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Prevention knowledge, risk behaviours, and seroprevalence among nonurban injectors of southwest Connecticut

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Abstract

Introduction and Aims—Little is known about injection-associated risk behaviours, knowledge and seroprevalence of viral infections among people who inject drugs (PWID) in nonurban locales in the US. Harm reduction services are more available in urban locales. The present study examined a cohort of active PWID residing in non-urban areas of Connecticut to investigate how primarily injecting in urban or non-urban areas was associated with injection-associated risk behaviours, knowledge and prevalence of blood-borne viruses

Design and Methods—We described the sample and performed bivariate and multivariable analyses on injection-associated risk behaviours, HIV/hepatitis/overdose knowledge, and baseline serological data to identify differences between individuals who injected primarily in nonurban locales and those who did not.

Results—Harm reduction knowledge and use of harm reduction services were poor in both groups. Those injecting most often in urban settings were 1.88 (1.19, 2.98 95% confidence interval) times more likely to engage in at least one injection-associated risk behaviour than their nonurban counterpart. Seroprevalence rates (23.6% for hepatitis B virus, 39.2% for hepatitis C virus, and 1.1% for HIV) were no different between the two groups.

Discussion and Conclusions—The data provided little evidence that the benefits of urban harm reduction programs such as syringe exchange, risk reduction interventions, and education programs have penetrated into this nonurban population, even among those who injected in urban locales where such programs exist. Harm reduction interventions for nonurban communities of PWID are needed to reduce HIV and hepatitis B and C transmission.

Keywords

HIV/AIDS; hepatitis; injection drug use; risk; prevalence

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Introduction

There is increasing evidence that non-medical opioid use has spread beyond urban areas in the US [1–4]. While the modal route of administration for non-medical opioid use varies geographically [5], for those who develop a serious drug abuse disorder, intravenous injection is common. This transition increases risk of blood-borne viral infections, most especially HIV and the hepatidites (hepatitis B virus, HBV and hepatitis C virus, HCV), and opioid overdose [6–9]. Since harm reduction services such as syringe exchange programs have been implemented in urban areas. Exposure to these services among nonurban-dwelling people who inject drugs (PWID) is likely to be negligible. Nevertheless, because many nonurban injectors report going to urban locales to buy and/or inject drugs, we hypothesised that this might result in exposure to harm reduction programs with resultant increases in prevention knowledge and reductions in unsafe injection practices that result in blood-borne infection or overdose.

The association between knowledge about a given health threat, risk behaviour and disease state has been well established and is supported by theoretical models [10–14]. Most recent research that specifically examined HIV knowledge in the US has focused on populations such as immigrants residing in the US [15]. PWID residing in nonurban areas are insufficiently studied, both in terms of their knowledge and degree of risky behaviour.

Recent U.S. studies suggest that hepatitis knowledge levels are lower than those for HIV [16–20]. HCV infection is often perceived as a harsh inevitability, particularly relative to risk of HIV infection [19,21,22], and a realistic one for PWID in the US where prevalence rates range from 31 to 95% depending upon when and where the data were collected [19,23–26]. Most PWID are infected with HCV within the first two years of initiating injection drug use [27,28]. Recent declines in both HCV incidence and prevalence [28–30] notwithstanding, there is continued concern about increased HCV risk in nonurban locales [31–33].

Several national and international studies have sought to describe injection-associated risk behaviours particularly with respect to HCV infection [23,34–38] where HCV incidence is increasing among nonurban young PWID in the US [33]. There are conflicting reports concerning the association between awareness of HIV or HCV infection and injection-associated risk behaviour, some studies noting no association [24,39,40] and another finding a tendency to reduce risk behaviours when individuals are aware of their infection [41]. Contextual factors such as relationship status, withdrawal symptoms [42], lack of access to harm reduction services [30], and drug type [43] were associated with increased injection-associated risk behaviours.

Given the lack of recent information regarding knowledge about risk behaviours associated with, and seroprevalence of injection-associated infections among PWID residing in nonurban locales, we recruited and enrolled PWID residing in the nonurban towns of Fairfield and New Haven Counties in southwestern Connecticut. Of the 51 towns and cities in the two counties, six have populations ranging from approximately 80 to 144 thousand inhabitants. The remainder have considerably less (<2 to 60,000) with over two-thirds having populations less than 30 thousand and are considered nonurban municipalities

located within proximity to larger Northeast cities (e.g. New York City, Bridgeport, New Haven). We compared individuals who injected drugs most often in urban locales (defined as cities with populations in excess of 80,000) to those who injected drug most often in nonurban locales and tested four hypotheses:

1. PWID who inject most often in urban locales will have lower income, less job stability, higher rates of incarceration, longer injection careers and larger injection networks;
2. they will be more knowledgeable about HIV, viral hepatitis and opioid overdose risk and prevention;
3. they will have lower levels of unsafe injection practices, greater use of existing harm reduction services, and lower rates of opioid overdoses; and
4. they will have higher seroprevalence rates for HIV, HBV and HCV and lower rates of recent opioid overdose.

Methods

The Suburban Health, Education, Research, and Prevention Alliance study was a mixed methods, longitudinal study of adult PWID stably residing nonurban towns in Fairfield or New Haven Counties of Connecticut. We were interested in understanding the potential influence of most frequent injection venue (i.e. urban vs. nonurban) upon injection-associated risk behaviours, knowledge about HIV, hepatitis, and overdose risk and prevention, and HIV, HBV and HCV seroprevalence. Hence, all participants resided in nonurban locales (i.e. municipalities with population sizes less than 8,000), but varied in terms of the locale where they most often injected in the previous six months. Our four hypotheses were based on the notion that primary injection venue will influence individuals' exposure to and adoption of harm reduction strategies. The current report is limited to analyses from the final baseline dataset. More information concerning study methods can be found in previous publications [44,45]. All participants provided informed consent prior to enrolling in the study and received up to $60 for completion of the baseline assessment. The Yale Human Investigations Committee reviewed and approved the study and all associated materials.

Participants

Baseline data were collected between November 2008 and January 2012; 462 participants were enrolled. Inclusion criteria included: (i) being at least 18 years old; (ii) self-report of at least one injection during the previous 30 days; (iii) proof of residence for at least six months in any town in Fairfield or New Haven Counties (excluding the major cities of Bridgeport, Danbury, New Haven, Norwalk, Stamford or Waterbury); (iv) willingness to participate in semi-annual interviews and provide an annual blood sample; and (v) competence to provide informed consent.

Respondent-driven sampling [46,47] was used to recruit 100 seeds from local HIV and harm reduction service organisations and a substance abuse treatment agency; 60 seeds did not generate referral chains. Weighting of the variables of interest using standard RDS measures

was not used because they produced little difference in the estimated prevalence for outcomes of interest and larger confidence intervals. Therefore, the study sample should be considered one of convenience.

Measures

Participants completed a two-part semi-structured baseline interview. The first part, conducted by trained staff, was a face-to-face interview to collect geospatial data more easily obtained through open-ended discussion and the use of maps. Participants then completed the second part using audio computer-assisted self-interview software (NOVA Research Company, Bethesda, MD). After completing both parts of the interview, a trained phlebotomist obtained a 4–6 ml blood sample from participants and instructed them to return for their test results in two weeks.

Independent variables included: most frequent injection locale (i.e. nonurban vs. urban) in the past six months, sociodemographics, health and substance abuse treatment history, social support, use of harm reduction services and involvement with the criminal justice system. Minority representation was low but commensurate with the towns' demographics. The race/ethnicity variable was therefore dichotomised (White vs. non-White). Participants completed six clinical measures, including those items from the Addiction Severity Index [48–50] that are needed to calculate the seven subscales, three consumption questions from the Alcohol Use Disorders Identification Test [51,52], Brief Pain Inventory [53,54], Center for Epidemiological Studies Depression Scale [55], and Beck Anxiety Inventory [56,57].

The outcomes of interest for the four hypotheses included: (i) injection venue; (ii) HIV, hepatitis and overdose knowledge; (iii) injection-associated risk behaviours; and (iv) HIV, HBV and HCV infection status. The knowledge variable was calculated as the percent of correct responses to 42 True/False items concerning HIV and hepatitis transmission and prevention and overdose recognition and response that we have used in previous studies [17,58,59]. To reduce the potential for type I error due to multiple comparisons, a dichotomous (never/at least once) composite injection-associated risk behaviours variable was calculated based on participants' reports of having engaged in at least one of the six risk behaviours during the 30 days (i.e. receptive syringe-sharing, syringe-mediated sharing, sharing drug in liquid form, sharing of cookers, drug-mixing water or rinse water).

Sera were prepared and stored at −20°C, subsequently thawed, and tested using serological test kits (Bio-Rad Laboratories, Hercules, California). HBV testing included screening for core and surface antibodies and for surface antigen. Participants received their results in a face-to-face post-test counselling session; if positive for antibodies to HIV, HBV surface antigen or HCV, they were referred for confirmatory testing at a certified laboratory where they could then be referred for treatment if the confirmatory test was also positive. Study staff counselled participants on strategies to prevent viral transmission, and those who were negative for all three HBV tests were informed that they were susceptible to infection and advised to receive the three-dose vaccination series.

Statistical Analysis

We initially tested for potential differences between the 438 participants who responded to the item concerning most frequent injection locale and those who did not; no differences were noted for sex, race, education or employment status, involvement with the criminal justice system, or any of the six risk behaviours assessed. Non-responders were significantly more likely to be married.

To address the first hypothesis, we calculated chi-square and Student's t-tests to assess for potential differences in characteristics between participants who reported having injected most often during the previous six months (to be referred to as "primary injection locale or venue" hereafter) in nonurban vs. urban locales. To address the remaining three hypotheses, primary injection locale was included as an independent variable when testing the three outcomes of interest (i.e. knowledge, risk behaviours and infection status).

Initially, we conducted a series of bivariate logistic analyses to assess the relationship between primary injection venue, the other independent variables, and the outcomes of interest of knowledge, injection-associated risk behaviours and viral infection status. A series of bivariate linear regression analyses were similarly conducted to determine the association between primary injection venue, other independent variables, and knowledge level. Variables with a $P>0.25$ in the bivariate analyses were excluded from the three multivariable analyses; injection venue was included in all models as the primary independent variable of interest. A backward selection procedure was used to sequentially eliminate covariates that did not remain significant. The significance level for inclusion in the multivariable models was defined as $P<0.05$ (2-tailed test). All statistical analyses were performed using SAS (Version 9.1, SAS Institute Inc., Cary, NC).

Results

A detailed description of the study sample is available in previous publications [44, 45]. Briefly, the majority of participants was non-Hispanic White and male. The race/ethnicity proportions were: White 83.7%; Hispanic 8.7%; African American 6.3%; Other 1.3%; one participant refused the question (data not shown).

In testing whether PWID who injected predominantly in urban areas differed on sociodemographic factors from their nonurban counterpart (Table 1), we found few differences between the two groups save that those injecting most often in urban locales were younger by almost six years ($P<0.0001$), had been injecting nearly three years less ($P=0.007$), and were less likely to have health insurance ($P=0.001$), Regardless of location, most had been in substance abuse treatment at least once and had a criminal record. Almost all participants (89.8%) reported having been arrested at least once, 80.0% of whom reported incarceration periods longer than that necessary to post bail (data not shown). The mean total number of arrests was 9.1 (12.3 SD) and 3.1 (5.1 SD) were for drug violations; the mean number of incarcerations extending beyond the time necessary to post bail was 5.7 (8.2 SD; data not shown). No between-group differences were noted for gender, race, education, employment status, monthly income, or the size of participants' injection networks for the past six months.

Knowledge level for the total sample was poor, no one answered all 42 items correctly, and the overall mean score was 59.5% (14.3 SD; data not shown). The hypothesis that PWID injecting in urban locales would have greater knowledge about HIV/AIDS, hepatitis, and opioid overdose was not supported in bivariate or multivariable analyses. More knowledgeable participants were significantly more likely to be White (P=0.0005), have at least a high school education (P <0.0001), and have had at least six injection partners in the past six months (P=0.01; Table 2).

With respect to injection-associated practices (Table 3), 90.5% of participants identified heroin as their preferred drug, 64.9% reported having purchased drugs most often in urban areas in the past six months, while 22.8% relied upon home delivery. Regardless of where participants purchased their drugs, 62.4% reported that they injected most often in their own home (data not shown). Within the previous 30 days, most PWID (74.5%) purchased syringes at pharmacies, 3.7% reported receiving most of their syringes from either of the two existing syringe exchange programs, and 7.8%) reported receiving any syringes from a syringe exchange program. On average, participants injected slightly more often than twice per day and frequently re-used their own syringes. When asked about six injection-associated behaviours, nearly half the sample (43.1%; data not shown) reported having engaged in at least one during the previous 30 days. The most commonly reported risk was sharing drug (52.3%), although sharing of drug-mixing (33.8%) or rinse water (31.2%) was also common. Almost a third (31.0%) reported having ever experienced an overdose, and among these individuals, it was common to have experienced more than one.

Based on the assumption that PWID who injected most often in urban locales were more likely to have been exposed to harm reduction programs than were those who injected most often in nonurban locales, we hypothesised that the former group would be less likely to engage in at least one of the six injection-associated risk behaviours and would experience fewer non-fatal opioid overdoses. Neither group had much exposure to harm reduction programs, and our hypotheses regarding injection-associated risk behaviours and overdose experience were not supported. In the multivariable model (adjusted for sex and age), those who injected most often in urban settings were almost twice as likely to engage in at least one injection-associated risk behaviour as their nonurban counterpart (P=0.007). Older participants (P=0.003) and males (P <0.0001) were less likely to engage in injection-associated risk behaviours (Table 4).

We hypothesised that HIV, HBV and HCV seroprevalence would be significantly higher among those who injected most often in urban locales. Seroprevalences for the total sample were: 23.6% for HBV, 39.2% for HCV and 1.1% for HIV. There were too few cases of HIV to perform any inferential test, and bivariate associations of injection locale with either HBV or HCV infection were non-significant.

Discussion

This report presents the primary analyses from the Suburban Health, Education, Research, and Prevention Alliance project: a comparison of knowledge levels, injection-associated risk behaviours, and the prevalence of HIV, HBV and HCV infection between PWID residing in

nonurban areas of southwestern Connecticut who primarily injected in urban locales and those who did not. To our knowledge, this is the largest longitudinal study of active injectors (i.e. not in substance abuse treatment or enrolled in treatment for less than 30 days) from a nonurban region of the US. We tested four hypotheses, none of which were supported by the data, suggesting that nonurban PWID—regardless of primary injection venue—are not being reached by existing syringe exchange or harm reduction programs. This may possibly be attributed to insufficient opportunities for nonurban PWID to come into contact with such programs due to limited hours of operation or geographic coverage. Or it may be due to a lack of awareness of the existence of such programs among nonurban PWID, limited advertising by the programs in urban areas and none in nonurban regions, the existing harm reduction interventions may be poorly suited to the information and resource needs of this population or other as yet unidentified factors. Additional research is needed to understand how best to effectively reach and intervene with PWID residing in nonurban locales.

The findings raise two concerns: (i) prevention knowledge and exposure to harm reduction services and resources is low; and (ii) injection-associated risk behaviours (especially sharing of syringes, drugs in liquid form and water—all among the likeliest to transmit HIV or HCV) were highly prevalent. There are only two official harm reduction programs in the region, both are located in major urban areas, have limited hours, and access to these services via public transportation is not possible from all areas or may require up to 45 minutes to reach by private car. Innovative strategies are therefore needed to disseminate harm reduction information and resources to this population. Pharmacies may represent one such novel venue for expanding nonurban harm reduction efforts beyond merely selling syringes [60]. Although there is a 1992 law permitting syringe sales without the need for a prescription in Connecticut [61, 62], implementation of harm reduction interventions such as training PWID about injection hygiene or overdose prevention and response remain relatively scarce in nonurban locales. Smartphone technology such as text-based programs that provide regular messages concerning methods to improve injection hygiene, strategies for coping with cravings, and information about access to local harm reduction and substance abuse treatment programs may be another strategy for implementing interventions targeting nonurban PWID. Expansion of home delivery of syringes and other safe injection supplies beyond the large cities where most harm reduction programs operate is strongly recommended and essential in preventing further spread of HCV which is already at 40%. At the structural level, policy changes aimed at counteracting the prevailing “NIMBY” (not in my back yard) attitudes [63–66] and increasing the number of substance abuse treatment and syringe exchange programs located in nonurban locales are recommended. In Connecticut, syringe exchange programs are limited to operating only in the jurisdictions within which they have been approved. Changing the policy to permit home delivery to a larger region may be another approach to expanding access. We also recommend that the existing exchanges be converted to distribution centres where the number of syringes distributed is based upon need rather than a strict one-for-one exchange as is currently the case. HIV, hepatitis and overdose recognition and prevention knowledge was higher within larger injection networks and suggests that there may be diffusion of health promotion information within these networks. This may, in turn, provide another possible intervention strategy (e.g. peer-based interventions) [67, 68].

The fact that, contrary to our hypothesis, those injecting most often in urban locales were significantly more likely to have engaged in at least one injection-associated risk behaviour within the previous month suggests that these individuals may have been injecting in a hurry or in a location not conducive to hygienic injection (e.g. lack of clean water, utensils, drug-preparation surfaces). The issue that women reported engaging in injection-associated risk behaviours more often than men was not surprising albeit disappointing. Many factors have been attributed to this phenomenon including inherent power dynamics between genders [69–72], suggesting the need for harm reduction interventions tailored to the specific needs of female injectors.

Limitations

There are several limitations to this study. The sample is one of convenience, and therefore the findings may have limited generalisability. PWID with higher incomes may be under-represented. The self-reported data collected in this study are subject to recall and social desirability bias. We attempted to minimise response bias by using computerised, self-administered survey methods, an effective strategy to minimise the potential for under-reporting of risky and stigmatised behaviours [73–75]. We chose to employ a single composite risk variable as the outcome of interest in the multivariable analysis since the proportion of those who reported having engaged in any of the six injection-associated risk behaviours was relatively small for most risks, and we didn't wish to increase the potential for type I error associated with multiple comparisons. This decision does not account for the fact that some behaviours are riskier than others and limited our understanding of the specific risk behaviours most likely associated with injection venue. To offset these potential limitations, we included the results of bivariate analysis for each risk behaviour in Table 2. Finally, because all participants resided in nonurban towns, no conclusions can be made about the differences between PWID residing in urban versus nonurban areas. The question of whether the harm reduction information and prevention needs of nonurban PWID differ from those of their urban-dwelling counterpart should be explored in future studies as should the specific contextual factors and risk dynamics that are associated with engaging in injection-associated risk behaviours, particularly for those who inject most often in urban locales and females.

Conclusions

We have previously noted that PWID residing in nonurban locales are in need of the HIV, hepatitis, and overdose prevention information but do not appear to be accessing traditional harm reduction programs [45]. The data suggest the need to expand harm reduction services to nonurban locales. Novel strategies such as pharmacy-based, home delivery, and peer-led interventions should be considered as other means of expanding harm reduction initiatives in nonurban settings. The positive association between HCV infection and length of injection career has been noted previously in published accounts of our study [44] as well as in a recent meta-analysis of data on urban PWID [44,76]. These findings underscore the continued and urgent need to intervene as soon as possible with new injectors in order to provide them with harm reduction information and services.

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Table 1

Comparison of baseline characteristics and injection venue

Characteristics	Total sample (N = 462)	Bivariate analyses		
		Injected most often in urban locales (n = 111)	Injected most often in nonurban locales (n = 327)	*P* value
Age[1, 2]	35.6 (11.0)	31.4 (9.9)	37.2 (11.1)	<0.0001
Male[3]	62.3%	60.4%	62.7%	–
White race[3]	83.6%	78.4%	85.0%	–
High school degree or more[3]	80.5%	77.6%	81.7%	–
Unemployed[3]	71.2%	69.4%	71.8%	–
Having some health insurance, %[3]	76.6%	64.7%	80.7%	0.001
Monthly income (last 30 days)[2, 3]				–
<$500	32.0%	36.0%	30.9%	
$500–$999	21.4%	20.7%	21.7%	
$1000–$1999	28.8%	31.5%	27.2%	
≥$2000	17.8%	11.7%	20.2%	
Having ever been in jail[3]	80.0%	75.3%	81.6%	–
Years of injection[1, 2]	11.2 (10.3)	9.3 (8.5)	12.1 (10.8)	0.007
≥ 6 injection partners past 6 months[3]	53.4%	55.0%	53.1%	–

[1] Mean (SD).

[2] Student's t-test.

[3] Chi-squared test.

Table 2

Bivariate and multivariable linear regression analysis for the association between injection locale (and potential confounders) and HIV, HBV and HCV knowledge score[1]

Variables	Regression coefficient (standard error), *P* value	
	Bivariate analysis	Multivariate analysis
Age[2]	−0.08 (0.03), *P* = 0.003	–
Male[3]	−0.34 (0.61), *P* = 0.57	–
White race[3]	2.91 (0.78), *P* = 0.0002	2.78 (0.79), *P* = 0.0005
High school degree or more[3]	3.56 (0.74), *P* < 0.0001	3.48 (0.75), *P* < 0.0001
Unemployed[3]	−0.12 (0.65), *P* = 0.85	–
Having some form of health insurance[3]	0.13 (0.74), *P* = 0.86	–
Monthly income (last 30 days)[3, 4]	0.64 (0.26), *P* = 0.02	–
Having ever been in jail[3]	−0.86 (0.75), *P* = 0.25	–
Years of injection[2]	−0.05 (0.03), *P* = 0.10	–
≥ 6 injection partners past 6 months[2]	1.29 (0.59), *P* = 0.03	1.49 (0.59), *P* = 0.01
Injected most often in urban locale[2]	0.73 (0.69), *P* = 0.29	0.92 (0.68), *P* = 0.18

[1] Sample size for the 11 bivariate models ranged from 414 – 462. Sample size for the multivariate model – 422.

[2] Student's t-test.

[3] Chi-squared test.

[4] Monthly income was based on 4 ordinal levels.

Table 3

Comparison of drug-related behaviours and injection venue

Behaviour	Total sample (N = 462)	Bivariate analyses		
		Injected most often in urban locales (n = 111)[1]	Injected most often in non-urban locales (n = 327)[1]	*P* value
Heroin as drug of choice[2]	90.5	93.6	89.6	
Most frequent venue for drug purchase[2, 3]				<0.0001
Urban	64.9	94.3	53.4	
Nonurban, but not their own residence	12.3	1.9	16.5	
Home delivery	22.8	3.8	30.1	
Syringe source[2]				0.01
Pharmacy	74.5	71.0	84.7	
Syringe exchange	3.7	4.6	0.9	
Other	21.8	24.4	14.4	
Injections [4, 5]	30 (10, 69)	34 (18, 69)	26 (7, 63)	0.003[6]
# Times re-used own syringe[4, 5]	3 (2, 8)	4 (2, 10)	3 (2, 6)	0.04[6]
Receptive syringe-sharing[2, 4]	21.9	31.5	18.1	0.003
Syringe-mediated sharing[2, 4]	14.5	20.7	11.9	0.02
Shared drug in any form[2, 4]	52.3	66.7	47.5	0.0005
Shared drug in liquid form[2, 4]	21.5	21.6	22.4	
Shared cooker[2, 4]	18.8	19.8	19.0	
Shared drug-mixing water[2, 4]	33.8	46.9	28.4	0.0004
Shared rinse water[2, 4]	31.2	46.0	25.7	<0.0001
Ever experienced overdose[2]	31.0	34.6	29.7	
# Overdoses experienced[5]	2.0 (1.0, 3.0)	2.0 (1.0, 3.0)	2.0 (1.0, 3.0)	

[1] 438 participants reported where they had injected most often in the previous six months.

[2] Percentage (%); Chi-squared tests for bivariate analyses.

[3] Past six months.

[4] Past 30 days.

[5] Median (25%; 75%); Student's t-test for bivariate analyses.

[6] *P* value was obtained by log transforming corresponding variable due to its skewness.

Table 4

Bivariate and multivariable logistic regression analysis for the association between injection locale (and potential confounders) and injection-associated risk behaviour[1, 2]

Variables	Odds ratio (95% confidence interval)	
	Bivariate analysis	Multivariable analysis
Age[3]	0.97 (0.95–0.98), $P = 0.0001$	0.97 (0.95–0.99), $P = 0.003$
Male[4]	0.45 (0.31–0.66), $P < 0.0001$	0.42 (0.28–0.63), $P < 0.0001$
White race[4]	1.56 (0.93–2.61), $P = 0.09$	–
High school degree or more[4]	1.03 (0.64–1.66), $P = 0.90$	–
Unemployed[4]	0.98 (0.65–1.46), $P = 0.90$	–
Having some form of health insurance[4]	0.89 (0.57–1.41), $P = 0.63$	–
Monthly income (last 30 days)[4, 5]	1.06 (0.90–1.25), $P = 0.51$	–
Having ever been in jail[4]	0.68 (0.42–1.10), $P = 0.11$	–
Years of injection[3]	0.98 (0.96–1.00), $P = 0.03$	–
≥ 6 injection partners past 6 months[4]	1.47 (1.01–2.13), $P = 0.04$	–
Injected most often in urban locale[4]	2.15 (1.39–3.33), $P = 0.0006$	1.88 (1.19–2.98), $P = 0.007$

[1] Injection-associated risk behaviour was defined as having engaged at least once in any one of the following behaviours in the past 30 days: receptive syringe-sharing, syringe-mediated sharing, sharing drug in liquid form, or the sharing of cookers, drug-mixing water, or rinse water.

[2] Sample size for the 11 bivariate models ranged from 414 – 462. Sample size for the multivariate model = 438.

[3] Student's t-test.

[4] Chi-squared test.

[5] Monthly income was based on 4 ordinal levels.