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PROTECTIVE FACTORS ASSOCIATED WITH SHORT-TERM CESSATION OF INJECTION DRUG USE AMONG A CANADIAN COHORT OF PEOPLE WHO INJECT DRUGS

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Abstract

Introduction and Aims—Strategies are needed to transition persons who inject drugs out of injecting. We undertook this study to identify protective factors associated with cessation of injection drug use.

Design and Methods—Data were derived from three prospective cohorts of people who use illicit drugs in Vancouver, Canada, between September 2005 and November 2011. Generalised estimating equations were used to examine protective factors and 6-month cessation of injection drug use.

Results—Our sample of 1663 people who inject drugs included 563 (33.9%) women, and median age was 40 years. Overall, 904 (54.4%) individuals had at least one 6-month injection cessation event. In multivariable analysis, protective factors associated with cessation of injection drug use included the following: having a regular place to stay [adjusted odds ratio (AOR) = 1.30; 95% confidence interval (CI) 1.13–1.48]; formal employment (AOR = 1.12; 95% CI 1.01–1.23); social support from personal contacts (AOR = 1.22; 95% CI 1.10–1.35); social support from professionals (AOR = 1.26; 95% CI 1.14–1.39); ability to access health and social services (AOR = 1.21; 95% CI 1.09–1.34); and positive self-rated health (AOR = 1.21, 95% CI 1.11–1.32).

Discussion and Conclusions—Over half of people who inject drugs in this study reported achieving 6-month cessation of injection drug use, with cessation being associated with a range of modifiable protective factors. Policy makers and practitioners should promote increased access to

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Ethical approval and informed consent

This research was approved by the University of British Columbia/Providence Healthcare Research Ethics Board. All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. Written informed consent was obtained from all individual participants included in the study.

stable housing, employment, social support and other services to promote cessation of injection drug use.

Keywords

intravenous drug abuse; protective factors; drug-seeking behaviour; health services accessibility; social determinants of health

INTRODUCTION

The health and social sequelae of injection drug use are universally known to negatively impact individuals, families and society [1, 2]. There is growing availability of effective addiction treatment for opioid use [3, 4]; however, population-level coverage remains low, there are high rates of discontinuation of treatment, and relapse post-treatment frequently occurs [2, 3]. For other commonly used drugs, such as cocaine, crack and crystal methamphetamine, no proven treatment exists [6]. Addiction treatment is only one factor in the wider determinants of health and behaviour change for people who inject drugs (PWID) [1]. Literature demonstrating natural recovery of illicit drug use (i.e. cessation of drug use without treatment) [7] compels us to look beyond clinical interventions to contextual factors that are known to play a role in perpetuating drug use and related harms, such as homelessness, incarceration and socioeconomic status [8, 9].

Rhodes' [1, 10] 'risk environment framework' has been widely used to examine the physical and social context of drug-related harm [11–16] and aims to better describe the conditions of risk and vulnerability among PWID. Previous research on cessation of injection drug use has considered some social, structural and environmental risks and has found that homelessness [17–19], incarceration [20, 21] and neighbourhood poverty [22, 23], as well as individual-level risks such as higher frequency and intensity of drug use [18, 20] and positive HIV status [20], are associated with a decreased likelihood of cessation. Risk factor analyses have also identified factors positively correlated with cessation of injection drug use, such as attendance at needle exchange programs and pharmacies [20], being enrolled in drug treatment programs [21, 23, 24], having a fixed address [19], being employed [18] and participating in peer educator interventions [25]. While research on these risk factors is vital to identifying needs and priorities for PWID, risk-based approaches have a tendency to emphasise deficits and problems and may increase marginalisation among vulnerable groups [26].

In contrast, 'assets-based' approaches seek to highlight positive capability and protective factors to promote solutions to public health problems that can increase equity and empowerment for the affected population [26]. Although individual protective factors for cessation of injection have been previously identified within risk factor models, there is a lack of studies that specifically investigate a set of protective factors within a single study to identify independent associations with cessation of injection drug use. Thus, the aim of this study was to examine a range of modifiable protective factors associated with cessation of injection drug use among PWID in Vancouver, Canada.

METHODS

We adhered to the STROBE reporting guidelines for observational epidemiological studies to increase the quality and transparency of the reporting of this article [27].

Study design

Data were drawn from three related open prospective community cohorts of people who use illicit drugs in Vancouver, Canada. All three cohorts use harmonised data collection methodology, which allow for combined analyses. Described in detail elsewhere, the Vancouver Injection Drug Users Study (VIDUS) follows PWID [28], the AIDS Care Cohort to evaluate Exposure to Survival Services (ACCESS) follows HIV-positive people who use illicit drugs via injection or non-injection [29] and the At Risk Youth Study is comprised of street-involved youth aged 14–26 years who use illicit drugs [30]. Recruitment was conducted using snowball sampling and street outreach. Eligibility criteria include living in the greater Vancouver area at enrolment, reporting injecting an illicit drug in the past 30 days (for VIDUS) and using an illicit drug other than cannabis in the past 30 days (for ACCESS and the At Risk Youth Study), and providing written informed consent. Individuals in VIDUS who seroconvert to HIV following recruitment are transferred into the ACCESS study. Participants answer a standardised interviewer-administered questionnaire at baseline and at 6-month follow-up interviews. Data are collected on various factors, including sociodemographic factors, drug use patterns, police activity and incarceration, sexual activity, addiction treatment, violence, social issues and support, health status and health service use. After each study visit, participants received a CAD\$20 cash honorarium for their time. All three studies have been approved by the University of British Columbia/ Providence Healthcare Research Ethics Board and conform to the provisions of the Declaration of Helsinki.

Outcome: cessation of injection drug use

The main outcome measure of this study is self-reported cessation of injection drug use for 6 months, defined as injection at the previous follow up and reporting ‘none’ when asked which drugs they have injected in the past 6 months at the current follow up. Six-month cessation was chosen so as to examine the conditions under which PWID initially stopped injecting. Further, it was beyond the scope of this study to examine long-term behaviour change as it was hypothesised that these processes may involve different protective factors than those for initial cessation. To be eligible for inclusion, participants had to report injecting any drug in the past 6 months at baseline. Participants who did not report injecting at baseline but then started injecting during follow up were also included. In addition, all participants had to provide at least two sequential measurements to be included in the study.

Predictors: protective factors

The main variables of interest were potential protective factors associated with cessation of injection drug use. Conceptually, protective factors were defined as those variables that are ‘salutogenic’ (enable people to stay well despite stressful situations and hardships) and promote PWID to move towards a state of better health, in this case, by ceasing injection

drug use. They are also modifiable from a public health perspective and consistent with an assets-based approach [26].

The study was limited to data from 2005 to 2011 as these years provided the most comprehensive set of protective factors available for analysis in the datasets. Protective factors included having a regular place to stay (yes vs. no); being in a stable relationship (married/common law, regular partner living or not living together vs. no stable partner); having social support from personal contacts such as partners, friends, family and colleagues (yes vs. no); having social support from professional contacts such as health-care workers, counsellors, doctors and religious leaders (yes vs. no); and having positive self-rated health (excellent, very good or good vs. fair or poor). In addition, participants were asked about having any formal employment (regular, temporary or self-employment vs. any other sources of income); enrolment in a methadone maintenance program (yes vs. no); participation in psychosocial addiction treatment (yes vs. no); and if there was ever any time they were in need of a service but not able to obtain it, for example hospital, counselling, housing, needle exchange, police (never a time could not access a service vs. at least one time where unable to access a service). All variables referred to the 6 months prior to the follow-up interview unless otherwise stated. Educational attainment was not included as a protective factor because most participants had completed their education prior to study enrolment, and thus, it was not considered modifiable in present terms.

Covariates: sociodemographics and risk factors

The protective factors described previously were the main variables of interest; however, variables that have been previously shown to be associated with cessation of injection drug use [21, 24] were also included as covariates. Sociodemographic variables included calendar year (per additional year); age (per additional year); gender (female vs. male); ethnicity (Caucasian vs. Other); and residency in Vancouver's downtown eastside neighbourhood in the previous 6 months (yes vs. no). Risk factors included daily heroin injection (yes vs. no); daily cocaine injection (yes vs. no); daily speedball injection (yes vs. no); daily non-injection crack use (yes vs. no); daily non-injection crystal methamphetamine use (yes vs. no); and incarceration (yes vs. no). Drug use patterns and incarceration were asked about during the 6 months prior to the interview, and variables relating to injection were lagged by 6 months to account for temporality with the outcome. We did not lag other time-dependent variables as conceptually we felt that 12 months was too large of a time gap to be meaningfully associated with the outcome.

Statistical analysis

Only participants with complete data at baseline were included in the analysis. To describe the baseline sample, we calculated frequencies and proportions [or median and inter quartile range (IQR) for continuous variables] of participants for each of the protective, sociodemographic and risk factors. We also described cessation of injection drug use by calculating the frequencies and proportions of participants reporting 6-month cessation for each of the 11 semi-annual follow ups over the study period, the overall frequency and proportion of participants who report cessation at least once during the study and the median and IQR for the number of cessation events per participant.

We used longitudinal generalised estimating equations (GEE) regression analyses to examine associations between the variables of interest and cessation of injection and calculated odds ratios, 95% confidence intervals and P-values. We conducted univariable GEE models estimating the effect of each of the predictors on 6-month cessation of injection drug use. Then we constructed a multivariable model using the quasi-Akaike information criterion for GEE and P-values. We began by first including all variables significant in univariable analyses at $P < 0.10$ in a preliminary model and used the variance inflation factor to check for multi-collinearity among the set of variables. Then we sequentially removed each variable with the highest P-value, using backward model selection, with the final model including the set of variables associated with the lowest quasi-Akaike information criterion. All P-values are two-sided.

RESULTS

There were 1732 participants eligible for inclusion in the study; 69 (4%) were excluded because of missing data at baseline, and 1663 were included in the final sample for analysis. Missing data on individual variables was low throughout follow up with less than 5% missing for each variable (data not shown). As this is an open cohort, individuals contributed different numbers of semi-annual follow ups to the study (median = 6, IQR = 3–9).

A description of the baseline characteristics of the sample is provided in Table 1. The sample was middle aged, predominantly male and Caucasian, and the majority lived in Vancouver's downtown eastside neighbourhood in the 6 months before the baseline interview. Overall, just over half (54.4%) of the sample reported cessation of injection drug use at least once during the study period (median = 1, IQR = 0–3).

Cessation was at its lowest from June to November 2007 with only 22.4% of respondents reporting not injecting any drug in the past 6 months (Figure 1). After this follow up, however, the proportion reporting cessation steadily rose over time reaching its highest level (40.5%) in the last follow up in June to November 2011.

In unadjusted univariable GEE analysis, cessation of injection drug use was associated with all variables of interest at $P < 0.05$ in the directions hypothesised: the presence of protective factors increased the likelihood of cessation, and the presence of risk factors decreased the likelihood of ceasing injection (Table 2). Older age and calendar year (per additional year) were associated with an increased likelihood of cessation, as was being female. However, being of Caucasian ethnicity and living in Vancouver's downtown eastside in the 6 months prior to the interview decreased the likelihood of cessation.

Results for all protective factors in the final adjusted model were in the same direction and of similar magnitude to associations in the unadjusted analyses. However, neither methadone maintenance therapy nor psychosocial addiction programs were statistically significant after adjustment (Table 2). Having a regular place to stay, social support from personal contacts, social support from professional contacts, ability to access all services needed and positive self-rated health remained statistically significant, as did all risk factors and

sociodemographics. Variance inflation factor scores were all less than 5, indicating no multicollinearity.

DISCUSSION

In this paper, we aimed to quantitatively estimate how modifiable protective factors were associated with cessation of injection drug use among PWID in Vancouver, Canada. Our findings indicate that overall, the proportion of PWID reporting injection drug use cessation increased over time, with the proportion reaching its highest level in the most recent follow up. Our findings showed that having a regular place to live, formal employment, social support from personal contacts and professionals, being able to access necessary services and having good self-rated health were protective factors independently associated with cessation of injection drug use among our sample of PWID after adjustment for drug treatment and known sociodemographic and risk factors associated with continued injection.

Interpretation

This study employed an asset-based approach to provide clear and practical messages about 'what works' in cessation of injection drug use within a single study. The set of protective factors identified were also in line with a traditional social determinants perspective [8] and an 'enabling environments' approach, described in Rhodes' risk environment framework, which aims to alleviate the conditions of risk and vulnerability and therefore seeks to reduce inequalities in order to tackle drug-related harms [1, 10]. The Staying Safe Intervention [31] is an example of an assets-based approach that has developed and applied research on how PWID with a long history of drug use have remained free from HIV and hepatitis C infection while living in a neighbourhood with high rates of these infections in New York City. The intervention seeks to train peer educators to promote strategies and practices of risk avoidance. Given the relatively limited amount of research on assets-based approaches for injection drug use cessation, further work should assess the generalisability of the findings from this study to other settings, and to design and evaluate interventions that target protective factors among this vulnerable population, such as the Staying Safe Intervention. We discuss each of the identified protective factors in the succeeding text with a view to making specific recommendations for research and policy.

Similar to our findings, previous research has demonstrated that having a regular place to stay is a key factor in promoting cessation of injection drug use [11, 18, 19, 32]. Moreover, it has been shown to be an important determinant for preventing initiation of injection drug use among street-involved youth [33]. Innovative and supportive social housing solutions may be more likely to promote drug use cessation for even the most entrenched PWID [34]. Policy makers should invest in making flexible housing solutions more widely available, in addition to conventional social housing, to prevent initiation, to minimise harms and to promote cessation of injection drug use.

Employment is also widely known to be an important determinant of morbidity and mortality in the general population. As in other studies involving PWID [18, 21, 32], having formal employment was shown to be associated with cessation of injection. However, it is noteworthy that PWID often face frequent barriers to employment, particularly those who

are actively using and/or are high-intensity drug users [35]. Previous research on transitions into employment for PWID indicated that the social, structural and physical environmental context must be considered when devising interventions to engage PWID in the labour market [13]. In this study of active PWID, 27% of participants reported having regular, temporary or self-employment. Further research is needed to identify the protective factors that have enabled these individuals to find a job, particularly among those who have retained regular employment. Previous work in this setting has shown that nearly half of individuals engaged in street-based income generation activities, including sex work, drug dealing, panhandling and recycling/salvaging/vending, would forego these activities if low-threshold casual employment opportunities were available [24].

Having social support is a well-established protective determinant of health in the general population. In this study, social support was also found to promote cessation of injection drug use. Previous research on social networks of people who use drugs has shown that having a lower proportion of contacts who use drugs in an individual's social support network was associated with increased likelihood of cessation, possibly because of the provision of more avenues to reduce their interaction with people who use drugs who reinforce their own drug use [7]. However, community-based research involving PWID has shown demonstrable health benefits of peer educator and peer-led programs, for example by promoting safer drug use practices [25, 31, 36] and encouraging HIV testing [37]. There is minimal research on social support, social networks and social capital to promote resilience to and cessation of injection drug use. More research is needed to identify the types of social supports within and outside of the drug treatment system that are most beneficial for cessation of injection drug use, which may include wider expansion of peer interventions, and how to best promote them at a policy level.

Methadone and psychosocial addiction treatment, widely shown to be associated with cessation [21, 23, 32, 38, 39], was not statistically significant after adjustment in our model. In our study, only 26% of participants were daily heroin users at baseline, and methadone is only effective for reducing opioid use, which may explain the non-statistical significance of methadone treatment in our poly-substance-using sample. With respect to psychosocial addiction treatment, a Cochrane Collaboration systematic review on psychosocial outpatient interventions for cocaine and psycho-stimulants has shown large variability in their effectiveness to promote behaviour change [5]. While evidence-based residential treatment has been shown to support cessation of drug use, the local environment does not have an established system of quality residential treatment [40]. In this context, because addiction treatment interventions continue to be an essential component of addressing addiction-related behaviours, improvements to the addiction care system would likely demonstrate benefits to injecting cessation locally [41]. Further research should continue to work to identify more effective therapeutic interventions for opioid and non-opioid drug use and how best to deliver them in the real world.

Self-rated health is well known to predict mortality [42], and PWID are much more likely to die prematurely relative to the general population[43]. In this study, cessation of injection drug use was associated with positive self-rated health. However, given that both of these measures were assessed at the same time, it is not known whether having better health

promoted injection cessation or whether participants ceased injection and then rated their health as excellent, very good or good as a result of the positive effects of their behaviour change. We also found that access to necessary health and social services was associated with an increased likelihood of cessation. From a policy perspective, improving the health of PWID through increased availability and access to services may have the added co-benefit of promoting cessation of injection drug use in addition to reducing morbidity and mortality among this population.

Strengths and limitations

This study used data from three large, longitudinal cohorts with a detailed questionnaire, regular follow up and low variable missingness. Although these are observational data and causation cannot be inferred, findings corroborate previous research [21] examining the impact of various sociodemographic and risk factors on injection cessation. The present study adds to the existing literature by also examining several protective factors in a single study to observe their independent effects. In common with other studies involving PWID [23, 38], generalisability is limited as the sample was not randomly selected. Nevertheless, given the importance of anonymity for disclosing information about illicit drug use, a registry of drug users to select samples from would not be practical or ethical. Measures in this study were self-reported and relate to socially sensitive topics; thus, our findings may be subject to response bias. However, previous research has shown that self-reported data on drug behaviour is reliable [44]. Our analysis was also limited by the measures available in the survey instrument(s). Although models were fully adjusted for known covariates, it is possible, as with all observational studies, that unmeasured or residual confounding may have impacted our results. We observed relatively high levels of cessation in this study and adjusted for calendar year and age to account for temporal trends [45]. However, there may be other trends in drug patterns, for instance in the availability of certain injection drugs (e.g. heroin) or popularity of non-injection drug use (e.g. crack smoking), that may have contributed to the overall cessation rates. We note that we did, however, adjust for non-injection drug use in the analysis. In a similar way, there are likely additional important protective factors not explored in this study, such as individual resilience and capability [46, 47], social network characteristics [7] and neighbourhood characteristics [22, 32].

Conclusion

Our findings revealed that being employed, having social support, a regular place to live, being able to access services and being healthy were positively and independently associated with cessation of injection drug use. Further, all are factors that are modifiable by appropriate public health and social policy. Researchers, policy makers and practitioners should consider how to promote stable, flexible and innovative social housing solutions and to encourage greater participation in the labour market through the removal of barriers and the continued identification and promotion of protective factors. Further research is needed to better understand the types of social support networks, such as peer educator models, that are most effective for promoting cessation of injection drug use and to develop practical interventions that can be supported through policy. Finally, improving the general health status of PWID through improving availability and access to essential services, including

drug treatment, is urgently needed in order to increase resilience, minimise harm and promote cessation of injection drug use.

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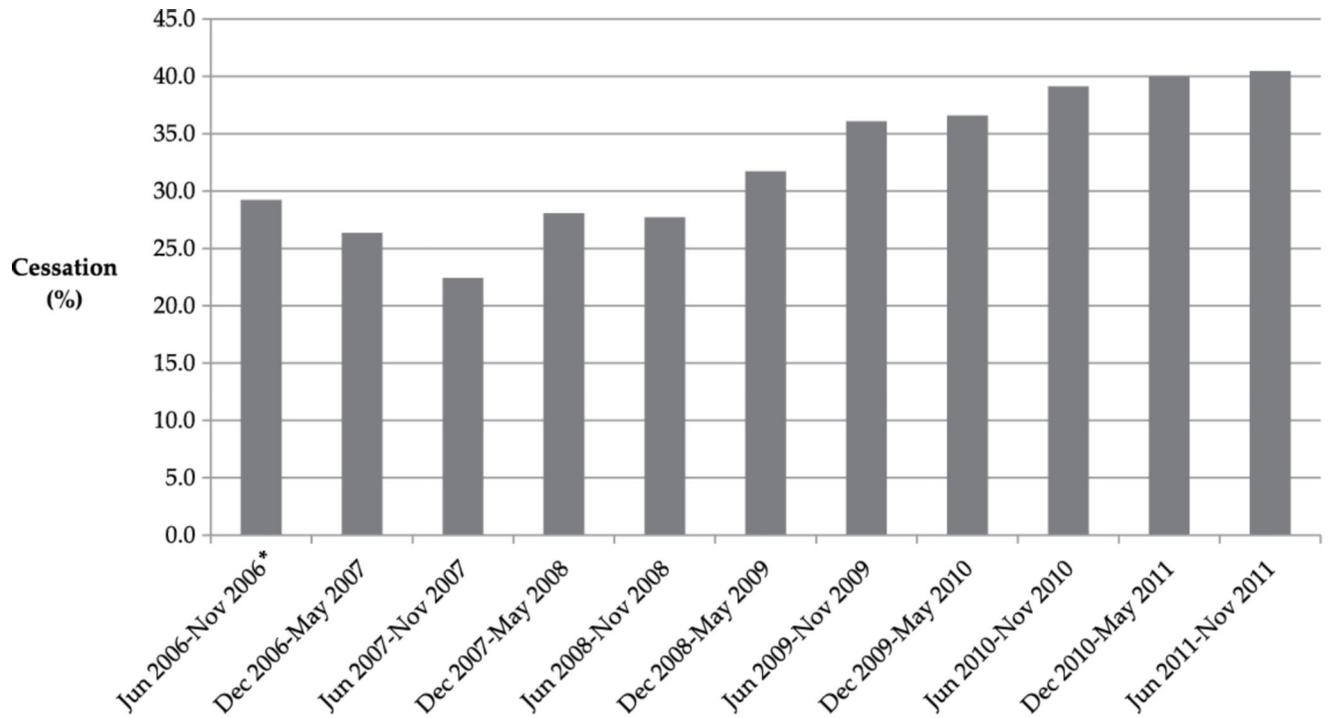
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The period before June 2006 was the first baseline interview in which 100% of participants reported injection of any drug.

Figure 1.
Percentages of participants reporting 6-month cessation of injection drug use (n=1663)

Table 1

Baseline characteristics of the study sample (n=1663)

Characteristic	Total (%)
Protective factors	
Regular place to stay	1222 (73.5)
Stable relationship	492 (29.6)
Formal employment ^a	441 (26.5)
MMT enrolment ^a	632 (38.0)
Psychosocial addiction treatment ^a	778 (46.8)
Social support—personal	1231 (74.0)
Social support—professional	430 (25.9)
Able to access services needed ^a	1188 (71.4)
Positive self-rated health	1119 (67.3)
Sociodemographics	
Calendar year (med, IQR)	2006 (2006–2007)
Age (med, IQR)	40.3 (30.9–47.0)
Female gender	563 (33.9)
Caucasian ethnicity	1039 (62.5)
DTES residency ^a	1087 (65.4)
Risk factors	
Daily heroin injection ^a	434 (26.1)
Daily cocaine injection ^a	154 (9.3)
Daily speedball injection ^a	58 (3.5)
Daily non-injection crack ^a	631 (37.9)
Daily non-injection crystal meth ^a	44 (2.7)
Incarceration ^a	302 (18.2)

^aRefers to the 6-month period prior to the interview.

DTES, downtown eastside neighbourhood of Vancouver; IQR, interquartile range; med, median; MMT, methadone maintenance therapy.

Table 2

Univariable and multivariable GEE analysis of factors associated with 6-month cessation of injection drug use (n=1663)

Characteristic ^a	Unadjusted		Adjusted	
	Odds ratio (95% CI)	P-value	Odds ratio (95% CI)	P-value
Protective factors				
Regular place to stay	1.69 (1.50–1.90)	<0.001	1.30 (1.13–1.48)	<0.001
Stable relationship	1.11 (1.00–1.24)	0.061	1.04 (0.93–1.17)	0.465
Formal employment ^c	1.15 (1.04–1.26)	0.006	1.12 (1.01–1.23)	0.030
MMT enrolment ^c	1.18 (1.04–1.34)	0.012	0.93 (0.78–1.10)	0.393
Psychosocial addiction treatment ^c	1.17 (1.05–1.30)	0.003	1.12 (0.98–1.29)	0.106
Social support—personal	1.28 (1.16–1.41)	<0.001	1.22 (1.10–1.35)	<0.001
Social support—professional	1.20 (1.08–1.32)	<0.001	1.26 (1.14–1.39)	<0.001
Able to access services needed ^c	1.32 (1.19–1.45)	<0.001	1.21 (1.09–1.34)	<0.001
Positive self-rated health	1.31 (1.20–1.42)	<0.001	1.21 (1.11–1.32)	<0.001
Sociodemographics				
Calendar year (per additional yr)	1.22 (1.18–1.26)	<0.001	1.14 (1.11–1.18)	<0.001
Age (per additional yr)	1.04 (1.03–1.05)	<0.001	1.02 (1.01–1.02)	<0.001
Female gender (vs. male)	1.26 (1.06–1.50)	0.008	1.34 (1.11–1.61)	0.003
Caucasian ethnicity (vs. other)	0.69 (0.59–0.82)	<0.001	0.68 (0.57–0.82)	<0.001
DTES residency ^c	0.55 (0.49–0.62)	<0.001	0.68 (0.60–0.77)	<0.001
Risk factors				
Daily heroin injection ^{cd}	0.41 (0.35–0.47)	<0.001	0.51 (0.44–0.58)	<0.001
Daily cocaine injection ^{cd}	0.60 (0.50–0.70)	<0.001	0.70 (0.58–0.84)	<0.001
Daily speedball injection ^{cd}	0.76 (0.61–0.93)	0.009	<i>b</i>	<i>b</i>
Daily non-injection crack ^c	0.42 (0.36–0.48)	<0.001	0.52 (0.46–0.60)	<0.001
Daily non-injection crystal meth ^c	0.57 (0.35–0.93)	0.024	0.55 (0.33–0.91)	0.020
Incarceration ^c	0.57 (0.49–0.65)	<0.001	0.71 (0.61–0.83)	<0.001

^aYes versus no unless otherwise specified.

^bVariable dropped from final model.

^cRefers to the 6-month period prior to the interview.

^dVariable lagged by 6 months

CI, confidence interval; DTES, downtown eastside neighbourhood of Vancouver; GEE, generalized estimating equations; IQR, interquartile range; med, median; MMT, methadone maintenance therapy.