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Increasing Awareness about HIV Prevention among Young People Who Initiated Injection Drug Use in a Canadian Setting, 1988–2014

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Abstract

Background—Globally, harm reduction interventions, including needle and syringe programs (NSPs), have been shown to reduce HIV risks among people who inject drugs (PWID). However, little is known about the impact of these efforts on the circumstances of first injection. Therefore, we sought to identify changes in the awareness about HIV prevention and syringe borrowing at the time of first injection drug use in Vancouver, Canada, during a period of NSP expansion.

Methods—Data were drawn from prospective cohorts of PWID in Vancouver, who initiated injecting between 1988 and 2014. Multivariable regression was used to assess changes in the awareness about HIV and NSPs and syringe borrowing behaviour at first injection against calendar year of first injection.

Results—Among 1,044 participants (36.9% female), at the time of first injection 73.9% reported having known syringe sharing was an HIV risk, 54.1% reported having heard of NSPs, and 7.8% reported having borrowed a syringe used by others. In multivariable analyses, calendar year of

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CONFLICT OF INTEREST

None declared.

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first injection was independently and positively associated with awareness about HIV (adjusted prevalence ratio [APR]: 1.09; 95% confidence interval [CI]: 1.06, 1.11) and awareness about NSPs (APR: 1.18; 95% CI: 1.13, 1.24). While calendar year of first injection was significantly and negatively associated with syringe borrowing at first injection in bivariable analyses, the association did not remain significant in multivariable analyses (adjusted odds ratio: 0.90; 95% CI: 0.72, 1.14).

Conclusions—We found that awareness about HIV and NSPs at first injection have increased over time amongst PWID in this setting. However, declining trends in syringe borrowing at first injection were not determined after adjustment for socio-demographic characteristics. This suggests that HIV prevention efforts may have contributed to increased awareness about HIV prevention, but further research is needed to identify sub-populations at heightened risk of HIV at first injection.

Keywords

HIV; needle and syringe programs; harm reduction; injection drug use

INTRODUCTION

Injection drug use represents increased vulnerability to the human immunodeficiency virus (HIV) and remains a critical global issue. In 2013, there were an estimated 35 million people living with HIV globally. Outside of sub-Saharan Africa, 30% of new HIV infections were occurring amongst people who inject drugs (PWID), notably through the sharing of contaminated injection equipment (Joint United Nations Programme on HIV/AIDS, 2014b). It is also estimated that worldwide there are nearly 12.7 million PWID with roughly 1.7 million or 13% living with HIV (United Nations Office on Drugs and Crime, 2014). The prevalence of HIV amongst PWID remains almost 28 times as high as that in the general population (Joint United Nations Programme on HIV/AIDS, 2014a). Because HIV transmission through contaminated injection equipment is highly efficient, HIV can be rapidly spread in networks of PWID once introduced. For example, in the Middle East and Northern Africa, where HIV epidemics have primarily been driven by unprotected sexual behaviour, recent reviews have shown that injection drug use has recently emerged as a major driver of the epidemics (Joint United Nations Programme on HIV/AIDS, 2014b; Mumtaz, Riedner, & Abu-Raddad, 2014). Thus, PWID continue to represent a key population for the global HIV/AIDS response.

Fortunately, over the past two decades, a number of evidence-based public health interventions have been developed in response to HIV transmission amongst PWID. These include needle and syringe programmes (NSPs) (Wodak & Cooney, 2006; World Health Organization, 2004b; World Health Organization, United Nations Office for Drug Control, Joint United Nations Programme on HIV/AIDS, 2004), opioid agonist therapies (Mattick, Breen, Kimber, & Davoli, 2009; World Health Organization, 2004a), and targeted education (Aggleton, Jenkins, & Malcolm, 2005; Ball A, Weiler G, Beg M, Doupe A, 2005; Harm Reduction International, 2014); they have been endorsed by the United Nations agencies as key interventions to prevent HIV infection amongst PWID (United Nations Office on Drugs and Crime, Joint United Nations Programme on HIV/AIDS, 2012).

While a substantial amount of research has been done on the favorable impact of these public health interventions on HIV incidence amongst established PWID (Bastos & Strathdee, 2000; C. Des Jarlais et al., 2000; D. C. Des Jarlais, 2000a, 2000b; Monterroso et al., 2000; Vlahov, Robertson, & Strathdee, 2010), little is known about the effect of these interventions on young people who are initiating injection drug. This is a growing concern as a recent estimate of prevalence of HIV amongst young PWID under 25 years old was as high as 5.2% (Joint United Nations Programme on HIV/AIDS, 2014a). This indicates that there is a need to understand the awareness of young PWID regarding HIV risk behaviour and prevention at the onset of injection drug use.

Vancouver, Canada, experienced an explosive HIV outbreak amongst PWID in the mid-1990s, particularly in the city's Downtown Eastside neighbourhood, which houses close to one third of the PWID in Vancouver (Hyshka, Strathdee, Wood, & Kerr, 2012). This outbreak was characterized by some of North America's highest HIV incidence rates, despite the presence of public health efforts to prevent HIV implemented in this setting, including NSPs that were initiated in 1988 (Hyshka et al., 2012; Strathdee, Patrick, Currie, et al., 1997). Accordingly, many questioned how this HIV outbreak could have occurred in the years following the initiation of NSPs (Nosyk et al., 2012; Wood et al., 2003, 2009). After extensive research, it became clear that Vancouver's PWID had a lot of difficulty in accessing sterile drug paraphernalia because of restrictive syringe exchange policies as well as programmatic barriers, such as limited NSP facilities and hours of operation (Hyshka, Strathdee, Wood, & Kerr, 2012; Strathdee et al., 1997). Thus, even though NSPs were in place, they were not being optimally used by PWID. Fortunately, improvements were made to the NSPs in the early 2000s (Hyshka et al., 2012), which have led to declining rates of syringe sharing amongst PWID (Kerr et al., 2010). The existence of public health interventions that have been shown to reduce HIV risks among established PWID (Bastos & Strathdee, 2000; Monterroso et al., 2000; Wood et al., 2009) and the presence of large long-running prospective cohort studies of PWID beginning in 1996 in Vancouver make it an ideal setting to examine trends of awareness about HIV prevention and HIV risk behaviour amongst people who initiate injection drug use over a period of more than two decades. Our hypothesis for the present study was that PWID's awareness about HIV and NSPs at the time of first injection have risen with time, while rates of syringe borrowing (i.e., receptive syringe sharing) have decreased with time presumably because of the improvements in public health policy and NSPs in this setting.

METHODS

Study design

Data for this analysis were derived from the assessments of a series of ongoing open prospective cohort studies involving people who use drugs, including the At-Risk Youth Study (ARYS), the AIDS Care Cohort to evaluate Exposure to Survival Services (ACCESS), and the Vancouver Injection Drug Users Study (VIDUS). The VIDUS study began enrolment in May 1996 and recruits individuals who injected drugs in the month prior to enrolment through word of mouth, street out-reach, and referrals. In 2005, the original VIDUS cohort was divided into two separate studies: VIDUS now follows HIV-negative

PWID and ACCESS follows HIV-positive drug users residing in the Greater Vancouver area. The ARYS began in late 2005 and is made up of street-involved youth who report use of drugs other than or in addition to cannabis and are aged 14–26 (Wood, Stoltz, Montaner, & Kerr, 2006).

Sampling and follow-up methodologies for the three cohort studies have been described in detail previously (Nosyk et al., 2012; Strathdee, Patrick, Archibald, et al., 1997; Wood et al., 2009; Wood, Stoltz, Montaner, et al., 2006). Specific eligibility criteria were outlined in other articles; however, general eligibility across all three cohorts required age of at least 14 years, residence in the Greater Vancouver region, and the provision of informed consent. At baseline and semi-annually thereafter, participants complete an interviewer-administered questionnaire that elicits information pertaining to sociodemographic characteristics, drug use, treatment utilization, and HIV risk behaviours. Nurses obtain blood specimens for HIV and Hepatitis C Virus (HCV) serology, and HIV disease monitoring (e.g., CD4 counts, HIV-1 RNA) where appropriate. Participants receive \$20 CAD for each visit. All studies utilize harmonized recruitment and data collection tools, enabling us to combine data from studies with different inclusion criteria. The University of British Columbia and Providence Health Care Research Ethics Boards have approved these studies.

Study participants and measures

For the present analysis, all cohort participants who were enrolled in any of the three cohorts (ARYS, ACCESS, and VIDUS) between June 1, 2006 and May 31, 2014 were considered for inclusion. Eligibility criteria included: (1) all cohort participants who reported a history of injection drug use at study enrolment and who initiated injection drug use on or after 1988; or (2) ARYS participants who were injection-naïve at baseline and who initiated injecting during follow-up. The year of 1988 was selected as the beginning of the study period as a large NSP begun to operate in Vancouver in 1988 (Hyshka et al., 2012).

The present analysis had three main outcomes: (1) awareness about HIV at the time of first injection, defined by answering “yes” or “no” to a question: “When you shot up for the first time, did you know a person could get HIV-infected by sharing needles?”; (2) awareness about NSPs at the time of first injection, defined by answering “yes” or “no” to a question: “Before you first injected, had you ever heard of needle distribution, where people can get needles for free?”; and (3) syringe borrowing at the time of first injection, defined by answering “yes” or “no” to a question: “The first time you fixed, did you use a needle that someone else had used?” While the first two outcomes were significantly correlated ($p < 0.001$), we considered them as two separate outcomes given that they were conceptually different, as well as because 258 of 1,044 (24.7%) participants reported awareness about one but not the other.

Explanatory variables that were hypothesized to be associated with each of the three outcomes included: calendar year intervals of first injection (1988–1992–1993–1997–1998–2002–2003–2007–2008–2014); ethnicity (Caucasian vs. others); age at first injection (per year older); gender (female vs. men who have sex with men [MSM] vs. heterosexual male); a history of engagement in sex work (yes vs. no); neighborhood or city of residency at first injection (the Downtown Eastside [one of the oldest and poorest neighbourhoods in

Vancouver, including Chinatown, Gastown, Oppenheimer Park, Strathcona, Thornton Park and Victory Square, as well as the industrial area to the North vs. other areas in the Lower Mainland] vs. the area surrounding and including Vancouver vs. outside the Lower Mainland); level of education (completed high school or higher vs. less than high school); and cohort designation at the time of interview (VIDUS vs. ACCESS vs. ARYS). For the calendar year variable, we used four-year intervals for ease of interpretation of trends in longer time periods. However, for all regression analyses, we also conducted sensitivity analyses in which the calendar year was treated as a continuous variable. For syringe borrowing, we included two additional variables: awareness of HIV and/or NSP at first injection (no to both vs. yes to either vs. yes to both), and assisted injection at first injection (yes vs. no).

Statistical analysis

First, we used descriptive statistics to examine the sample characteristics using data collected at the baseline interview (or a follow-up interview for ARYS participants who initiated injection drug use during follow-up) where circumstances of first injection were asked. We plotted proportions of participants reporting awareness about HIV and NSPs as well as syringe borrowing at the time of first injection over the four-year calendar intervals of first injection between 1988 and 2014. Trends were examined using the Cochran-Mantel-Haenszel test for ordinal data.

Because the HIV epidemic in Vancouver has also been concentrated among MSM and sex workers (McInnes et al., 2009), we also examined the HIV prevalence among participants who identified themselves as MSM and who reported a history of engagement in sex work, respectively, as well as the number of ARYS participants among these sub-samples who were HIV-positive prior to initiating injection drug use.

Since the frequency of two outcomes (awareness about HIV and NSPs) exceeded 10%, we used the prevalence ratio as a measure of association for these two outcomes (McNutt, Wu, Xue, & Hafner, 2003), whereas the odds ratio was used for syringe borrowing at first injection. Accordingly, we used the simple log-binomial regression (for the first two outcomes) and logistic regression (for syringe borrowing) to examine bivariate associations with the explanatory variables. Then, we used an *a priori*-defined statistical protocol that examined factors associated with each of the three outcomes by fitting a multivariable regression model that included all variables that were significantly associated with each of the three outcomes at the p -values < 0.10 level in bivariable analyses. All p -values were two-sided. All statistical analyses were performed using SAS software version 9.3 (SAS, Cary, NC).

RESULTS

Summary statistics

In total, 1,044 PWID were eligible for this analysis. The sample characteristics at the time of interview are described in Table 1 for the total sample and by individual cohorts. As shown, the median age at the time of interview was 28.7 years (interquartile range [IQR]: 22.8–

37.6). Most participants were heterosexual male (58.7%), Caucasian (62.2%), received less than high school education (56.7%), and had experienced homelessness (91.2%). Two hundred and eighty-one (26.9%) were HIV-positive and 576 (55.2%) were HCV-positive. The two most common drug use patterns reported during the six months prior to the interview were at least daily heroin injection (23.7%) and crack smoking (28.9%).

In total, 46 (4.4%) participants identified themselves as MSM, and 28 of them were HIV-positive at the time of interview. Of these, only one individual in the ARYS study reported being HIV-positive prior to initiating injection drug use. For the remaining 27 individuals, it was unknown which of the HIV infection or initiation of injection drug use preceded. A total of 284 (27.2%) reported having ever engaged in sex work, and 80 of them were HIV-positive. As none of these 80 individuals were enrolled in ARYS, it was unknown which of the HIV infection or initiation of injection drug use preceded.

The median age at first injection was 20.0 years (IQR: 17.0–26.0). Four-year calendar year intervals of first injection between 1988 and 2014 were almost equally distributed among this sample (range: 17.0–23.6%). At first injection, the majority of participants had awareness about HIV (73.9%) and NSPs (54.1%), and only a minority engaged in syringe borrowing (7.8%).

Figure 1 shows the trends of syringe borrowing and awareness about HIV and NSPs at first injection among the entire sample, as well as stratified by cohorts. As shown, among the entire sample, percent reporting awareness about HIV and NSPs at first injection increased with time (Cochran-Mantel-Haenszel test p -value <0.001), while percent reporting syringe borrowing at first injection decreased with time (Cochran-Mantel-Haenszel test p -value <0.001).

Bivariable and Multivariable Analyses

Table 2 shows the results of bivariable and multivariable regression analyses. As shown, in multivariable analyses, calendar year of first injection (per four years later) was independently and positively associated with awareness about HIV (adjusted prevalence ratio [APR]: 1.09; 95% confidence interval [CI]: 1.06, 1.11) and NSPs at first injection (APR: 1.18; 95% CI: 1.13, 1.24). While calendar year of first injection was significantly and negatively associated with syringe borrowing at first injection in bivariable analyses (odds ratio: 0.75; 95% CI: 0.64, 0.89), the association did not remain significant in multivariable analyses (adjusted odds ratio [AOR]: 0.90; 95% CI: 0.72, 1.14). In sensitivity analyses, the calendar year of first injection (per year later) was independently and positively associated with awareness about HIV (APR: 1.01; 95% CI: 1.00, 1.01; $p < 0.001$) and NSPs (APR: 1.03; 95% CI: 1.02, 1.03; $p < 0.001$), but not with syringe borrowing (AOR: 0.99; 95% CI: 0.95, 1.03; $p = 0.638$).

Female gender was independently and positively associated with syringe borrowing at first injection (AOR: 1.69; 95% CI: 1.05, 2.71), while living in the Downtown Eastside was negatively associated with syringe borrowing at first injection (AOR: 0.51; 95% CI: 0.27, 0.95). Living in the Downtown Eastside (APR: 1.35; 95% CI: 1.19, 1.54) or other areas of the Lower Mainland (APR: 1.26; 95% CI: 1.10, 1.44) was independently and positively

associated with NSP awareness at first injection, however, this was not the case for HIV awareness at first injection. Compared to ARYS, those who were enrolled in ACCESS were less likely to have been aware about HIV at first injection (APR: 0.85; 95% CI: 0.76, 0.94).

DISCUSSION

Among our sample of PWID in Vancouver who initiated injection drug use between 1988 and 2014, we found that awareness of HIV and NSPs at first injection has significantly increased over time after adjusting for socio-demographic characteristics. Similarly, rates of syringe borrowing at first injection have significantly decreased in bivariable analyses, although the declining rates were not determined to be significant in multivariable analyses.

Although the present study did not assess the impact of direct exposure to public health interventions, these findings suggest that various HIV prevention efforts that have been implemented in Vancouver since 1988 may have contributed to increasing awareness of HIV risks and HIV prevention tools among young people who have started to inject drugs in this setting. This finding is consistent with a large body of literature indicating the effectiveness of NSPs and other public health education campaigns in increasing awareness about HIV risks among established PWID (D. C. Des Jarlais, 2000b; Hyska et al., 2012; Kerr, Tyndall, Li, Montaner, & Wood, 2005; Mathers et al., 2008; Monterosso et al., 2000). It is also possible that the opening of a supervised injection facility in Vancouver's Downtown Eastside in September 2003 may also have had an impact on the awareness of HIV and NSPs amongst new PWID. Although the opening of the facility itself unlikely had a direct impact on those who had not initiated injecting by then, it has gained a lot of media attention and therefore may have served to increase public awareness about HIV risks associated with injection drug use (Dooling & Rachlis, 2010; Drucker, 2006; Jozaghi & Andresen, 2013). Unfortunately, it was not possible to identify the channels through which participants obtained information on HIV and NSPs in the present study. In light of the recent information technological development, future research should seek to identify effective modes of public health education among people at risk of initiating injection drug use.

The finding that the association between calendar year of first injection and syringe borrowing at first injection did not remain significant in multivariable analyses warrants further research. Our results suggest that there might be some confounding effects through gender. Future research should take these factors into account and also explore other factors that may be associated with syringe borrowing at first injection. Given that young PWID with presumably short injecting careers are at particularly high risk of HIV infection (Joint United Nations Programme on HIV/AIDS, 2014a), identifying sub-populations of young PWID who may be vulnerable to HIV risk at the onset of injection drug use will serve to help improve how we target and design HIV prevention efforts.

The findings that those who resided in the Downtown Eastside neighbourhood at the time of first injection were more likely to be aware of NSPs and less likely to borrow used syringes at first injection suggest the potential benefit of widespread NSPs and other harm reduction programs targeting established PWID to new PWID. As discussed previously, this

neighbourhood is home to concentrated epidemics of injection drug use and HIV (Hyshka et al., 2012). Thus, the decreased risk of syringe borrowing among the residents in the neighbourhood appears counter-intuitive. However, this area is also characterized by high availability of syringe outlets and other low-threshold health and harm reduction services (Shannon et al., 2008), which may have helped reduce the risk of syringe borrowing. Taken together with the finding that awareness about HIV and/or NSPs alone was not significantly associated with decreased risk of syringe borrowing at first injection, our study highlights the importance of ensuring the availability of sterile syringes in a setting where injection drug use may occur. While the number of countries supporting and implementing NSPs and other harm reduction programs is increasing, the coverage of such interventions remains low in many settings (Harm Reduction International, 2014). In particular, some countries, including Iceland, Turkey, and Trinidad and Tobago are still opposed to NSPs despite having PWID populations (Harm Reduction International, 2014), possibly out of fear that such programs increases injection drug use. However, there is no scientific evidence that NSPs increase injection drug use (Kerr et al., 2005). Given that injection drug use continues to drive HIV epidemics in many settings and is also associated with many other infections (e.g., HCV, infective endocarditis, osteomyelitis) through the same injecting behaviour that increases HIV risk, and considering our findings indicating the potential benefit of widespread syringe availability to new PWID, it is important to make sure that both established and new PWID have access to sterile injection equipment.

There are some limitations with respect to our study. First, self-reported data may have been susceptible to reporting biases, including recall bias and socially desirable reporting. In particular, these may have led to underestimating the rates of undesirable behaviours (i.e., syringe borrowing) or overestimating the rates of desirable behaviours (i.e., awareness about HIV and NSPs). However, since participants were blinded to the eventual use of the data, we believe it would affect the different calendar years similarly, so that the overall trends would be affected by the same degree. In addition, recall periods may have been different across the cohorts: VIDUS and ACCESS participants would have to recall injection initiation that occurred many years prior, while ARYS participants who initiated injecting during follow-up would be recalling a much more recent event. Second, as with any observational study, the observed relationships between the explanatory variables and outcomes may be under the influence of unmeasured confounding, although we sought to address this bias with multivariable adjustment involving key demographic and behavioral characteristics. Third, as our sample was not randomly selected, our findings may not be generalizable to other populations of PWID. Fourth, we were unable to assess the role of social networks, such as levels of engagement with drug-using peers and exposure to PWID prior to first injection, in influencing the outcomes because of limitations in appropriate variables in our data set.

In summary, we found that awareness about HIV prevention has increased among young people who initiated injection drug use in Vancouver between 1988 and 2014. These findings suggest that the wide array of HIV prevention efforts implemented in this setting during the past two decades may have contributed to reduced HIV risks among this population. Although our study did not identify significant declines in syringe borrowing at first injection over time, this points to a need for further research to identify sub-populations

who may be at heightened risk of engaging in HIV risk behaviour at the onset of injection drug use.

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Highlights

We utilized data from long-running prospective cohorts of people who inject drugs.

We examined changes in the knowledge of HIV risk at the time of first injection during 1998–2014.

Knowledge has significantly increased over time during a period of NSP expansion. 7.8% engaged in receptive syringe sharing at first injection.

Future research should identify sub-populations at elevated HIV risk at first injection.

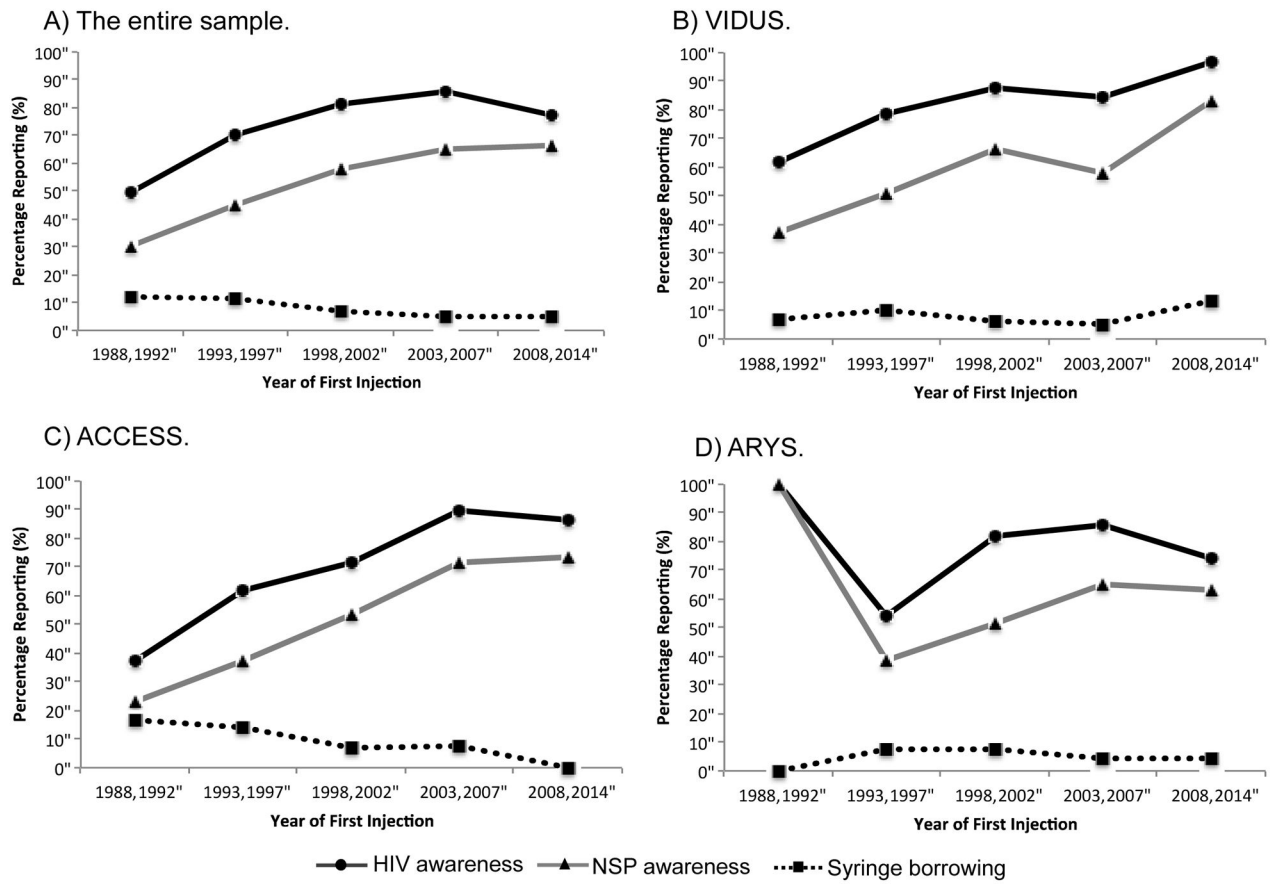


Figure 1. Percentage reporting awareness of HIV and Needle and Syringe Programs and syringe borrowing against calendar year of first injection in all cohorts, and stratified by individual cohorts.

Table 1

Sample characteristics of PWID cohort participants in Vancouver, Canada, who first injected drugs between 1988 and 2014 ($n = 1044$).

Characteristics	Total	ARYS	ACCESS	VIDUS
	$n=1044$ (%)	$n=419$ (%)	$n=279$ (%)	$n=346$ (%)
Characteristics at the time of interview				
Age (median, IQR)	28.7 (22.8–37.6)	22.2 (20.5–24.0)	39.3 (33.1–45.1)	34.0 (29.2–39.1)
Less than high school education	592 (56.7)	266 (63.5)	151 (54.1)	175 (50.6)
Caucasian	649 (62.2)	296 (70.6)	146 (52.3)	207 (59.8)
Gender				
Heterosexual male	613 (58.7)	261 (62.3)	156 (55.9)	196 (56.7)
MSM	46 (4.4)	17 (4.1)	27 (9.7)	2 (0.6)
Female	385 (36.9)	141 (33.6)	96 (34.4)	148 (42.8)
Ever been homeless	952 (91.2)	391 (93.3)	245 (87.8)	316 (91.3)
Drug use patterns in the previous 6 months				
At least daily heroin injection	247 (23.7)	57 (13.6)	48 (17.2)	142 (41.0)
At least daily cocaine injection	60 (5.8)	3 (0.7)	20 (7.2)	37 (10.7)
At least daily crystal meth injection	84 (8.1)	32 (7.6)	14 (5.0)	38 (11.0)
At least daily crack smoking	302 (28.9)	69 (16.5)	93 (33.3)	140 (40.5)
Ever incarcerated	245 (23.5)	111 (26.5)	51 (18.3)	83 (24.0)
Ever engaged in sex work	284 (27.2)	93 (22.2)	80 (28.7)	111 (32.1)
Ever accessed any drug addiction treatment	741 (71.0)	240 (57.3)	222 (79.6)	279 (80.6)
HIV seropositivity	281 (26.9)	2 (0.5)	279	0
HCV seropositivity	576 (55.2)	78 (18.6)	230 (82.4)	268 (77.5)
Circumstances of first injection				
Age at first injection (median, IQR)	20.0 (17.0–26.0)	19.0 (17.0–21.0)	25.0 (19.0–34.0)	22.0 (18.0–29.0)
Awareness about HIV (yes)	771 (73.9)	329 (78.5)	170 (60.9)	272 (78.6)
Awareness about NSPs (yes)	565 (54.1)	257 (61.3)	119 (42.7)	189 (54.6)
Syringe borrowing (yes)	81 (7.8)	20 (4.8)	33 (11.8)	28 (8.1)
Calendar year of first injection				
1988 – 1992	178 (17.0)	1 (0.2)	91 (32.6)	86 (24.9)
1993 – 1997	203 (19.4)	13 (3.1)	78 (27.9)	112 (32.4)
1998 – 2002	202 (19.4)	66 (15.8)	56 (20.1)	80 (23.1)
2003 – 2007	215 (20.6)	138 (32.9)	39 (14.0)	38 (11.0)
2008 – 2014	246 (23.6)	201 (48.0)	15 (5.4)	30 (8.6)
Neighborhood/city of residence				
Outside of Lower Mainland	392 (37.6)	158 (37.7)	111 (39.8)	123 (35.6)
Other areas of Lower Mainland	252 (24.1)	95 (22.7)	63 (22.6)	94 (27.2)
Vancouver's Downtown Eastside	300 (28.7)	69 (16.5)	104 (37.3)	127 (36.7)
Assisted injection by:				
Friend	424 (40.6)	159 (38.0)	123 (44.1)	142 (41.0)
Acquaintance	86 (8.2)	28 (6.7)	24 (8.6)	34 (9.8)

Characteristics	Total	ARYS	ACCESS	VIDUS
	<i>n=1044 (%)</i>	<i>n=419(%)</i>	<i>n=279 (%)</i>	<i>n=346(%)</i>
Family member	56 (5.4)	13 (3.1)	18 (6.5)	25 (7.3)
Boyfriend/girlfriend/partner	96 (9.2)	30 (7.2)	29 (10.4)	37 (10.7)
Pimp	0	0	0	0
Trick/Client/John	2 (0.2)	1 (0.2)	0	1 (0.3)
Sex worker/"co-worker"	4 (0.4)	2 (0.5)	1 (0.4)	1 (0.3)
Dealer	18 (1.7)	5 (1.2)	8 (2.9)	5 (1.5)
Inmate/prisoner	5 (0.5)	2 (0.5)	0	3 (0.9)
Stranger	5 (0.5)	0	2 (0.7)	3 (0.9)

PWID = People Who Inject Drugs; IQR = Interquartile Range; ARYS = At-Risk Youth Study; ACCESS = AIDS Care Cohort to evaluate Exposure to Survival Services; VIDUS = Vancouver Injection Drug Users Study; NSP = Needle and Syringe Program; MSM = Men who have Sex with Men

Table 2

Bivariable and Multivariable Regression Analyses of Factors associated with HIV Awareness, NSP Awareness and Syringe Borrowing at First Injection among PWID in Vancouver, Canada ($n = 1044$).

Variable	Awareness about HIV			Awareness about NSP			Syringe borrowing				
	PR (95% CI)	P-value	APR (95% CI)	PR (95% CI)	P-value	APR (95% CI)	P-value	OR (95% CI)	P-value	AOR (95% CI)	P-value
Calendar year interval of first injection (per 4 years later)	1.08 (1.05, 1.10)	<0.001	1.09 (1.06, 1.11)	1.17 (1.13, 1.22)	<0.001	1.18 (1.13, 1.24)	<0.001	0.75 (0.64, 0.89)	<0.001	0.90 (0.72, 1.14)	0.381
Age at first injection (per year older)	1.00 (0.99, 1.00)	0.775		1.00 (0.99, 1.01)	0.311			1.00 (0.98, 1.03)	0.814		
Ethnicity											
Other	reference			reference				reference			
Caucasian	1.03 (0.96, 1.11)	0.453		1.02 (0.91, 1.15)	0.692			0.81 (0.51, 1.29)	0.381		
Gender											
Heterosexual male	reference			reference				reference			
MSM	1.08 (0.93, 1.25)	0.324		1.08 (0.84, 1.39)	0.554			1.02 (0.30, 3.43)	0.979	0.90 (0.26, 3.16)	0.875
Female	1.01 (0.94, 1.09)	0.829		1.01 (0.90, 1.13)	0.884			1.65 (1.04, 2.63)	0.034	1.69 (1.05, 2.71)	0.031
Ever engaged in sex work											
No	reference			reference				reference			
Yes	0.99 (0.91, 1.07)	0.784		0.99 (0.87, 1.12)	0.846			1.37 (0.85, 2.23)	0.199		
Assisted injection at first injection											
No	reference							reference			
Yes								1.40 (0.84, 2.33)	0.194		
Awareness about HIV and/or NSPs											
Yes to both								reference		reference	
Yes to either								1.23 (0.69, 2.19)	0.477	0.99 (0.54, 1.80)	0.970
No to both								1.99 (1.17, 3.39)	0.011	1.61 (0.88, 2.95)	0.123
Neighborhood/City											
Outside of Lower Mainland	reference			reference				reference		reference	
Other areas of Lower Mainland	1.08 (0.99, 1.18)	0.061	1.00 (0.94, 1.06)	1.36 (1.17, 1.57)	<0.001	1.26 (1.10, 1.44)	<0.001	0.91 (0.53, 1.56)	0.729	0.95 (0.54, 1.67)	0.867
Downtown Eastside	1.09 (1.00, 1.18)	0.046	1.05 (0.97, 1.13)	1.48 (1.29, 1.70)	<0.001	1.35 (1.19, 1.54)	<0.001	0.54 (0.30, 0.97)	0.040	0.51 (0.27, 0.95)	0.034

Variable	Awareness about HIV			Awareness about NSP			Syringe borrowing				
	PR (95% CI)	P-value	APR (95% CI)	P-value	PR (95% CI)	APR (95% CI)	P-value	OR (95% CI)	P-value	AOR (95% CI)	P-value
Education											
Less than high school	reference				reference			reference			
High school completion or higher	1.05 (0.98, 1.13)	0.186			1.00 (0.89, 1.12)	0.990		1.13 (0.71, 1.82)	0.610		
Cohort											
ARYS	reference				reference			reference			reference
ACCESS	0.76 (0.69, 0.85)	<0.001	0.85 (0.76, 0.94)	0.002	0.68 (0.59, 0.80)	<0.001	0.86 (0.73, 1.01)	0.065	2.70 (1.51, 4.81)	<0.001	1.82 (0.86, 3.86)
VIDUS	0.99 (0.92, 1.06)	0.757	0.99 (0.92, 1.06)	0.710	0.88 (0.78, 0.99)	0.041	1.01 (0.91, 1.13)	0.814	1.71 (0.95, 3.10)	0.076	1.18 (0.56, 2.48)

PR = Prevalence Ratio; APR = Adjusted Prevalence Ratio; CI = Confidence Interval; OR = Odds Ratio; AOR = Adjusted Odds Ratio; PWID = People Who Inject Drugs; IQR = Interquartile Range; ARYS = At-Risk Youth Study; ACCESS = AIDS Care Cohort to evaluate Exposure to Survival Services; VIDUS = Vancouver Injection Drug Users Study; NSP = Needle and Syringe Program; MSM = Men who have Sex with Men