection drug use within the past six months, be at least 18 years old, and reside in the city of Toronto. For the present analysis, we excluded one participant who was missing data on public injecting.

We sought to enroll participants with and without recent SCS use. Our recruitment strategy included a combination of active (direct invitations) and passive approaches (posters, recruitment cards) both within and outside SCS settings, including community health and social service organizations, outreach programs, peer referral, on the street, and through needle and syringe distribution programs. All participants

provided written informed consent and, upon completion of the survey, received an honorarium of \$30 CAD. We collected data on sociodemographic, socio-structural, drug use, harm reduction, and health-related characteristics of participants using interviewer-administered surveys. Further details are outlined in our published OiSIS-Toronto cohort profile (Scheim et al., 2021).

Variables and measurement

Study measures were based on participants' self-reported socio-demographic and recent (past 6-month) socio-structural, drug-related, and harm reduction service use characteristics. The primary outcome was public injecting, measured by asking participants: "In the last six months, how often did you inject in public or semi-public areas like a park, an alley or a public washroom?" Response options were never, occasionally ($\leq 25\%$), sometimes (26–74%), usually ($\geq 75\%$), and always (100% of the time). Responses were dichotomized to indicate high-frequency public injecting, defined as reporting usually or always injecting in public, versus sometimes, occasionally, or never injecting in public. Consistent with prior research (Khezri et al., 2025), high-frequency public injecting was selected as the primary outcome to measure a more persistent pattern of public injecting, rather than using a broader definition that combines occasional and frequent public injecting. This distinction is important as frequent public injecting has been associated with non-fatal overdose and other drug-related harms (Khezri et al., 2025). The primary exposure of interest, recent SCS use, was defined *a priori* as any versus no recent SCS use within the past six months, consistent with the primary study objective of comparing participants who had accessed an SCS with those who had not. Participants who reported recent use on any questionnaire item assessing SCS utilization within the past six months were classified as having recent SCS use. To describe patterns of recent SCS use, we categorized frequency of use as "daily", "less-than-daily", or "no recent SCS use". Housing instability was considered as a potential effect modifier for the association between SCS use and high-frequency public injecting. It was derived from a series of survey items asking participants where they had spent at least one night in the past six months and where they had spent most nights. We created a single categorical variable grouping participants into one of three categories: those experiencing "mostly unstable housing", "some unstable housing", or "no unstable housing", based on whether they reported spending most, some, or none of their nights in unstable housing settings such as on the streets, in a shelter, or having no fixed address.

We explored potential covariates of public injecting, including sociodemographic characteristics: age in years, gender (male, female, trans/gender-diverse), race/ethnicity (White, Indigenous, racialized/non-Indigenous), and educational attainment ($<$ high school vs. $\geq$ high school). Socio-structural characteristics included housing instability (described previously), income sources (paid employment, social assistance, and criminalized income-generating activities such as selling drugs, sex work, and theft/other illegal income), and incarceration ($\geq$ one night in jail). Drug-related characteristics included drugs injected most often (fentanyl, heroin/prescription opioids, and stimulants), frequency of injection drug use (defined two ways: as a binary measure for daily vs. $<$ daily, and as a continuous measure of the average number of injections performed per day, on a day when one is injecting). Other drug use characteristics included daily injection of fentanyl, heroin/prescription opioids, and stimulants (methamphetamines, illicit or prescription amphetamines, or speedball), as well as daily smoking of crystal meth and crack cocaine. We also explored opioid agonist treatment (OAT) use, defined as any recent prescription of methadone or buprenorphine/naloxone for an opioid use disorder indication. Drug-related harms were operationalized as a set of individual binary (yes or no) variables, each representing a recent report of the following: non-fatal overdose, sharing of needles/syringes, using water from an outdoor source to inject, and providing injection initiation assistance to someone

who has never injected before or requiring help injecting. Among participants who reported any recent public injecting, we explored the context of public injecting via survey questions asking about reasons for public injecting.

Statistical analysis

We followed a descriptive epidemiologic framework (Lesko et al., 2022) to characterize the study sample overall and by high-frequency public injecting. We examined associations between covariates and high-frequency public injecting using modified Poisson regression models with robust standard errors to estimate unadjusted and age- and gender-adjusted prevalence ratios (PR) with 95% confidence intervals (CI) and models minimally adjusted for age and gender (Gnardellis et al., 2022). We used modified Poisson regression to allow for the direct estimation of PR, rather than using logistic regression to estimate prevalence odds ratios, as these measures may differ meaningfully when the outcome is not rare (Gnardellis et al., 2022). Continuous variables, age and frequency of daily injection drug use, were modelled using restricted cubic splines with knots at 5th, 27.5th, 50th, 72.5th, and 95th percentiles (Harrell, 2015).

In multivariable modelling, confounders of the association between recent SCS use and high-frequency public injecting were selected *a priori* using the modified disjunctive cause criterion, which includes known or potential causes of the exposure, outcome, or both (VanderWeele, 2019). Characteristics known to be associated with public injecting include age, gender, housing instability, selling drugs, sex work, injecting frequency, drug types frequently injected, and OAT (DeBeck et al., 2009; Horyniak et al., 2013; Hunt et al., 2007; Rachlis et al., 2009; Richardson et al., 2010). Education, race/ethnicity, and daily smoking of crystal meth and crack cocaine were considered potential confounders. We excluded covariates that may be consequences of public injecting (e.g., incarceration, non-fatal overdose, needle/syringe sharing), as conditioning on downstream effects of the exposure or outcome can bias estimates (Hernán et al., 2004).

We investigated potential modification of the association between recent SCS use and high-frequency public injecting by housing instability status using two approaches: (1) estimating discrete marginal associations (absolute differences in predicted probabilities of high-frequency public injecting by SCS use) within each level of housing instability, including plots to illustrate the magnitude of association across levels of housing instability (Williams, 2012), and (2) stratified multivariable models by housing instability. Interaction models were explored but did not converge because of sparse outcome-exposure cells; therefore, stratified analyses were used. In stratified models, participants with mostly unstable housing were compared with those with some or no unstable housing, with the latter categories combined to improve precision. Missing data were reported for descriptive analyses. For modelling, we conducted a complete case analysis, excluding those with missing covariate data (10% of the overall 700 study sample; 7% due to missing housing status, 3% due to other missing covariates). Data analysis was performed using Stata 18.

This study was approved by research ethics boards at Unity Health Toronto and Toronto Public Health and reported according to STROBE guidelines for cross-sectional studies (von Elm et al., 2008).

Results

Descriptive analyses

A total of 700 participants were included in this analysis. Most participants reported public injecting at least once within the past six months ($n = 570$, 81%), and 15% ($n = 108$) reported high-frequency public injecting (usually/always vs. sometimes/occasionally/never injecting in public). Overall, 87% ($n = 608$) had used an SCS in the past six months, including 30% ($n = 212$) who reported daily use and 57% (n

$= 396$) who reported less-than-daily use; 13% ($n = 92$) reported no recent SCS use. The prevalence of high-frequency public injecting was 14.6% ($n = 89$) among participants who used SCS compared with 20.7% ($n = 19$) among those who did not use SCS. Among 649 participants with data on recent housing, 49.5% ($n = 322$) reported experiencing mostly unstable housing, 40.8% ($n = 265$) reported some unstable housing, and 9.5% ($n = 62$) reported no unstable housing (Table S1).

Table 1 describes participant characteristics and their associations with high-frequency public injecting before and after minimal adjustment for age and gender. Participants who reported high-frequency public injecting were younger than those who reported infrequent or no public injecting (median age [interquartile range]: 36 [31–45] vs. 40 [33–50]). High-frequency public injecting was associated with several socio-structural characteristics, particularly unstable housing, and lower educational attainment. A positive, non-linear association was observed between the number of injections per day (on a day when one is injecting) and the predicted prevalence of high-frequency public injecting (Figure S1). Furthermore, participants who reported high-frequency public injecting were more likely to report characteristics associated with drug-related harms such as needle/syringe sharing, using puddle water/outdoor water sources to inject, and non-fatal overdose.

Association between recent SCS use and high-frequency public injecting: overall and stratified by housing instability

Table 2 presents the association between recent SCS use and high-frequency public injecting, overall and stratified by housing instability. In fully adjusted analyses, recent SCS use was associated with a 51% lower prevalence of high-frequency public injecting ($aPR = 0.49$; 95% CI: 0.32–0.77). Fig. 1 shows the marginal predicted probability of high-frequency public injecting by recent SCS use and housing instability from the fully adjusted model. Among participants with mostly unstable housing, the predicted probability of high-frequency public injecting was 44% (95% CI: 27%–62%) for those who did not report recent SCS use, compared with 22% (95% CI: 17%–26%) for those who reported recent SCS use, corresponding to an absolute difference of –22.6 percentage points (95% CI: –40.6 to –4.7). Among participants with some unstable housing, predicted probabilities were 11% (95% CI: 4%–18%) for those who did not report recent SCS use versus 6% (95% CI: 3%–8%) for those who reported recent SCS use (absolute difference: –5.8 percentage points; 95% CI: –11.3 to –3.0). For participants with no unstable housing, predicted probabilities were low in both groups (7% vs. 4%) and the absolute difference was not statistically distinguishable from zero (–3.8 percentage points; 95% CI: –9.7 to 2.2). While the larger absolute difference among those with mostly unstable housing compared with those with some or no unstable housing is consistent with possible effect modification on the additive scale, formal interaction measures, such as the relative excess risk due to interaction, were not estimated due to sparse cells in some strata.

Stratified analyses confirmed that the association between recent SCS use and high-frequency public injecting was concentrated among participants experiencing mostly unstable housing, where recent SCS use was associated with a 53% lower prevalence of high-frequency public injecting ($aPR = 0.47$; 95% CI: 0.29–0.75). Among participants with some or no unstable housing, high-frequency public injecting was rare, particularly among those who reported no recent SCS use (only one event), resulting in unstable estimates. Although the adjusted estimate indicated a protective association, the confidence interval was wide and compatible with both lower prevalence and no clear association ($aPR = 0.28$; 95% CI: 0.07–1.18).

Contexts of public injecting

Table S2 outlines the contexts of public injecting reported by participants. Among the 570 participants who reported any recent public

Table 1

Covariates of high-frequency public injecting among study participants (Nov 2018 – Mar 2020).

Covariates	Total (n = 700) n (%)	High-frequency public injecting		PR (95% CI)	Age and gender adjusted PR (95% CI)
		No	Yes		
Age (median [IQR]) ^a	40 (33-49)	592 (85%)	108 (15%)	p < 0.01	
		40 (33-50)	36 (31-45)		
Gender					
Male	452 (65%)	382 (65%)	70 (65%)	Reference	Reference
Female	224 (32%)	189 (32%)	35 (32%)	1.01 (0.69-1.47)	0.91 (0.60-1.37)
Trans/gender-diverse	23 (3.3%)	20 (3.4%)	3 (2.8%)	0.84 (0.29-2.47)	0.72 (0.22-2.30)
Race/ethnicity					
White	373 (53%)	324 (55%)	49 (45%)	Reference	Reference
Indigenous	237 (34%)	191 (32%)	46 (43%)	1.48 (1.02-2.14)	1.43 (0.96-2.15)
Racialized/non-Indigenous	89 (13%)	76 (13%)	13 (12%)	1.11 (0.63-1.96)	1.04 (0.56-1.93)
Education (highest attained)					
< High school	280 (40%)	225 (38%)	55 (51%)	Reference	Reference
≥ High school	420 (60%)	367 (62%)	53 (49%)	0.64 (0.45-0.91)	0.64 (0.44-0.93)
Housing instability ^a (n = 649)					
No unstable housing	62 (9.6%)	60 (11%)	2 (2%)	Reference	Reference
Some unstable housing	265 (41%)	249 (45%)	16 (16%)		
Mostly unstable housing	322 (50%)	239 (44%)	83 (82%)	4.68 (2.88-7.61)	4.37 (2.61-7.32)
Income sources ^{a,b}					
Paid employment	280 (40%)	244 (41%)	36 (33%)	0.75 (0.52-1.09)	0.71 (0.48-1.07)
Social assistance	636 (91%)	540 (91%)	96 (89%)	0.81 (0.47-1.39)	0.86 (0.47-1.58)
Selling drugs	353 (50%)	286 (48%)	67 (62%)	1.61 (1.12-2.30)	1.50 (1.02-2.22)
Sex work (n = 684)	193 (28%)	151 (26%)	42 (39%)	1.67 (1.18-2.37)	1.57 (1.05-2.34)
Other criminalized income generating activities	454 (65%)	370 (63%)	84 (78%)	1.90 (1.24-2.91)	1.75 (1.11-2.76)
Incarceration (≥ 1 night) ^a (n = 649)	247 (38%)	199 (36%)	48 (48%)	1.47 (1.03-2.11)	1.35 (0.91-2.0)
Drug(s) injected most often ^a (n = 686)					
Fentanyl	332 (48%)	280 (48%)	52 (50%)	Reference	Reference
Heroin/Prescription opioids	113 (16%)	93 (16%)	20 (19%)	1.13 (0.71-1.81)	1.37 (0.81-2.32)
Stimulants	241 (35%)	208 (36%)	33 (31%)	0.87 (0.58-1.31)	0.99 (0.64-1.54)
Injecting drug use frequency ^{a,c}					
Daily injecting of any drug	397 (57%)	331 (56%)	66 (61%)	1.20 (0.84-1.71)	1.13 (0.77-1.67)
Daily fentanyl injecting	319 (46%)	265 (45%)	54 (50%)	1.19 (0.84-1.68)	1.06 (0.72-1.55)
Daily heroin/opioid injecting	176 (25%)	149 (25%)	27 (25%)	0.99 (0.66-1.48)	1.01 (0.65-1.56)
Daily stimulant injecting	159 (23%)	127 (22%)	32 (30%)	1.43 (0.98-2.07)	1.33 (0.87-2.01)
Daily crystal meth, smoking	58 (8.3%)	43 (7.3%)	15 (14%)	1.79 (1.11-2.87)	1.63 (0.94-2.82)
Daily crack cocaine, smoking	127 (18%)	105 (18%)	22 (20%)	1.15 (0.75-1.77)	1.28 (0.79-2.06)
Injecting per day ^d	3 (2-5)	3 (2-5)	4 (2-7)	N/A, p < 0.01	–
Harm reduction service use					
SCS use ^{ab}	608 (87%)	519 (88%)	89 (82%)	0.71 (0.45-1.11)	0.60 (0.36-0.99)
OAT ^{ab}	290 (41%)	247 (42%)	43 (40%)	0.93 (0.65-1.33)	0.89 (0.60-1.31)
HCV testing (ever)	646 (92%)	550 (93%)	96 (89%)	0.67 (0.39-1.14)	0.73 (0.40-1.35)
HIV testing (ever)	663 (95%)	566 (96%)	97 (90%)	0.49 (0.29-0.84)	0.53 (0.28-0.99)
Drug-related harms ^{ab}					
Non-fatal overdose	269 (39%)	218 (37%)	51 (48%)	1.45 (1.03-2.06)	1.37 (0.93-2.00)
Shared needle/syringe	159 (23%)	121 (21%)	38 (35%)	1.84 (1.29-2.62)	1.63 (1.08-2.44)
Puddle/outdoor water to inject	163 (23%)	126 (21%)	37 (34%)	1.72 (1.20-2.45)	1.61 (1.08-2.40)
Provided injection initiation assistance	78 (11%)	63 (11%)	15 (14%)	1.29 (0.79-2.10)	1.26 (0.73-2.17)
Needed help injecting	293 (42%)	254 (43%)	39 (36%)	0.79 (0.55-1.13)	0.79 (0.53-1.18)

For variable with missing data, column percentages are calculated using the denominator with non-missing data, and the valid sample size is presented alongside the variable (for n > 2 missing).

^a Continuous variables for age and number of injections per day have been modelled using restricted cubic splines.

^a Recent: past 6 months.

^b Any versus none.

^c Daily versus less than daily use.

^d Average number of injections on a day when one is injecting.

injecting, commonly cited reasons for public injecting were related to lack of housing (73%; n = 418), convenience (66%; n = 378), and accessibility issues (55%; n = 315). Other self-reported reasons for injecting in public included client-specific needs and preferences (30%; n = 169), such as needing injecting assistance, and SCS operational barriers (24%; n = 139), such as limited operating hours and long wait times. Notably, SCS operational barriers were cited by 36% (n = 69) of participants who reported daily SCS use (n = 194), compared with 21% (n = 67) who reported less-than-daily SCS use (n = 323) and 6% (n = 3) who reported no recent SCS use (n = 53).

Discussion

We estimated the association between recent SCS use and public injecting and described socio-structural and drug use characteristics of people who reported high-frequency public injecting among a community-recruited cohort of people who inject drugs in Toronto, Canada. Prevalence of high-frequency public injecting was higher among younger adults and those with lower educational attainment. Housing instability was the covariate with the strongest association with high-frequency public injecting. Participants who experienced mostly unstable housing had a more than fourfold higher prevalence of high-frequency public injecting compared with those experiencing some or no unstable housing. These findings are consistent with a substantial

Table 2

Association between supervised consumption service use and high-frequency public injecting overall and stratified by housing instability.

Strata	Stratum-specific prevalence of high-frequency public injecting ¹		Relative effect of recent SCS use (any vs. none) on high-frequency public injecting	
	No recent SCS use	Recent SCS use	PR (95% CI)	APR ^{2,3} (95% CI)
Total (n = 700)	19/92 (20.7%)	89/608 (14.6%)	0.71 (0.45-1.11)	0.49 (0.32-0.77)
Mostly unstable housing (n = 322)	18/42 (42.9%)	65/280 (23.2%)	0.54 (0.36-0.82)	0.47 (0.29-0.75)
Some/no unstable housing (n = 327)	1/46 (2.2%)	17/281 (6.0%)	2.78 (0.38-20.47)	0.28 (0.07-1.18)
Missing	0/4 (0%)	7/47 (7.7%)		
Marginal predicted probability of high-frequency public injecting (95% CI) from the confounder adjusted multivariable model				
	No recent SCS use	Recent SCS use	Discrete marginal association (95% CI)	
Mostly unstable housing	44% (27%-62%)	22% (17%-26%)	– 22.6 (– 40.6 to – 4.7)	
Some unstable housing	11% (4%-18%)	6% (3%-8%)	– 5.8 (– 11.3 to – 3.0)	
No unstable housing	7% (– 3% to 18%)	4% (– 2% to – 9%)	– 3.8 (– 9.7 to 2.2)	

¹ Each cell above presents the number (%) with high-frequency public injecting per strata subtotal (n/N, [%]).

Prevalence Ratio (PR) and 95% confidence intervals (CI) estimated from a modified Poisson model with robust standard errors.

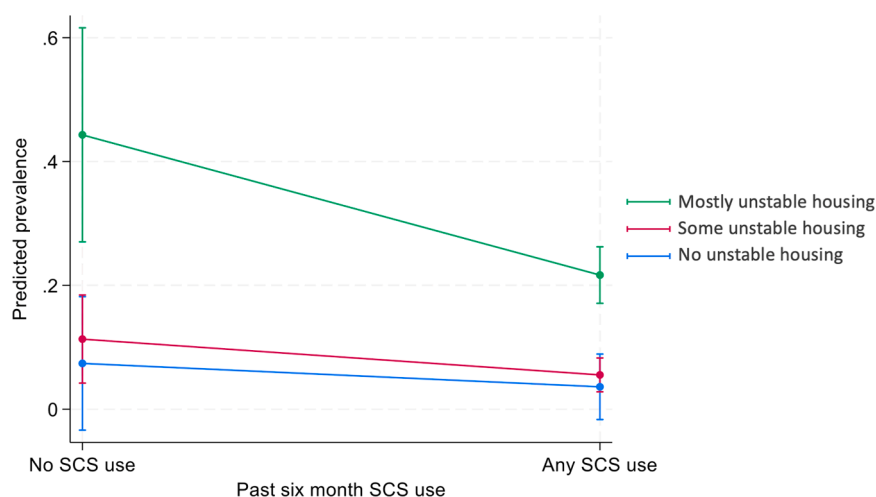
² aPR adjusted for age, gender identity, race/ethnicity, education, selling drugs, illegal income via theft, sex work, daily injection fentanyl, daily injection heroin/prescription opioids, daily injection stimulants, daily crack cocaine smoking, daily crystal meth smoking, drug used most often, and OAT. Housing instability is included in the model as either a covariate or stratifying variable.³ Complete case analysis with valid sample sizes in adjusted analyses of: n = 627 in the full sample, n = 316 among those with mostly unstable housing, and n = 311 among those with some/no unstable housing.

body of research describing public injecting as a risk environment outcome shaped by housing instability and homelessness (Gower et al., 2022; McKnight et al., 2007; Rhodes et al., 2006; Small et al., 2007; Vallance et al., 2018).

Our multivariable model showed that recent SCS use was associated with a substantially lower adjusted prevalence of high-frequency public injecting compared with no recent SCS use, after accounting for key sociodemographic and drug-related characteristics that are known correlates of public injecting. This finding is consistent with the available body of peer-reviewed research from Vancouver, Australia, and Europe that suggests SCS use is associated with lower likelihood of public injecting (Kennedy et al., 2017; Levensgood et al., 2021). An ecological evaluation of the Vancouver SCS reported a statistically significant reduction in public injecting in the first 12 weeks after implementation (Wood et al., 2004), and analyses from the same cohort found that consistent SCS use was associated with higher odds of reporting less outdoor injecting (AOR = 2.73; 95%CI: 1.93–3.87) (Stoltz et al., 2007). In Catalonia, Spain, frequent attendees of SCS had significantly lower odds of public injecting compared with non-frequent attendees (AOR = 0.27; 95% CI: 0.12–0.62) (Folch et al., 2018). In repeated cross-sectional surveys of residents and business operators in the vicinity of Sydney

Australia's SCS, researchers found a statistically significant decline in the proportion of respondents witnessing public injecting (Salmon et al., 2007). Lastly, in Copenhagen, Denmark, a survey of 41 SCS clients found that over half reported injecting outdoors less often after the facility opened compared with before (Kinnard et al., 2014).

Our stratified, confounder-adjusted models demonstrated that recent SCS use was associated with a lower predicted probability of high-frequency public injecting among the group with mostly unstable housing. Specifically, in this stratum, the marginal predicted probability of high-frequency public injecting was more than one-fifth lower among participants who reported recent SCS use than among those who did not. Estimates were smaller and less precise in strata reflecting some or no unstable housing, likely due to lower baseline prevalence and sparse events. Together, these findings suggest that SCS may be especially beneficial for people experiencing housing instability or homelessness as they are more dependent on safer use environments. This finding aligns with evidence emphasizing the importance of SCS for people who inject drugs with concurrent experience of housing instability or homelessness (Magwood et al., 2020; Rhodes et al., 2006; Small et al., 2007) as these individuals have higher odds of public injecting (Gower et al., 2022; McKnight et al., 2007), and are at risk of non-fatal overdose (Dunne

**Fig. 1.** Predicted probability of high-frequency public injecting by SCS use and housing instability status.

Note: Predicted probabilities and 95% confidence intervals estimated from a modified Poisson regression model adjusted for age, gender, race/ethnicity, education, selling drugs, sex work, other criminalized income generating activities, daily fentanyl injection, daily heroin/prescription opioid injection, daily stimulant injection, daily crack cocaine smoking, daily crystal meth smoking, drug injected most often, and opioid agonist therapy.

et al., 2025) and HIV and HCV acquisition (Arum et al., 2021). Thus, given the large baseline prevalence of high-frequency public injecting among those experiencing mostly unstable housing, our findings suggest that even moderate associations between SCS and this phenomenon would correspond to meaningful reductions in public injecting when access to SCS is available.

Participants' self-reported reasons for public injecting were primarily lack of housing, accessibility issues, and SCS operational barriers, including limited service hours and capacity constraints resulting in long wait times. These findings echo qualitative research from Canadian SCS settings showing how limited operating hours, wait times, and restrictive policies (e.g., prohibiting injection assistance, lack of privacy) that do not align with client needs and preferences shape whether people can or will use SCS (Ali et al., 2023; Urbanik & Greene, 2021). Limited or untimely access to SCS may contribute to public injecting, even among those who regularly use SCS, when they need to consume drugs immediately to avoid unwanted withdrawal (Ali et al., 2023). Indeed, in a study of Vancouver's SCS (Insite), persistent public injecting among service users was significantly associated with program wait times (McKnight et al., 2007). Overall, these findings point toward issues related to service capacity and implementation barriers as plausible mechanisms linking SCS to continued public injecting. Extending service hours, reducing wait times, improving geographic accessibility, and aligning clinical policies with real-world injecting practices could enhance the beneficial public and client outcomes of SCS programs.

Policy implications

Our findings have policy implications for Ontario's transitioning substance use service system amid co-occurring crises of housing instability and drug toxicity. Lack of affordable housing and a shelter system that is operating at full capacity have contributed to an increase in the number of people who are unstably housed and experience outdoor homelessness since the close of our study period (City of Toronto, 2024). In October 2024, Toronto's Street Needs Assessment survey estimated that 15,418 people were experiencing homelessness, and outdoor homelessness increased by 118% between 2021 and 2024 (City of Toronto, 2024). During that year, approximately one-quarter of people experiencing homelessness and substance use expressed a need for SCS (City of Toronto, 2024). However, in the same year, the Ontario government announced that SCS located within 200 metres of schools or childcare centres would close by March 31, 2025. In March 2026, this was followed by an announcement that all eight provincially-funded SCS would be defunded by June 2026. In this context, our findings underscore the importance of SCS as a critical harm reduction and overdose response strategy for people experiencing concurrent substance use and homelessness. Data from the Chief Coroner of Ontario show that seven in ten fatal opioid toxicity deaths occur in private residences (Ontario Drug Policy Research Network, 2024), where people may be more likely to use alone and where overdose recognition and response can be delayed. Thus, reducing SCS availability may plausibly shift consumption toward less supervised environments, with negative consequences for overdose and other drug use outcomes among both housed and unhoused service users. Additionally, public injecting rates may increase, particularly in neighbourhoods with high concentrations of structurally vulnerable people who use drugs, and lead to increased high-risk consumption practices and a greater burden of adverse drug outcomes (Arum et al., 2021; Khezri et al., 2025).

Limitations

Several limitations should guide interpretation of our study findings. First, given the cross-sectional design, results should not be interpreted as evidence of causal relationships. Second, our findings are based on a convenience sample, which limits generalizability. Our study sample included a larger proportion of participants who reported recent SCS use

relative to those who did not report recent SCS use. This imbalance may partly reflect recruitment through community health and social service organizations, whose clients may be more likely to be connected to harm reduction services, including SCS. Consequently, the study population may not fully reflect the broader population of people who inject drugs in Toronto. Third, all measures are self-reported and subject to recall and social desirability bias. However, validation studies among people who inject drugs, including OISIS-Toronto participants, support good agreement between self-reported service use and objective measures over 6-month look-back recall periods (Bouck et al., 2022; Safaean et al., 2002). To minimize social desirability bias, surveys were administered by trained research staff who had lived/living experience of drug use. Fourth, our exposure was defined *a priori* as any versus no SCS use in the past six months. Future research should examine whether the association varies by intensity of SCS use. Fifth, our sample sizes were limited for the stratified analyses, particularly for the groups with some or no unstable housing. This, coupled with the rare outcome of high-frequency public injecting for these subgroups, presented challenges for modelling the outcome. Accordingly, the stratified estimate for participants with some or no unstable housing should be interpreted as descriptive rather than inferential. We had limited precision to assess whether the exposure-outcome association varied across levels of housing instability. Future research would benefit from longitudinal designs with large sample sizes and quasi-experimental methods to confirm our findings and strengthen the ability to draw causal inferences. Lastly, the study was restricted to data collected before the COVID-19 pandemic to avoid potential disruptions to SCS access and service delivery during that period. However, drug use environments, housing affordability, and access to harm reduction services have changed since data collection, which may limit the applicability of these findings to the current Toronto context.

Conclusion

High-frequency public injecting was concentrated among participants who experienced greater housing instability. The lower prevalence of high-frequency public injecting among those who reported recent SCS use, especially the subgroup with mostly unstable housing, highlights the potential value of providing SCS services in Toronto. Some people who regularly use SCS may still inject in public spaces due to lack of housing, barriers to service access, and modifiable operational challenges. There is a need for comprehensive substance use policies that pair access to SCS with low-barrier access to available treatment on-demand, supportive housing interventions, and service design improvements that reduce access barriers and are person-centered. Conversely, policy shifts that reduce SCS availability may plausibly increase public injecting in areas where people have few alternatives for safer indoor use, particularly in the Ontario context, where an underfunded addiction treatment system limits access to high-quality treatment.

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CRedit authorship contribution statement

Frishta Nafeh: Writing – review & editing, Writing – original draft, Validation, Methodology, Formal analysis. **Zoë R. Greenwald:** Writing – review & editing, Validation, Methodology, Formal analysis, Conceptualization. **Matthew Bonn:** Writing – review & editing,

Validation, Methodology. **Jolene Eeuwes**: Writing – review & editing, Validation, Methodology. **Kate Atkinson**: Writing – review & editing, Validation, Methodology. **Steffanie A. Strathdee**: Writing – review & editing. **Mohammad Karamouzian**: Writing – review & editing, Validation, Supervision, Project administration, Methodology, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Dan Werb**: Writing – review & editing, Validation, Supervision, Project administration, Methodology, Funding acquisition, Formal analysis, Data curation, Conceptualization.

Declaration of competing interest

DW is a founder of a private company developing a mobile drug checking technology and has acted as an expert witness in a legal challenge related to the closure of supervised consumption services in Ontario in 2025 and in Alberta in 2026.

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Supplementary materials

Supplementary material associated with this article can be found, in the online version, at [doi:10.1016/j.drugpo.2026.105473](https://doi.org/10.1016/j.drugpo.2026.105473).

Data availability

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy and ethical restrictions. This study includes original data, and study author Zoë R Greenwald confirms she had full access to all the data in the study and takes responsibility for the integrity of the data and the accuracy of the analysis.

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