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Street-involved youth engaged in sex work at increased risk of syringe sharing

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ABSTRACT

Syringe sharing places street-involved young people at risk of acquiring HIV and hepatitis C. While markers of economic marginalization, such as homelessness, have been linked with syringe sharing and have led to targeted interventions, the relationship between syringe sharing and other markers of economic vulnerability, such as sex work, are not well documented among young people. This study examines whether those engaged in sex work are at increased risk of syringe borrowing and syringe lending among street-involved youth who use injection drugs in Vancouver, Canada. Between September 2005 and May 2014, data was collected from the At-Risk Youth Study (ARYS), a prospective cohort of street involved youth aged 14–26. Generalized estimating equations with a confounding model building approach was used to examine the relationship between sex work and syringe borrowing and lending. 498 youth reported injecting drugs at some point during the study period and were therefore included in the analysis. In multivariable analysis, youth who engaged in sex work were at an elevated risk of both syringe borrowing (Adjusted Odds Ratio (AOR) = 2.17, 95% Confidence Interval [CI] = 1.40–3.36) and syringe lending (AOR = 1.66, 95% CI = 1.07–2.59). Our study found that youth engaged in street-based sex work were at a significantly higher risk of both syringe borrowing and lending among youth who use injection drugs in Vancouver. Ready access to clean syringes, safer working conditions for sex workers to enable risk reduction measures, and increased access to addiction treatment are identified as promising opportunities for reducing syringe sharing in this setting.

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Syringe sharing; injection drug use; sex work; Vancouver; youth

Introduction

Street-involved young people face a number of serious health and social risks as a result of precarious housing status, poverty, and histories of physical and mental trauma (Boivin, Roy, Haley, & Galbaud du Fort, 2005; Elliott, 2013; Farrow, Deisher, Brown, Kulig, & Kipke, 1992; Stoltz et al., 2007). National studies among street-involved youth have found that 28% have engaged in survival sex work (Greene, Ennett, & Ringwalt, 1999) and further that 26% have used injection drugs (Robertson & Toro, 1999). These activities place youth at increased risk of contracting blood borne viruses such as HIV and hepatitis C (Kerr et al., 2009; Noell et al., 2001).

A Canadian surveillance report in 2014 found the prevalence of HIV among youth who use injection drugs aged 15–25 to be 15 times higher than the national average (*HIV and AIDS in Canada: Surveillance Report to December 31, 2014*, 2015). The prevalence of hepatitis C in injection drug using street youth aged 15–24 is even more striking at 18.3% compared with national youth prevalence of 0.2% (*Epi-Update: Hepatitis C virus*

(*HCV in youth aged 15 to 24 years*, 2010). Data from our own setting revealed a significantly higher prevalence and incidence of HCV among young people who inject drugs who also engaged in sex work, compared with those who did not (Shannon et al., 2010). It was hypothesized that this was as a result of syringe sharing among overlapping sex and drug use partners although this has not been conclusively established.

Owing largely to improved needle distribution practices, among adult people who inject drugs (PWID) substantial declines in rates of syringe sharing have been observed in many settings (Bluthenthal, Kral, Gee, Erringer, & Edlin, 2000; C. Des Jarlais et al., 2000; D. C. Des Jarlais et al., 2009; Fatseas et al., 2012; Kerr et al., 2010; Kim, Jin, McFarland, & Raymond, 2015; Langendam, van Brussel, Coutinho, & van Ameijden, 2000; van Ameijden & Coutinho, 1998). In Vancouver for example, among adult PWID, syringe borrowing declined from 20.1% in 1998 to 9.2% in 2003 (Kerr et al., 2010). However, despite this progress, syringe sharing remains prevalent among street-involved youth (Roy, Boudreau,

Leclerc, Boivin, & Godin, 2007; Tassiopoulos, Bernstein, & Bernstein, 2013). Data from our own setting demonstrated that in 2014, 15.9% of youth who use injection drugs reported syringe borrowing (Bozinoff et al., 2017).

Among adult populations, sex work has been found to mediate syringe sharing in multiple settings (Lau et al., 2008; Spittal et al., 2003). Although sexual partnerships that overlap with drug-use partnerships have been hypothesized to account for higher rates of HCV among this group, the association between sex work and syringe sharing among young people has not been firmly established, and could prompt targeted interventions for this group. Given the urgent need to reduce harms associated with injection drug use, we investigated whether young people who engaged in street-based sex work were at increased risk of syringe borrowing and syringe lending after controlling for drug use practices and other known risks factors.

Methods

Data was obtained from the At-Risk Youth Study (ARYS), a prospective cohort of street-involved, drug-using youth in Vancouver, Canada. The study has been described in detail previously (Wood, Stoltz, Montaner, & Kerr, 2006). Briefly, beginning in 2005, extensive street-based outreach methods including nighttime outreach and snowball sampling were used to reach street-involved youth. Youth were eligible to participate if they were between 14 and 26 in age at the time of enrollment, had used illicit drugs other than or in addition to cannabis in the 30 days prior, were street-involved, and were able to provide written informed consent. Street-involved was defined as being temporarily or absolutely without stable housing or having accessed a service for homeless youth in the past six months. To ensure the cohort captures the experiences of young people, it is continually being refreshed through open and ongoing study recruitment.

At baseline and every 6 months thereafter, participants completed an interviewer-administered questionnaire. The questionnaire elicits sociodemographic data and information related to drug use patterns, sexual and drug-related risk behaviors, and access to health and social services. At each study visit, participants receive a stipend of \$30 CAD. This study has been approved by the University of British Columbia's Research Ethics Board.

For the present analysis, 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 includes only active injectors and therefore only observations

involving a report of injection drug use during the last six months were included. Baseline data for this analysis is considered the first visit where injection drug use was reported, and does not necessarily imply first-ever injection drug use. Our outcomes of interest were syringe borrowing (receptive syringe sharing), defined based on an affirmative answer to "In the past 6 months, have you fixed with a rig that had already been used by someone else?" and syringe lending (distributive syringe sharing) defined based on an affirmative answer to the following question: "In the past 6 months have you lent your used rig to someone else?" The primary independent variable was having engaged in sex work, defined as exchanging sex for money, gifts, food, shelter, clothes, or drugs in the last six months (yes vs. no). Participants younger than 18 years of age at the time of the interview were informed prior to completing the questionnaire that a positive response to having engaged in sex work would require the study coordinator to report the participant to child protective services as sex work under the age of 18 years is considered child exploitation rather than sex work. We anticipated that this would result in significant under reporting of sex work engagement and therefore observations from participants under the age of 18 were not included in the current analysis.

To adjust for variables that are known or hypothesized to be associated with both syringe sharing and sex work, we examined a wide range of potential confounders. These included: age (per year older); gender (female vs. male); ethnicity (White vs. other); binge drug use defined as going on drug "runs" or "binges" where drugs were used more than usual (yes vs. no); homelessness defined as having no fixed address, sleeping on the street, couch surfing, or staying in a shelter or hostel (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); daily crystal methamphetamine use via injection or non-injection (yes vs. no); recent incarceration, defined as having been in prison, jail or detention (yes vs. no); and as in previous analyses (Lloyd-Smith, Kerr, Zhang, Montaner, & Wood, 2008; Tyndall et al., 2003) 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?" All drug use and behavioral variables refer to activities or experiences in the past six months.

To assess the relationship between syringe sharing and sex work, we used the Pearson's Chi-square test (dichotomous variables) and the Wilcoxon rank test (continuous variables) to compare covariates of interest at baseline stratified by syringe borrowing and syringe lending.

As a next step, generalized estimating equation (GEE) analysis with a logit link function was applied to assess the independent effect of sex work on syringe borrowing and syringe lending. These methods provide standard errors adjusted by multiple observations per person through an exchangeable working correlation structure. Therefore, data from each follow-up visit that included a report of injection drug use was considered in this analysis. The GEE estimating mechanism allowed us to address missing data by using an all available pairs method to encompass the missing data from dropouts or intermittent missing data. All non-missing pairs of data are used in the estimators of the working correlation parameters.

GEE bivariable analyses were first used to determine factors associated with syringe borrowing and syringe lending respectively. To fit multivariable GEE model, we used a backwards selection process. All variables found to be significantly associated with syringe sharing in bivariable analyses (at p -value < 0.10) were included in a full model. Using a stepwise approach, we subsequently generated a series of reduced models by removing each secondary explanatory variable one at a time. For each of these models we assessed the relative change in the coefficient for sex work. The variable of interest that resulted in the smallest absolute relative change in the coefficient for sex work was then removed. Secondary variables continued to be removed through this process until the smallest relative change in the coefficient for sex work on syringe sharing exceeded 5%. Remaining variables were considered confounders and were included in the final multivariable model. All statistical analyses were performed using SAS software version 9.4 (SAS, Cary, NC, USA). All tests of significance were two-sided.

Results

Between September 2005 to May 2014, 1158 street-involved young people were interviewed as part of the ARYS study. 498 participants reported injecting drugs at some point during the study period and a total of 1369 observations of recent injection drug use were included in the present analysis. At baseline, the median age of our sample was 22.6 years (interquartile range [IQR] = 20.8–24.3), 33.3% (166) of participants were female, and 72.9% (363) were White. 82 (16.5%) reported having engaged in sex work in the last 6 months at baseline. 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).

Thirty-nine participants contributed in total of 46 missing data points among all the covariates included in the analysis. Observations with missing data were deleted from the model fitting.

The baseline characteristics of the study sample stratified by syringe borrowing and syringe lending are presented in [Tables 1](#) and [2](#) respectively.

Generalized Estimating Equations with confounding model analysis to explore the association between sex work, syringe borrowing, and syringe lending while adjusting for socio-demographic, structural, behavioral, and other risk variables are presented in [Tables 3](#) and [4](#) respectively. In the multivariable analysis, having engaged in sex work in the last six months remained significantly and positively associated with syringe borrowing (AOR = 2.17, 95% Confidence Interval [CI] = 1.40–3.36, $p < 0.001$) after adjusting for the following identified confounders: age, ethnicity, and difficulty finding clean needles. Similarly, in multivariable analysis, having engaged in sex work in the last six months remained significantly and positively associated with syringe lending (AOR = 1.66, CI = 1.07–2.59, $p = 0.025$) after adjusting for the following identified confounders: age, ethnicity, binge drug use, and difficulty finding clean needles.

Discussion

Among our sample of street-involved youth, youth engaged in sex work were at a significantly higher risk of syringe borrowing and syringe lending. These observations are consistent with the literature among adult PWID, where sex workers have consistently reported sharing syringes more often than PWID who were not engaged in sex work (Lau et al., 2008; Spittal et al., 2003).

There are a number of possible interpretations of these findings linked to the complexities of sex work and substance use relationships. A 2008 Vancouver study found that the majority (59%) of sex workers reported drug sharing with their clients in the last 6 months. 54% of female sex workers reported crack cocaine pipe sharing while 13% reported borrowing a used syringe (Shannon, Kerr, Bright, Gibson, & Tyndall, 2008). Ethnographic work from San Francisco suggests that young people who use drugs and are engaged in sex work have significant overlap in their sexual and drug use networks and are more likely to have an older partner who may control access to and preparation of drugs (Bourgeois, Prince, & Moss, 2004). Vulnerability to unsafe injection practices may be compounded by the fact that these young people who use drugs may require help with injecting, thereby limiting their control over safe injecting practices (Bourgeois et al., 2004; Kral

Table 1. Baseline characteristics^o of street-involved youth who inject drugs (*n* = 498) stratified by syringe borrowing

Characteristic	Total (%) <i>n</i> = 498	Syringe borrowing*		<i>p</i> -value
		Yes (%) <i>n</i> = 87	No (%) <i>n</i> = 411	
Sex work*	82 (16.5)	23 (26.4)	59 (14.4)	0.006
Age € (median, IQR)	22.6 (20.8–24.3)	22.5 (20.5–24.2)	22.6 (20.8–24.3)	0.661
Female gender	166 (33.3)	36 (41.4)	130 (31.6)	0.080
White	363 (72.9)	72 (82.8)	291 (70.8)	0.024
Binge drug use*	294 (59.0)	60 (69.0)	234 (56.9)	0.040
Daily heroin use*	126 (25.3)	31 (35.6)	95 (23.1)	0.010
Daily cocaine use*	19 (3.8)	7 (8.0)	12 (2.9)	0.024
Daily crystal meth use*	105 (21.1)	18 (20.7)	87 (21.2)	0.896
Homelessness*	373 (74.9)	66 (75.9)	307 (74.7)	0.875
Incarceration*	107 (21.5)	22 (25.3)	85 (20.7)	0.348
Difficulty finding needles*	138 (27.7)	31 (35.6)	107 (26.0)	0.061

Notes: “€” refers to continuous variable, *p*-value is generated from Wilcoxon rank-sum test.

^oCharacteristics were measured at their first visit (during the study period: September 2005 to May 2014) that included a report of injection drug use.

*Refers to activities in the last six months.

Alex, Bluthenthal Ricky, Erringer Elizabeth, Lorvick, & Edlin Brian, 2002; Miller et al., 2002; O’Connell et al., 2005). Public health messaging focused on safe-injection practices are unlikely to result in behavior change where uneven power relations between young PWID and their sex/drug-use partners continues, and where individual “rational” decision making is structurally constrained (Bourgois et al., 2004).

Among adult sex workers, substance use with clients has been associated with higher pay for sex, reduced perceptions of personal risk, and high risk sexual behavior including unprotected sex (Wechsberg et al., 2008). Young people may be motivated to engage in sex work while intoxicated for a number of reasons including active addiction, higher pay (Wechsberg et al., 2008), and in order to dissociate from the present or cope with mental health issues such as depression and anxiety (Mayock, 2005). The reduced perception of personal risk while intoxicated (Wechsberg et al., 2008), may explain risk-taking behavior such as syringe borrowing and syringe lending among young PWID who engage in sex work in our setting. Adolescents and transitional-aged

youth may be particularly vulnerable to this type of disinhibition due to full development of the nucleus accumbens (the pleasure and reward center of the brain) and lack of development of the pre-frontal cortex (responsible for executive function, inhibition, and decision-making) (Casey & Jones, 2010; Zucker, Heitzeg, & Nigg, 2011). If substance use is common during sex work encounters, ready access to clean syringes in all settings where young people find themselves should be a public health priority.

Another potential explanation for our findings relates to the criminalization of both substance use and sex work. Young people in our cohort who support themselves through sex work face the dual threat of criminalization of substance use and sex work, which are both strongly associated with increased drug related (Bozinoff et al., 2017; Small, 2005) and sexual risks (Shannon et al., 2009; Shannon, Kerr, Allinott, et al., 2008). Criminalized and enforcement-based approaches to the regulation of sex work have consistently been linked to elevated risks for violence, and reduced ability to negotiate safer sex transactions, including prevention of HIV and other

Table 2. Baseline characteristics^o of street-involved youth who inject drugs (*n* = 498) stratified by syringe lending.

Characteristic	Total (%) <i>n</i> = 498	Syringe lending*		<i>p</i> -value
		Yes (%) <i>n</i> = 80	No (%) <i>n</i> = 418	
Sex work*	82 (16.5)	22 (27.5)	60 (14.4)	0.004
Age € (median, IQR)	22.6 (20.8–24.3)	22.4 (20.5–23.8)	22.7 (20.8–24.4)	0.384
Female gender	166 (33.3)	30 (37.5)	136 (32.5)	0.388
White	363 (72.9)	65 (81.3)	298 (71.3)	0.044
Binge drug use*	294 (59.0)	59 (73.8)	235 (56.2)	0.004
Daily heroin use*	126 (25.3)	29 (36.3)	97 (23.2)	0.010
Daily cocaine use*	19 (3.8)	7 (8.8)	12 (2.9)	0.013
Daily crystal meth use*	105 (21.1)	20 (25.0)	85 (20.3)	0.365
Homelessness*	373 (74.9)	65 (81.3)	308 (73.7)	0.171
Incarceration*	107 (21.5)	20 (25.0)	87 (20.8)	0.410
Difficulty finding needles *	138 (27.7)	34 (42.5)	104 (24.9)	<0.001

Notes: “€” refers to continuous variable, *p*-value is generated from Wilcoxon rank-sum test.

^oCharacteristics were measured at their first visit (during the study period: September 2005 to May 2014) that included a report of injection drug use.

*Refers to activities in the last six months.

Table 3. Bivariable and multivariable GEE analyses of factors associated with syringe borrowing and sex work, controlling for confounding variables.

Characteristic	Unadjusted		Adjusted	
	Odds ratio (95% CI)	<i>p</i> -value	Odds ratio (95% CI)	<i>p</i> -value
Sex work*	2.24 (1.49–3.37)	<0.001	2.17 (1.40–3.36)	<0.001
Age (per year older)	0.91 (0.84–0.97)	0.008	0.91 (0.85–0.99)	0.023
Female gender	1.20 (0.83–1.73)	0.342		
White	1.70 (1.10–2.62)	0.017	1.64 (1.04–2.59)	0.032
Homelessness*	1.71 (1.23–2.37)	0.001		
Binge drug use*	1.48 (1.11–1.96)	0.008		
Daily heroin use*	1.20 (0.89–1.61)	0.232		
Daily cocaine use*	1.83 (0.89–3.76)	0.099		
Daily crystal meth use*	0.87 (0.57–1.32)	0.499		
Incarceration*	1.23 (0.88–1.71)	0.231		
Difficulty finding needles	2.53 (1.85–3.44)	<0.001	2.31 (1.67–3.20)	<0.001

*Refers to activities in the last 6 months.

STIs (Rhodes, Simic, Baros, Platt, & Zikic, 2008; Shannon & Csete, 2010; Shannon & Montaner, 2012; Simić & Rhodes, 2009; WHO, 2011) and may also shape the syringe sharing risk environment of the young people in this study who support themselves through sex work. Programs and efforts to support sex worker safety should be a priority as this will support their autonomy with respect to the negotiation of sex work transactions and safe injection practices.

Finally, although markers of high intensity substance use were not identified as significant confounders in our study, greater addiction severity among adults has been associated with both sex work and syringe sharing (Gossop, 1993; Gu et al., 2008; Spittal et al., 2003) and

Table 4. Bivariable and multivariable GEE analyses of factors associated with syringe lending and sex work, controlling for confounding variables.

Characteristic	Unadjusted		Adjusted	
	Odds ratio (95% CI)	<i>p</i> -value	Odds ratio (95% CI)	<i>p</i> -value
Sex work*	1.75 (1.13–2.70)	0.012	1.66 (1.07–2.59)	0.025
Age (per year older)	0.90 (0.84–0.97)	0.003	0.92 (0.85–0.99)	0.033
Female gender	1.32 (0.91–1.92)	0.149		
White	1.94 (1.22–3.08)	0.005	1.80 (1.13–2.86)	0.013
Homelessness*	2.06 (1.43–2.96)	<0.001		
Binge drug use*	1.75 (1.26–2.42)	<0.001	1.60 (1.13–2.26)	0.009
Daily heroin use*	1.25 (0.87–1.79)	0.223		
Daily cocaine use*	1.61 (0.76–3.39)	0.213		
Daily crystal meth use**	1.14 (0.75–1.74)	0.548		
Incarceration*	1.46 (0.99–2.15)	0.054		
Difficulty finding needles*	2.23 (1.57–3.16)	<0.001	1.91 (1.32–2.75)	<0.001

*Refers to activities in the last 6 months.

may explain the relationship between sex work and syringe sharing among our sample. Increased addiction severity may result in more frequent drug administration leading to both more opportunities to use unsterile syringes, and increased need for means to pay for drugs. Reasons young people have difficulty seeking addiction treatment are numerous, and include perceived and real discrimination from healthcare workers, fear of being reported to police or child protection authorities, and organizational barriers such as requiring a fixed address (Barker, Kerr, Nguyen, Wood, & DeBeck, 2015; Haley & Roy, 1999; Phillips et al., 2014; Phillips et al., 2015). Efforts to increase access to addiction treatment, particularly that is trauma-informed, should be a priority.

Our study is not without limitations. Our data collection was based on self-report and therefore subject to response bias. These may include under-reporting of substance use and stigmatized activities such as sex work. However, self-reported drug use behavior has been found to be largely accurate among adult and young PWID (Brenner, Collins, Kann, Warren, & Williams, 1995; Darke, 1998). Additionally, the ARYS cohort is not a random sample, and as such may be subject to selection bias. However, extensive street-based outreach was undertaken, and the demographics of the ARYS cohort are consistent with other samples of street-involved youth in Vancouver (Miller, Strathdee, Kerr, Li, & Wood, 2006). Further, our measure for sex work engagement included transactions for money, gifts, food, shelter, clothes, or drugs, but cannot differentiate among the transactional elements. Additional study to determine if different transactional elements (exchanging sex for money vs. shelter vs. drugs) are associated with different risks profiles and behaviors would be of benefit.

In summary, our study found that youth who engaged in sex work were at a significantly higher risk of both syringe borrowing and lending among street-involved, drug-using youth in Vancouver. Complex overlaps of sex work and drug use relationships, criminalization, and addiction severity may account for the observed association between sex work and both syringe borrowing and syringe lending. Ready access to clean syringes, safer working conditions for sex workers to enable risk reduction measures, and increased access to addiction treatment are identified as promising opportunities for reducing syringe sharing in this setting.

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Disclosure statement

No potential conflict of interest was reported by the authors.

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