

## INTRODUCTION

Needle sharing places people who inject drugs (PWID) at high risk for acquiring or transmitting HIV and Hepatitis C (1-3). Syringe sharing has previously been associated with inability to access sterile syringes (4, 5), peer group norms that promote sharing (6, 7), risky sexual encounters (6, 8, 9), binge drug use (10), and homelessness (11-14).

Despite having one of North America's largest needle exchange programs (NEP) in place since 1988 (15), Vancouver was the site of a well-documented outbreak of HIV among PWID in the mid-1990s, with one of the highest incidences of HIV ever reported at 18.6 sero-conversions per 100 person years (16). Key factors attributed to fueling Vancouver's outbreak of HIV have been well documented and include: a shift in drug use patterns from heroin to cocaine, which resulted in many more injections per day owing to the drug's shorter half life (17); restrictive needle exchange practices that included limits on the number of needles distributed and requirements that used needles be exchanged for clean ones (18, 19); and a lack of available stable housing (20, 21). In response to the outbreak of HIV among Vancouver's population of people who use injection drugs, the local health authority implemented numerous changes to its NEP. These included refocusing the NEP away from an emphasis on public order objectives by separating distribution and collection functions, removing syringe distribution limits, decentralizing and diversifying NEP services, and incorporating peer-run models of needle distribution (22). Subsequent evaluations have linked these NEP changes to significant declines in syringe borrowing, lending, and HIV incidence among adults who use injection drugs in Vancouver (22). Despite these documented improvements among adults, less is known about whether progressive needle exchange policies and other harm reduction interventions are having

the same positive impact on improving access to syringes and reducing syringe sharing among youth. High rates of syringe sharing have been reported among youth who use injection drugs (6, 10); however, this has not been fully examined longitudinally in the current era of decentralized and diversified NEP services. The current longitudinal study examines the prevalence and correlates of syringe borrowing and lending after NEP changes were implemented in a prospective cohort of street-involved youth in Vancouver, Canada.

## METHODS

Data for this study was obtained from the At-Risk Youth Study (ARYS), an open prospective cohort study of street-involved youth in Vancouver, Canada. The cohort began in 2005 and has been described in detail previously (23). Briefly, to ensure the cohort captures the experiences of young people, the cohort is continually refreshed through open and ongoing study recruitment using snowball sampling and extensive street-based outreach methods. To be eligible, participants at recruitment had to be aged 14-26 years, use illicit drugs other than marijuana in the past 30 days, and provide written informed consent. Youth who were homeless or using services for homeless youth were considered “street-involved” in this study. At enrollment, and every six months, participants completed an interviewer-administered questionnaire that included questions related to demographic information and drug use patterns and provided blood samples tested for HIV and Hepatitis C. At each study visit, participants were provided with a stipend (\$30 CDN) for their time. The University of British Columbia’s Research Ethics Board approved the study.

For the present analyses, ARYS participants were eligible if they completed a survey between September 2005 and May 2014 and reported injecting drugs at any time during the

study period. This analysis only includes active injectors, and therefore only observations involving a report of injection during the last six months were included. Baseline data for this analysis is considered the first visit where injection drug use was reported during the study period and does not necessarily imply first ever injection drug use. Our outcomes of interest were syringe borrowing and syringe lending. Syringe borrowing (receptive syringe sharing) was defined based on an affirmative answer to the following question: “In the past 6 months, have you fixed with a rig that had already been used by someone else?” Syringe lending (distributive syringe sharing) was defined based on an affirmative answer to the following question: “In the past 6 months have you lent your used rig to someone else?”

To identify factors associated with syringe borrowing and lending respectively, we considered a number of potential explanatory variables. Covariates were selected a priori based on their known or hypothesized relationship with the primary outcomes of interest. Socio-demographic variables were as follows: gender (female vs. male); age (per year younger); and ethnicity (Caucasian vs. other). Drug use variables included: binge drug use defined as going on drug “runs” or “binges” where drugs were used more than usual (yes vs. no); daily heroin use via injection or non-injection (yes vs. no); daily cocaine use via injection or non-injection (yes vs. no); and daily crystal methamphetamine use via injection or non-injection (yes vs. no). Other variables considered included: homelessness, defined as having no fixed address, sleeping on the street, couch surfing, or staying in a shelter or hostel (yes vs. no); recent incarceration, defined as having been in prison, jail or detention (yes vs. no); and as in previous analyses (10, 17), having difficulty finding clean needles was defined as reporting yes or sometimes to the question “Do you find it difficult to get new rigs when you need them?” We also considered HIV and Hepatitis

C status based on blood work drawn at the time the surveys were completed. All drug use and behavioral variables refer to activities or experiences in the past six months and were time-updated at each study visit.

As a first step, we assessed the annual proportion of active injectors who reported syringe borrowing and syringe lending for each calendar year of the study period. Additionally, using all study visits where syringe borrowing was reported in the last six months, we recorded the frequency of reasons youth reported borrowing syringes. To assess reasons for reporting syringe borrowing, we asked, “Over the last six months, when you used a needle that someone else had already used, what were some of the reasons why?” Interviewers checked all answers that applied from a pre-populated list and wrote out verbatim other answers that were not listed.

To examine syringe borrowing and syringe lending, we compared covariates of interest at baseline stratified by syringe borrowing and syringe lending in the past six months using Pearson’s Chi-square test (dichotomous variables) and the Wilcoxon rank test (continuous variables). Then, to model factors associated with syringe borrowing and syringe lending over time and analyze longitudinal correlated within-subject data, generalized estimating equations (GEE) were used. These methods adjusted correlations among multiple observations per person using an exchangeable working correlation structure. First, bivariable GEE analyses were used to determine factors associated with syringe borrowing and syringe lending respectively. Variables significant at the  $p < 0.10$  threshold in bivariable analyses were entered in multivariable GEE models. Using a backwards model selection process, the model with the best overall fit was determined using the lowest quasiliikelihood under the independence model criterion (QIC)

value. All statistical analyses were performed using SAS software version 9.4 (SAS, Cary, NC). All p-values are two sided.

## RESULTS

### SAMPLE CHARACTERISTICS

Among the 1158 street-involved youth recruited into ARYS during the study period, 505 reported injecting drugs at some point during the study period and were therefore included in the current analysis. The median age of our sample at baseline was 22.5 years (interquartile range [IQR]: 20.7-24.3), 171 (33.9%) were female and 369 (73.1%) were Caucasian. This sample contributed a total of 1400 observations that included a report of recent injection drug use. The annual loss to follow-up rate for the cohort overall was 3.2%. The median number of study visits included in the analysis per participant was 2 (IQR 1-4) and the median number of study visits per participant for the cohort overall was 3 (IQR: 1 – 5).

Over the ten-year study period, a total of 142 (28.1%) youth reported syringe borrowing, 132 (26.1%) youth reported syringe lending, 83 (16.4%) reported engaging in both behaviors and 191 (37.8%) youth reported either syringe borrowing, syringe lending, or both.

The baseline characteristics of the study sample stratified by syringe borrowing and syringe lending are presented in Table I and Table II respectively. At baseline, individuals who reported syringe borrowing had significantly increased odds of being female (p-value =0.036); Caucasian (p-value =0.033); reporting binge drug use (p-value =0.042); daily heroin use (p-value =0.048); daily cocaine use (p-value =0.028); and being HIV positive (p-value =0.018). At baseline, individuals who reported syringe lending had significantly increased odds of being Caucasian (p-value =0.041); reporting binge drug use (p-value =0.001); daily heroin use (p-value

=0.007); daily cocaine use (p-value =0.012); and having difficulty finding clean needles (p-value <0.001).

#### ANNUAL PREVALENCE OF SYRINGE BORROWING AND LENDING

The annual proportions of the sample reporting syringe borrowing and syringe lending over the study period are reported in Figure 1. Over the ten-year period, the annual prevalence of syringe borrowing ranged between 5.7% and 24.1%, with an average annual prevalence of 16.4%. The annual prevalence of syringe lending ranged between 4.5% and 20.4%, with an average annual prevalence of 13.8%.

#### REASONS YOUTH REPORTED BORROWING SYRINGES

The reasons youth reported borrowing syringes and their frequencies are reported in Table III. The most frequent reasons cited were: “I did not have one on me” (61.1%); “I was with my partner” (14.7%); and “I could not get one/no access” (14.2%).

#### BIVARIABLE AND MULTIVARIABLE RESULTS

The bivariable and multivariable GEE analyses of factors associated with syringe borrowing and lending are presented in Tables IV and V. In multivariable analysis, factors associated with syringe borrowing in the past six months included: younger age (Adjusted Odds Ratio (AOR)=1.08,  $z = -2.19$ , 95% CI: 1.01-1.16,  $p=0.028$ ); homelessness (AOR=1.52,  $z=2.22$ , 95% CI: 1.05-2.21,  $p=0.026$ ); and difficulty finding clean needles (AOR=2.28,  $z = 5.10$ , 95% CI: 1.66-3.12,  $p<0.001$ ). Factors positively associated with syringe lending in the past six months included: Caucasian ethnicity (AOR=1.65,  $z=2.14$ , 95% CI: 1.04-2.62,  $p=0.032$ ); binge drug use (AOR=1.61,  $z=2.70$ , 95% CI: 1.14-2.28,  $p=0.007$ ); homelessness (AOR=1.65,  $z=2.49$ , 95% CI:

1.11-2.44,  $p=0.013$ ); and difficulty finding clean needles (AOR=1.89,  $z=3.49$ , 95% CI: 1.32-2.71,  $p<0.001$ ).

## DISCUSSION

Over the study period, 37.8% of the sample reported some type of syringe sharing. Syringe borrowing and syringe lending were positively and consistently associated with having difficulty finding clean needles and homelessness.

Annual prevalence of syringe borrowing spanned from 24.1% in 2005 to 15.9% in 2014 and from 20.4% in 2005 to 15.9% in 2014 for syringe lending. In 2011, there was a notable decline in the prevalence of both syringe borrowing (5.7%) and syringe lending (4.5%). To the best of our knowledge, there were no significant changes in study setting during or immediately prior to 2011 that would account for this decline. We therefore suspect these results are an anomaly specific to our data set. Overall, these annual prevalence estimates are lower than some figures observed in other samples of young PWID, but notably higher than figures reported among adults in the same setting. Specifically, an American study published in 2007 reported the prevalence of syringe lending in a cross-sectional study of young PWID age 15-30 years in five U.S. cities to be 45.8% in the 3 months prior to the study visit (6). Similarly, cross-sectional data from Massachusetts published in 2013 found that 50% of PWID less than 25 years of age reported syringe sharing in the last 30 days (24). A longitudinal cohort study in Montreal, Canada followed street-involved youth between 1995 and 2005 and observed that the prevalence of syringe borrowing decreased significantly over time from just under 50% in 1995 to a low of less than a third in 2004 (25). Studies among adults generally reported lower prevalence of syringe sharing, but have similarly reported declining prevalence of syringe sharing over time

accompanied by scale up of NEPs (22, 26-31). Among adult PWID in Vancouver, syringe borrowing declined from 20.1% in 1998 to 9.2% in 2003, and syringe lending declined from 19.1% in 1998 to 6.8% in 2003 (22). Prevalence estimates for syringe borrowing and lending were higher among youth in our study compared with those reported in their adult peers, although it is noted that the adult data is from an earlier time period (22). This finding nevertheless is consistent with other settings (32, 33). Our results indicate that youth likely benefit significantly from NEPs; however, as difficulty finding clean needles was significantly associated with syringe borrowing and syringe lending among our sample of youth, our findings suggest that service delivery for youth may be suboptimal.

The link between reporting difficulty accessing clean needles and engaging in syringe sharing is consistent with the literature (4, 5). As well, youth reported not being able to access needles as the third most common reason they had borrowed a syringe in the last six months. It is not possible to infer from our study why youth continue to report having difficulty accessing or finding clean needles. Geographic barriers have previously been found to influence utilization of NEPs (34-36) and may be playing a role in Vancouver. Existing NEP services in the city are primarily concentrated in the Downtown Eastside neighborhood which may not be optimal for youth in Vancouver who tend to coalesce in the adjacent, but distinct Downtown South neighborhood (37, 38). Evidence among adult populations of people who use injection drugs suggests that peer-run needle distribution programs are uniquely suited to engage with vulnerable individuals who may be isolated from formal public health services (39). Similarly, youth peer-run syringe distribution models may have potential to increase access to sterile syringes among vulnerable youth. A systematic review examining optimal provision of needle-exchange services



found that mobile van sites and vending machines attracted younger and higher risk PWID (40). Although there is an existing mobile needle exchange service, as well as existing vending machines dispensing crack pipes, a scale-up of these services may help extend them to difficult-to-reach youth. Further examination of how needle distribution efforts might be improved to better meet the needs of young people is warranted.

Although difficulty finding needles was significantly associated with syringe borrowing in the multivariable analysis, the most common reason for borrowing reported among participants was “I did not have one on me”. While it is impossible to infer from the data why participants did not have a clean needle, spontaneity of drug use in this population may provide one possible explanation. Among economically marginalized women or those involved in sex work for example, dependence on social networks for access to free drugs may leave them vulnerable to spontaneous offers of drug use, where clean injecting equipment may not be readily available (41, 42). Similarly, in the context of criminalization of drug use, young people may choose to inject as soon as they acquire the means, even in the absence of clean needles, for fear they will be apprehended by police (13, 43). To better inform interventions, further research should consider the contexts in which young people find themselves without clean needles.

Homelessness was significantly associated with both syringe borrowing and syringe lending, which is consistent with the literature (11-14). Unstable housing may lead PWID to inject in the street or public settings which places them at risk of being robbed or stopped by police (43). For these reasons, injection in public spaces may be rushed, resulting in reduced attention to safety and hygiene (43). Qualitative studies have found that homelessness is associated with heavier drug use in order to achieve sleep or wakeful states while on the street;

this may potentiate increased opportunities for syringe sharing (43). The association between homelessness and syringe sharing found in the current study setting suggests that policy interventions to increase the availability of stable housing for youth such as a Housing-First strategy could be expected to help reduce risky syringe sharing among young people who inject drugs.

Finally, consistent with the literature, binge drug use was found to be significantly and independently associated with syringe sharing (10); however, there was no association found between different types of drugs and syringe sharing.

There are several limitations to this study. The ARYS cohort is a sample of street-involved youth recruited through snowball sampling and street outreach strategies in Vancouver, making it subject to selection bias. The demographics of the sample however, are consistent with other samples of street-involved youth in Vancouver (44). Our findings are also subject to response biases as a limitation of using self-report surveys (45). Although previous research has found that self-reporting among drug-using populations is generally congruent with actual behavior (46-48) we expect that any response biases from participants in this study would underestimate the prevalence of some risk behaviors and therefore bias our results towards the null. Vancouver is also unique with respect to the evolution of NEPs over space and time, and therefore our findings may not be generalizable to young PWID in other settings. Finally, we were regrettably unable to include variables about geographic distance to, and utilization of NEPs in our analysis as these were inconsistently collected throughout the study period. Future research should consider these measures given our finding that difficulty finding clean needles was positively and significantly associated with syringe borrowing and lending.

In summary, 37.8% of street-involved youth reported some type of syringe sharing, despite a well-established NEP in the study setting. Retrospective analysis of Vancouver's HIV outbreak in the 1990s has shown that social and economic policies shape the effectiveness of harm-reduction services and mediate HIV risk behaviors such as syringe sharing (20). These findings highlight gaps in syringe access for vulnerable young injectors and suggest that service delivery for youth may be suboptimal.

#### COMPLIANCE WITH ETHICAL STANDARDS

**Funding:** The study was supported by the US National Institutes of Health (R01DA028532, U01DA038886) and the Canadian Institutes of Health Research (MOP-102742). This research was undertaken, in part, thanks to funding from the Canada Research Chairs program through a Tier 1 Canada Research Chair in Inner City Medicine, which supports Dr. Evan Wood. Dr. Kora DeBeck is supported by a MSFHR/St. Paul's Hospital Foundation-Providence Health Care Career Scholar Award and a Canadian Institutes of Health Research New Investigator Award. Dr. Lindsey Richardson is supported by a New Investigator Award from the Canadian Institutes of Health Research and a Scholar award from the Michael Smith Foundation for Health Research. Dr. Nikki Bozinoff received support from the Conrad N. Hilton Foundation/Addiction Medicine Foundation through a Next Generation Award as well as through the Research in Addiction Medicine Scholars program (R25DA033211).

**Conflict of Interest:** All authors declare that they have no conflicts of interest.

**Ethical approval:** 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.

This article does not contain any studies with animals performed by any of the authors.

Informed consent: Informed consent was obtained from all individual participants included in the study.

## REFERENCES

1. Des Jarlais DC, Friedman SR, Stoneburner RL. HIV infection and intravenous drug use: critical issues in transmission dynamics, infection outcomes, and prevention. *Rev Infect Dis.* 1988;10(1):151-8.
2. Patrick DM, Strathdee SA, Archibald CP, Ofner M, Craib KJ, Cornelisse PG, et al. Determinants of HIV seroconversion in injection drug users during a period of rising prevalence in Vancouver. *Int J STD AIDS.* 1997;8(7):437-45.
3. Girardi E, Zaccarelli M, Tossini G, Puro V, Narciso P, Visco G. Hepatitis C virus infection in intravenous drug users: prevalence and risk factors. *Scand J Infect Dis.* 1990;22(6):751-2.
4. Marshall BD, Shoveller JA, Wood E, Patterson TL, Kerr T. Difficulty accessing syringes mediates the relationship between methamphetamine use and syringe sharing among young injection drug users. *AIDS Behav.* 2011;15(7):1546-53.
5. Zhang L, Chen X, Zheng J, Zhao J, Jing J, Zhang J, et al. Ability to access community-based needle-syringe programs and injecting behaviors among drug users: a cross-sectional study in Hunan Province, China. *Harm Reduct J.* 2013;10:8.

6. Golub ET, Strathdee SA, Bailey SL, Hagan H, Latka MH, Hudson SM, et al. Distributive syringe sharing among young adult injection drug users in five U.S. cities. *Drug Alcohol Depend.* 91 Suppl 1. Ireland 2007. p. S30-8.
7. Davey-Rothwell MA, Latkin CA, Tobin KE. Longitudinal analysis of the relationship between perceived norms and sharing injection paraphernalia. *AIDS Behav.* 2010;14(4):878-84.
8. Bogart LM, Kral AH, Scott A, Anderson R, Flynn N, Gilbert ML, et al. Sexual risk among injection drug users recruited from syringe exchange programs in California. *Sex Transm Dis.* 32. United States 2005. p. 27-34.
9. Neaigus A, Reilly KH, Jenness SM, Hagan H, Wendel T, Gelpi-Acosta C. Dual HIV risk: receptive syringe sharing and unprotected sex among HIV-negative injection drug users in New York City. *AIDS Behav.* 2013;17(7):2501-9.
10. Lloyd-Smith E, Kerr T, Zhang R, Montaner JSG, Wood E. High prevalence of syringe sharing among street involved youth. *Addiction Research & Theory.* 2008;16(4):353-8.
11. Samo RN, Altaf A, Agha A, Pasha O, Rozi S, Memon A, et al. High HIV incidence among persons who inject drugs in Pakistan: greater risk with needle sharing and injecting frequently among the homeless. *PLoS One.* 2013;8(12):e81715.
12. Topp L, Iversen J, Baldry E, Maher L. Housing instability among people who inject drugs: results from the Australian needle and syringe program survey. *J Urban Health.* 2013;90(4):699-716.
13. Wagner KD, Simon-Freeman R, Bluthenthal RN. The association between law enforcement encounters and syringe sharing among IDUs on skid row: a mixed methods analysis. *AIDS Behav.* 2013;17(8):2637-43.

14. Corneil TA, Kuyper LM, Shoveller J, Hogg RS, Li K, Spittal PM, et al. Unstable housing, associated risk behaviour, and increased risk for HIV infection among injection drug users. *Health Place*. 12. England 2006. p. 79-85.
15. Bardsley J, Turvey J, Blatherwick J. Vancouver's needle exchange program. *Can J Public Health*. 1990;81(1):39-45.
16. Strathdee SA, Patrick DM, Currie SL, Cornelisse PG, Rekart ML, Montaner JS, et al. Needle exchange is not enough: lessons from the Vancouver injecting drug use study. *AIDS*. 1997;11(8):F59-65.
17. Tyndall MW, Currie S, Spittal P, Li K, Wood E, O'Shaughnessy MV, et al. Intensive injection cocaine use as the primary risk factor in the Vancouver HIV-1 epidemic. *AIDS*. 2003;17(6):887-93.
18. Wood E, Tyndall MW, Spittal PM, Li K, Hogg RS, O'Shaughnessy MV, et al. Needle exchange and difficulty with needle access during an ongoing HIV epidemic. *International Journal of Drug Policy*. 2002;13(2):95-102.
19. Spittal PM, Small W, Wood E, Johnston C, Charette J, Laliberté N, et al. How otherwise dedicated AIDS prevention workers come to support state-sponsored shortage of clean syringes in Vancouver, Canada. *International Journal of Drug Policy*. 2004;15(1):36-45.
20. Hyshka E, Strathdee S, Wood E, Kerr T. Needle exchange and the HIV epidemic in Vancouver: Lessons learned from 15 years of research. *International Journal of Drug Policy*. 2012;23(4):261-70.
21. Wood E, Kerr T. What do you do when you hit rock bottom? Responding to drugs in the city of Vancouver. *International Journal of Drug Policy*. 17(2):55-60.

22. Kerr T, Small W, Buchner C, Zhang R, Li K, Montaner J, et al. Syringe sharing and HIV incidence among injection drug users and increased access to sterile syringes. *Am J Public Health*. 2010;100(8):1449-53.
23. Wood E, Stoltz JA, Montaner JS, Kerr T. Evaluating methamphetamine use and risks of injection initiation among street youth: the ARYS study. *Harm Reduct J*. 2006;3:18.
24. Tassiopoulos K, Bernstein J, Bernstein E. Age and sharing of needle injection equipment in a cohort of Massachusetts injection drug users: an observational study. *Addiction Science & Clinical Practice*. 2013;8(1):20-.
25. Roy É, Boudreau J-F, Leclerc P, Boivin J-F, Godin G. Trends in injection drug use behaviors over 10 years among street youth. *Drug and Alcohol Dependence*. 2007;89(2–3):170-5.
26. van Ameijden EJ, Coutinho RA. Maximum impact of HIV prevention measures targeted at injecting drug users. *AIDS*. 1998;12(6):625-33.
27. Langendam MW, van Brussel GH, Coutinho RA, van Ameijden EJ. Trends in HIV risk behaviour and methadone dosage among HIV-negative drug users: an ecological study. *AIDS*. 2000;14(12):1870-2.
28. Fatseas M, Denis C, Serre F, Dubernet J, Daulouede JP, Auriacombe M. Change in HIV-HCV risk-taking behavior and seroprevalence among opiate users seeking treatment over an 11-year period and harm reduction policy. *AIDS Behav*. 2012;16(7):2082-90.
29. Kim NJ, Jin H, McFarland W, Raymond HF. Trends in sources and sharing of needles among people who inject drugs, San Francisco, 2005–2012. *International Journal of Drug Policy*. 2015;26(12):1238-43.

30. Des Jarlais DC, Arasteh K, Hagan H, McKnight C, Perlman DC, Friedman SR. Persistence and Change in Disparities in HIV Infection Among Injection Drug Users in New York City After Large-Scale Syringe Exchange Programs. *American Journal of Public Health*. 2009;99(Suppl 2):S445-S51.
31. Des Jarlais C, Perlis T, Friedman SR, Chapman T, Kwok J, Rockwell R, et al. Behavioral risk reduction in a declining HIV epidemic: injection drug users in New York City, 1990-1997. *Am J Public Health*. 2000;90(7):1112-6.
32. HIV infection and HIV-associated behaviors among injecting drug users - 20 cities, United States, 2009. *MMWR Morb Mortal Wkly Rep*. 61. United States 2012. p. 133-8.
33. Horyniak D, Dietze P, Degenhardt L, Higgs P, McIlwraith F, Alati R, et al. The relationship between age and risky injecting behaviours among a sample of Australian people who inject drugs. *Drug and Alcohol Dependence*. 2013;132(3):541-6.
34. Gindi RM, Rucker MG, Serio-Chapman CE, Sherman SG. Utilization patterns and correlates of retention among clients of the needle exchange program in Baltimore, Maryland. *Drug Alcohol Depend*. 2009;103(3):93-8.
35. Rockwell R, Des Jarlais DC, Friedman SR, Perlis TE, Paone D. Geographic proximity, policy and utilization of syringe exchange programmes. *AIDS Care*. 1999;11(4):437-42.
36. Hutchinson SJ, Taylor A, Goldberg DJ, Gruer L. Factors associated with injecting risk behaviour among serial community-wide samples of injecting drug users in Glasgow 1990-94: implications for control and prevention of blood-borne viruses. *Addiction*. 2000;95(6):931-40.



37. Fast D, Shoveller J, Shannon K, Kerr T. Safety and danger in downtown Vancouver: Understandings of place among young people entrenched in an urban drug scene. *Health & Place*. 2010;16(1):51-60.
38. Werb D, Kerr T, Fast D, Qi J, Montaner JSG, Wood E. Drug-related risks among street youth in two neighborhoods in a Canadian setting. *Health & Place*. 2010;16(5):1061-7.
39. Kerr T, Small W, Peasegood W, Douglas D, Pierre A, Wood E. Harm reduction by a “user-run” organization: A case study of the Vancouver Area Network of Drug Users (VANDU). *International Journal of Drug Policy*. 2006;17(2):61-9.
40. Jones L, Pickering L, Sumnall H, McVeigh J, Bellis MA. Optimal provision of needle and syringe programmes for injecting drug users: A systematic review. *Int J Drug Policy*. 21. Netherlands: 2010 Elsevier B.V; 2010. p. 335-42.
41. Wagner KD, Bloom JJ, Hatzazi SD, Sanders B, Lankenau SE. Control over drug acquisition, preparation and injection: Implications for HIV and HCV risk among young female injection drug users. *ISRN Addict*. 2013;2013.
42. Spittal PMP. Surviving the sex trade: a comparison of HIV risk behaviours among street-involved women in two Canadian cities who inject drugs. *AIDS care*.15(2):187-95.
43. Briggs D, Rhodes T, Marks D, Kimber J, Holloway G, Jones S. Injecting drug use and unstable housing: Scope for structural interventions in harm reduction. *Drugs-Education Prevention and Policy*. 2009;16(5):436-50.
44. Miller CL, Strathdee SA, Kerr T, Li K, Wood E. Factors associated with early adolescent initiation into injection drug use: implications for intervention programs. *J Adolesc Health*. 38. United States 2006. p. 462-4.

45. Podsakoff PM, MacKenzie SB, Lee JY, Podsakoff NP. Common method biases in behavioral research: a critical review of the literature and recommended remedies. *J Appl Psychol.* 88. United States 2003. p. 879-903.
46. Brener ND, Collins JL, Kann L, Warren CW, Williams BI. Reliability of the Youth Risk Behavior Survey Questionnaire. *American Journal of Epidemiology.* 1995;141(6):575-80.
47. Darke S. Self-report among injecting drug users: A review. *Drug and Alcohol Dependence.* 1998;51(3):253-63.
48. Rosenbaum JE. Truth or Consequences: The Intertemporal Consistency of Adolescent Self-report on the Youth Risk Behavior Survey. *American Journal of Epidemiology.* 2009;169(11):1388-97.