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Low perceived benefits and self-efficacy are associated with hepatitis C virus (HCV) infection-related risk among injection drug users

Joseph Cox[a,b,c,*], **Prithwish De**[a], **Carole Morissette**[b], **Claude Tremblay**[b], **Randolph Stephenson**[c], **Robert Allard**[a], **Lisa Graves**[c], and **Élise Roy**[a,b]

[a] McGill University, Montreal, QC, Canada

[b] Montreal Public Health Department, Montreal, QC, Canada

[c] Jewish General Hospital, Montreal, Canada

Abstract

Hepatitis C prevention counselling and education are intended to increase knowledge of disease, clarify perceptions about vulnerability to infection, and increase personal capacity for undertaking safer behaviours. This study examined the association of drug equipment sharing with psychosocial constructs of the AIDS Risk Reduction Model, specifically, knowledge and perceptions related to hepatitis C virus (HCV) among injection drug users (IDUs). Active IDUs were recruited between April 2004 and January 2005 from syringe exchange and methadone maintenance treatment programs in Montreal, Canada. A structured, interviewer-administered questionnaire elicited information on drug preparation and injection practices, self-reported hepatitis C testing and infection status, and AIDS Risk Reduction Model constructs. Separate logistic regression models were developed to examine variables in relation to: (1) the sharing of syringes, and (2) the sharing of drug preparation equipment (drug containers, filters, and water). Among the 321 participants, the mean age was 33 years, 70% were male, 80% were single, and 91% self-identified as Caucasian. In the multivariable analyses, psychosocial factors linked to syringe sharing were lower perceived benefits of safer injecting and greater difficulty to inject safely. As with syringe sharing, the sharing of drug preparation equipment was associated with lower perceived benefits of safer injecting but also with low self-efficacy to convince others to inject more safely. Interventions should aim to heighten awareness of the benefits of risk reduction and provide IDUs with the skills necessary to negotiate safer injecting with their peers.

Keywords

Knowledge; Self-efficacy; Risk perceptions; Hepatitis C; Injection drug use; Canada

[*]Corresponding author. Department of Epidemiology & Biostatistics, McGill University, Montreal, QC, Canada. jcox@santepub-mtl.qc.ca (J. Cox).

Introduction

Perceptions about drug-related risks are shaped in part by knowledge of associated infections and their consequences. Risk perceptions, in turn, may be important in influencing changes in behaviour so that the potential adverse consequences of unsafe drug injection can be avoided. One's intention and commitment to reduce injecting risk are in turn determined by such factors as perceived benefits and barriers, social norms and one's perceived capacity to undertake change.

A useful way to conceptualize the risk reduction behaviours of injection drug users (IDUs) is to use a behaviour change framework. The AIDS Risk Reduction Model is one such framework that describes how psychosocial constructs relate to HIV sexual-risk behaviour reduction (Catania, Kegeles, & Coates, 1990). In the model, the stages of change are described as (1) recognizing and *labelling* one's behaviour as high-risk for infection, (2) making a *commitment* to change one's behaviour to reduce risk and practice safer behaviours, and (3) *enacting* change by seeking solutions and adopting lower risk behaviours. The process of entering and progressing through Stage 1 is believed to be influenced by knowledge of routes, risk factors, and natural history of infection as well as an understanding of disease severity, symptoms, treatment and outcomes. The commitment to change described by Stage 2 is determined by group norms and assessment of the benefits of risk reduction, as well as by one's perceived capacity or self-efficacy to engage in behaviour change. Once an individual is committed to change, he or she is thought to proceed to Stage 3, the final stage of the model, wherein individuals enact safer behaviours, which can include communicating or negotiating safe practices with partners. Progression through the various stages of the model can also depend on one's level of self-esteem, aversive emotional states, and external motivators such as public education campaigns or support groups (Catania et al., 1990).

Many AIDS interventions have assumed that increasing knowledge about HIV transmission will lead to heightened perceptions of risk and to the eventual adoption of protective behaviours (Kline & Strickler, 1993). There is some indication, however, that knowledge alone is inadequate for prompting risk behaviour reduction. Instead, knowledge requires reinforcement at all stages of the AIDS Risk Reduction Model by activities that change perceptions or skills that encourage harm reduction. Using the AIDS Risk Reduction framework to study IDUs, Longshore and Anglin (1995) found that a lower intention to share injection equipment was associated with a greater perceived risk of HIV infection, knowledge of the modes of infection transmission, and perceived norms of risk behaviours.

To date, the relationship between cognitive and psychosocial constructs has not been well investigated among IDUs in the context of hepatitis C-risk behaviours. While similar research on HIV has provided some insight into hepatitis C risks, it is conceivable that differences in the epidemiology of each virus are likely to produce distinct responses with regard to risk reduction. In the current study, we used the AIDS Risk Reduction Model as a framework to investigate the relationship between drug equipment sharing and hepatitis C-related knowledge and perceptions in a sample of IDUs in Montreal, Canada.

Methods

Study design and population

IDUs who injected at least once in the past 6 months were recruited from three of the main syringe exchange programs and two methadone maintenance treatment clinics in Montreal, Canada, between April 2004 and January 2005. The latter clinic participants were new clients to treatment (with a median time in treatment of 2 months) and whose frequency of injecting risk behaviours did not differ significantly from the syringe exchange clients. The sample of clinic subjects was not found to differ significantly from the non-treatment sample with regard to the psychosocial factors and drug use variables examined in this analysis. This finding supports other research which shows that some IDUs continue to inject during the early months of treatment and maintain pre-treatment risk behaviours (Hartel et al., 1997).

Study subjects were at least 18 years of age and provided informed consent. Eligibility as an active or recent injector was verified by either the presence of injection marks, or through knowledge of typical injection procedures and about community services offered to IDUs. Four study interviewers, aged 23–34 years, were recruited for their prior experience working with marginalized groups including IDUs. The interviewers conducted a confidential, face-to-face, structured interview with each eligible and consenting participant. The questionnaire required on average 1.5 h to complete. Participants who completed the interview were provided CDN$20 for their time and offered general information about hepatitis C as well as referrals to relevant community-based services.

All study procedures and documents were approved by the McGill University Faculty of Medicine Institutional Review Board for Research on Human Subjects.

Data collection

We enquired about hepatitis C knowledge and perceptions that were relevant to the AIDS Risk Reduction stages. For Stage 1 (*labelling*) these included: awareness of routes of hepatitis C infection; methods of detecting infection; severity of infection; viability of the hepatitis C virus (HCV) in blood; differences between hepatitis C and HIV transmission and infection; natural history of hepatitis C infection; awareness of symptoms; outcomes of infection; and knowledge and availability of hepatitis C prevention measures and treatments. In addition, we enquired about the following perceptions: severity of hepatitis C infection, susceptibility to infection and vulnerability to worsening the disease. For Stage 2 (*commitment to change*) the variables included perceptions of: peer norms of injecting; benefits of and barriers to safer injection, and self-efficacy/capacity to adopt risk reduction practices (to negotiate safer injecting with peers and to enact risk reduction in the context of injecting with other IDUs). For Stage 3 (*enacting solutions*) we asked about drug use and any use of contaminated injecting equipment. All model-related questions were phrased as self-statements and responses were recorded using a 6-point Likert scale with responses ranging from “strongly disagree” to “strongly agree”.

The behavioural and psychosocial components of the questionnaire were developed by adapting elements from the SurvUDI study questionnaire of IDUs in Quebec (Roy et al.,

2007), the Montreal Street Youth Cohort (Roy et al., 1998), the Bloodborne Virus Transmission Risk Assessment Questionnaire used in Australia (Fry & Lintzeris, 2003), and the Diffusion of Benefits Through Syringe Exchange Program Project Questionnaire used in the United States (Grau, Bluthenthal, Marshall, Singer, & Heimer, 2005). Items pertaining to the model variables were developed through an iterative process involving several steps. First, the content validity of the questionnaire was evaluated using local experts. Second, an evaluation of the conceptual underpinnings (construct validity) and item formulation (clarity and content validity) was performed using qualitative and quantitative interviews with 30 active IDUs. Finally, the instrument was pilot-tested with 86 active IDUs (Cox et al., 2002). Test-retest correlations of 25 participants indicated that all but two knowledge items had high stability; these two concerned treatments and may have been improved by participation in the study. Principal components factor analysis was used to derive the factorial structure of the various knowledge and perceptions scales (Abdi, 2003). Scale psychometric properties and internal consistency (Cronbach's alpha) were examined. Factor loadings of ≥0.30 were retained in a scale. Of the 83 psychosocial items, three knowledge and nine perception questions were examined individually as these did not contribute to the identified scales; none proved to be significantly associated and so will not be discussed further. The full questionnaire including these 83 items, is available from the author.

In addition to the above, the questionnaire collected information on sociodemographics (age, gender, ethnicity, marital status, education, income, housing) and injection practices (age at first injection, types of drugs injected, place and frequency of injecting, injections with others, sharing of drugs and injection equipment), self-reported HIV and hepatitis C testing and infection status, history of drug overdose, self-rated mental and physical health, self-reported hepatitis A and B immunization status, history of methadone treatment, and medical follow-up and treatment for hepatitis C infection. All risk behaviour variables referred to the past 6 months or 1 month prior to study enrolment. The 1-month timeframe of risk behaviour assessment was used for questions most likely to be affected by recall. Public or semipublic injecting areas were defined as visible areas without privacy (e.g. street, cars, parks, public toilets, abandoned buildings), while private injection settings referred to more secluded areas (e.g. subject's own home, the home of a friend or family member, hotel or motel rooms). Polydrug use was defined as the injection of more than one type of drug in the past 6 months. Type of drug was restricted to cocaine and heroin since these represented nearly 90% of the drugs most commonly injected in this sample of IDUs. Finally, housing was classified as unstable if a subject resided in a single-room occupancy hotel, shelter, jail, or had no fixed address in the past 6 months.

Statistical analysis

The dependent variable for the analysis was *any use of contaminated drug equipment* (Stage 3 behaviours), which was defined as borrowing and/or lending of used injecting equipment during the past 6 months. We chose to examine syringes and drug preparation equipment separately because it is possible that different aspects of hepatitis C knowledge and perceptions are associated with the sharing of each type of material. Drug preparation equipment included containers (e.g. spoon, bag, syringe used for drug mixing), filters (e.g. cottons, tissue, toilet paper), and drug preparation water (or other liquid).

Continuous variables were compared using Student's *t*-test and categorical variables with Pearson's chi-square test. Variables were considered significant at $p<0.05$ (two-tailed).

Logistic regression was used to calculate unadjusted and adjusted odds ratios with 95% confidence intervals for the relationship of selected independent variables with syringe and drug preparation equipment sharing. Psychosocial variables were assessed for multi-collinearity, with the selection of only one variable for entry into the model when the correlation between two variables was moderate ($r = 0.30–0.50$) to high ($r>0.50$). The mean score for each psychosocial factor was used in the model.

The bivariate analysis consisted of examining the influence of each independent variable on the equipment sharing. All variables with a $p<0.20$ and those with substantive importance were entered into a multivariable regression model (Hosmer & Lemeshow, 1989). The initial step involved examining the correlation between covariates, then identifying and removing from the model the variable with the least significant *p*-value by the Wald chi-square test. If the likelihood ratio test between the initial and more parsimonious model was not significant, the excluded variable was considered to have a non-significant effect on the model. Also, the variable coefficients of the reduced model were not allowed to change by more than 20% compared to the previous model. These three steps were repeated until all variables retained in the model were statistically significant. Each excluded variable was then re-tested individually in the final model to assess confounding in the presence of other statistically significant variables. Potential confounders controlled for in the model included age, gender, and self-reported hepatitis C status.

Results

Of the 321 study participants, 86% were recruited from syringe exchange programs. As shown in Table 1, the mean age of participants was 32.7 years and the sample was predominantly male (70%), single (88%), and self-identified as Caucasian (91%). Many lived in unstable housing (41%), with nearly one quarter reporting living on the streets during the 6 months prior to the study interview. With respect to drug use, they reported a median of 11 years of injecting experience. The most commonly injected drugs were cocaine (71%) and heroin (17%), although the co-use of more than one type of injected drug in the past 6 months was prevalent. A substantial proportion of participants injected daily (39%) and most injected with other IDUs (74%). Syringes were shared by 23%, while any drug preparation equipment was shared by 37%. Sixty-three percent reported being hepatitis C positive and the majority had been tested for HIV or HCV in the past year.

Factor analysis identified 16 component scales (grouped along with their respective global scales) representing hepatitis C knowledge and perceptions (Table 2). Knowledge was generally high regarding modes of transmission but was more varied with respect to the availability and effectiveness of treatment, detection and recognition of infection, and impact of infection on daily living. Perceived risk of infection differed according to the type of injection equipment shared (data not shown). Although most participants recognized syringes as high-risk (99%), many also considered drug preparation containers (85%), filters

(82%), and water (82%) as being potentially high-risk modes of transmission. These latter objects were reported as carrying medium risk by only 15% of respondents.

Table 3 shows the results of the regression analysis of variables associated with the sharing of syringes and drug preparation equipment. Unadjusted analyses identified a potentially important association between the sharing of syringes and drug preparation materials with unstable housing, most drug use characteristics (except years injecting), most health status variables, and several of the knowledge and perception scales.

In the adjusted analysis (only significant adjusted odds ratios are presented), syringe sharing was associated with cocaine injecting, polydrug use, injecting in public, being tested for HIV in the past year, and reporting poor physical health. With respect to the psychosocial variables, syringes were more likely to be shared by IDUs who believed it was difficult to safely inject (odds ratio (OR) = 2.16 [1.31–3.56]) but less likely to be shared by those who perceived the benefits of using sterile equipment for safer injecting to be high (OR = 0.30 [0.15–0.58]). As with syringe sharing, the sharing of drug preparation equipment was associated with reporting poor physical health but also with injecting in public. Drug equipment sharers were also less likely to perceive the benefits of using sterile equipment for safer injecting to be high (OR = 0.52 [0.33–0.88]) and had a lower perceived ability to convince their peers to inject more safely (OR = 0.54 [0.34–0.84]). No significant interactions were found for syringe or drug preparation equipment sharing.

Discussion

Using the AIDS Risk Reduction Model as a guide for understanding risk reduction behaviour, we examined how psychosocial variables representing each of the stages of the model were associated with drug equipment sharing in the context of hepatitis C infection. While specific elements of each stage were important for sharing risk, the elements of Stage 2 (commitment to change) were found to be most relevant. More specifically, we found the sharing of injecting materials to be associated with a low perceived benefit of safer injecting for self and for others, difficulty with enacting harm reduction measures, and a perceived limited capacity in conveying risk reduction behaviours to injecting peers. These three separate but related factors highlight the connection between perceived personal and social barriers to risk reduction. It is conceivable that IDUs who consider safer injecting as a futile or difficult practice may feel less motivated to reduce personal risk or to convince others to practice similar protective behaviours.

Our results also demonstrate that the type of material shared (whether syringes or drug preparation equipment) is associated with different perceived barriers and self-efficacy for safer injection. We posit that these observed differences are influenced by an IDU’s control over injecting with personal syringes but the lesser control over the use of ancillary injecting materials as a result of the necessity to share or disregard for risk. For example, syringe sharing was strongly associated with lower perceived benefits of safer injecting as well as with higher perceived difficulty in obtaining and using sterile syringes. In contrast, drug preparation equipment sharing was associated with a lower capacity to persuade injecting peers about the benefits of safer injecting.

To date, our understanding of the psychosocial factors associated with injection-risk behaviours has been primarily guided by studies on HIV. However, important differences in the natural history, prevention, and public health impact between HIV and hepatitis C may account for distinct behavioural outcomes in relation to each of these infections. For instance, the extent of hepatitis C knowledge may be limited in comparison to HIV (Rhodes, Davis, & Judd, 2004). Knowledge of hepatitis C has been characterized by gaps and confusion, whereby IDUs might often feel that, despite their best efforts, the risk of infection is beyond their control (Davis, Rhodes, & Martin, 2004; Rhodes et al., 2004). The view that hepatitis C infection is a part of being an injector contradicts prevailing attitudes towards HIV, which is sometimes seen as being more easily avoidable. IDUs may justify sharing behaviours when their risk is perceived to be low or if the immediate reward of injecting is judged to outweigh the long-term risks (Connors, 1992). Awareness of risk factors related to non-syringe modes of infection transmission may also be incomplete (Heimer et al., 2002). Unlike for HIV, hepatitis C messages may be dismissed or altered, resulting in continued equipment sharing by IDUs (Davis et al., 2004). Distrust of the medical establishment, disbelief of prevention messages, and a disproportionate trust placed upon false messages provided by peers may exacerbate the ineffectiveness of prevention messages. Finally, knowledge of hepatitis C treatment availability has been found to be limited among many IDUs. For example, one study found only 37% of all respondents and 62% of hepatitis C positive respondents to be aware of available hepatitis C treatments (Carey et al., 2005).

However, as has been found for HIV infection (Celentano, Cohn, Davis, & Vlahov, 2002; Kang, Deren, Andia, Colon, & Robles, 2004; Longshore, Stein, & Anglin, 1997; Longshore, Stein, & Conner, 2004), hepatitis C knowledge may be less important than one's commitment to safer injection, which can be influenced by the perceived benefits of risk reduction and one's self-efficacy to inject drugs more safely. We noted that several drug use characteristics (cocaine injecting, injecting in public, polydrug use) and health status variables (poor physical health, HIV testing history) were also important determinants of sharing syringe and drug preparation equipment. These results support the notion that such personal and contextual factors exist alongside cognitive factors related to sharing. These findings further suggest a need for interventions that target both the risk environment and risk perceptions which impinge on safer injecting practices.

This study is not without limitations. First, the cross-sectional study design precludes any inference about causality. Because knowledge and perceptions were measured after the occurrence of risk behaviours, they may be consequences rather than causes of the behaviour. Second, our analysis required self-reports of drug use, risk behaviours, and infection status, which may be biased by social desirability. However, self-reports of drug users have shown acceptable levels of reliability and validity (Dowling-Guyer et al., 1994; Samuels, Vlahov, Anthony, & Chaisson, 1992). Third, the potential effect of other IDUs on participants' behaviours or beliefs can modify risk behaviours. While it is clear that one's group membership is likely to influence perceived risk through both normative and comparative functions, we found no change in perceived risk after controlling for social network type or size. Finally, this study was not a test of the AIDS Risk Reduction Model to predict injection-risk behaviours but rather it was used to guide the study enquiry.

While knowledge about the risk factors for hepatitis C infection, its natural history, and the sequelae of infection remains a cornerstone of prevention interventions, efforts to correct perceptions about the benefits of risk reduction and to instil the skills that enhance self-efficacy for safer injecting are required. In particular, education and counselling should help IDUs understand the advantages of specific risk reduction behaviours, recognize the barriers to their adoption, and assess personal ability to execute appropriate risk reducing practices. To achieve these objectives, prevention strategies should envision community, interpersonal, and individual-level interventions. One can imagine specific initiatives that seek to build normative support for risk reduction in order to promote and reinforce an individual's capacity for risk reduction. Also, injecting partners could be encouraged to discuss infection risk, if not in specific terms, then at least in the general context of communal injecting. Finally, communication and negotiation skills may be helpful for coping with the pressures to share injection equipment and for the encouragement of peers to avoid sharing.

In summary, understanding the elements of perceived risk in drug injecting populations is critically important because IDUs may underestimate their risk of hepatitis C infection. A focus on increasing knowledge about hepatitis C and making sterile equipment more widely available may provide only a partial solution to controlling hepatitis C in this population. Complementary approaches that address the perceived benefits of safer injecting and barriers to enacting behavioural change are needed with regard to hepatitis C. Given that the inability to convince other IDUs is also a relevant barrier, it is equally important to target interpersonal behaviours between drug injecting peers. Indeed, a better understanding of HCV-related knowledge and perceptions may contribute to the innovation of prevention interventions for IDUs and which could also lead to benefits regarding other bloodborne virus infections such as hepatitis B virus and HIV.

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Table 1

Profile of IDUs (n = 321) recruited in Montreal, Canada, 2004–2005

	n	%
Demographic		
Age (years)		
Mean (SD)	32.7	8.3
≤19	10	3.1
20–29	123	38.3
30–39	117	36.4
40–49	66	20.6
≥50	5	1.6
Gender		
Male	226	70.4
Female	93	29.0
Transgender	2	0.6
Ethnicity		
White	302	94.1
Canadian Aboriginal	12	3.7
Black	2	0.6
Other[a]	5	1.5
Marital status[b]		
Single	281	87.5
Married	3	0.9
Common law	16	5.0
Divorced, separated, widow	21	6.6
Education		
≤high school	246	76.9
Income (past year)		
<$20,000	243	75.7
Unstable housing[b]	130	40.6
Drug use		
Years injecting (median, IQR)	11	6–18
Drug most often used[b]		
Cocaine	228	71.0
Heroin	54	16.8
Speedball (mix of cocaine and heroin)	4	1.2
Other	35	10.9
Polydrug use[b]	173	53.9
Daily injecting[c]	110	38.7
Injected with one or more IDUs[c]	210	73.7
Public/semipublic injecting[c]	99	40.2

	n	%
Shared injection equipment[b]		
Syringes	73	22.7
Containers, filters, or water	118	36.8
Health status		
Self-reported infections		
HIV	55	19.3
HCV	173	62.9
HIV-HCV co-infection	50	18.8
Testing in past year		
HIV	243	81.8
HCV	217	76.4
Immunizations (at least one dose)		
Hepatitis A	226	89.0
Hepatitis B	242	96.0
Self-rated poor mental health[b]	158	49.7
Self-rated poor physical health[b]	151	47.5
Drug overdose (past year)	61	19.1
Ever received methadone maintenance treatment	77	24.0
Currently receiving medical followup for HCV (among HCV-positive IDUs, $n = 173$)	94	54.7
Ever taken HCV medications (among HCV-positive IDUs, $n = 173$)	9	5.3

SD = standard deviation; IQR = interquartile range.

Note: Percentage among respondents with non-missing data.

[a] Includes Hispanic, Asian, Middle Eastern.

[b] Refers to past 6 months.

[c] Refers to past month.

Table 2

Descriptive statistics of psychosocial variables

	Mean	SD	Median	No. items	Internal consistency (Cronbach's α)
Knowledge					
Global scale: modes of HCV transmission	4.29	0.57	4.38	16	0.78
(1) Through shared injecting equipment	4.34	0.75	4.50	6	0.75
(2) Through contact with blood or unprotected sex	4.57	0.65	5.00	6	0.70
(3) Preventing transmission by avoidance of equipment sharing and non-injected modes of drug use	4.01	0.83	4.25	4	0.49
Global scale: Characteristics of HCV infection	4.03	0.59	4.10	11	0.60
(4) Disease outcomes and complications from, untreated HCV infection, alcohol use and co-infection with HIV/hepatitis A (HAV)/hepatitis B (HBV)	4.27	0.73	4.40	5	0.66
(5) Availability and effectiveness of treatments and of prevention of other infections (HAV or HBV) on HCV infection	3.75	1.05	4.00	4	0.45
(6) Detection of infection and recognition of symptoms	3.85	1.06	4.00	2	0.30
Perceptions					
(7) Severity of HCV infection and impact on daily living	3.67	1.01	4.00	5	0.71
(8) Susceptibility to disease progression and consequences of hepatitis C disease among HCV-positive persons	3.92	0.77	4.00	4	0.82
Global scale: Susceptibility to HCV infection among noninfected persons	4.06	0.68	4.12	8	0.71
(9) Based on risk lowering behaviours (e.g. always using own drug equipment, ease and availability of HCV testing, SEPs reduce risk)	4.44	0.62	4.60	5	0.83
(10) Based on risk enhancing behaviours (e.g. sharing drug equipment with many partners, sharing equipment with persons who are on HCV treatment and absence of infection despite many years of injecting)	3.41	1.38	4.00	3	0.78
Global scale: self-efficacy/perceived control over safer injecting	4.21	0.81	4.41	12	0.90
(11) Self-efficacy for safer injecting, to modify injecting practices, and to overcome pressure to share equipment	4.14	0.93	4.38	8	0.87
(12) Capacity to convince others to safely inject with sterile equipment and refrain from sharing	4.38	0.75	4.50	4	0.75
(13) Benefits for oneself and for others from injecting with sterile equipment	4.37	0.63	4.33	3	0.45
Global scale: barriers to injecting with sterile equipment	1.28	0.85	1.18	8	0.68
(14) Difficulty to inject more safely due to lack of available sterile equipment, ease of use, and ability to carry injecting equipment without harassment	1.19	0.89	1.00	5	0.64
(15) Personal relationships are compromised due to loss of trust and misperceptions about infection status of injecting partners	1.50	1.23	1.33	3	0.63
(16) Effectiveness and accessibility of services and treatment for HCV infection	3.71	0.81	3.75	4	0.55

SD = standard deviation.

Note: knowledge and perceptions measured on a 6-point ordinal scale (0—strongly disagree, 1—disagree, 2—somewhat disagree, 3—somewhat agree, 4—agree, 5—strongly agree).

Component scales are numbered and categorized according to the constructs of knowledge and perceptions.

Table 3

Results of logistic regression identifying factors associated with sharing syringes and drug preparation equipment during the past 6 months

	Syringes (*n* = 198)		Drug preparation equipment (container, filter, or water) (*n* = 240)	
	OR (95% CI)	**Adjusted OR (95% CI)**	**OR (95% CI)**	**Adjusted OR 95% CI)**
Demographic				
Unstable housing[a]	2.45 (1.44–4.17)		1.89 (1.19–3.00)	
Drug use				
Cocaine injecting[a] (vs. heroin)	3.12 (1.18–8.20)	3.96 (1.05–14.98)	1.36 (0.71–2.58)	
Polydrug use[a]	2.04 (1.18–3.53)	2.76 (1.11–6.82)	2.22 (1.38–3.55)	
Public/semipublic injecting[b] (vs. private)	2.98 (1.61–5.49)	2.64 (1.09–6.38)	2.79 (1.64–4.74)	2.42 (1.26–4.65)
Required or provided help injecting[b]	4.13 (2.37–7.20)		6.28 (3.81–10.34)	
Tried to use sterile materials for each injection[b]	0.12 (0.05–0.28)		0.23 (0.10–0.53)	
Experienced problems obtaining sterile materials[a]	3.22 (1.59–6.52)		4.29 (2.07–8.88)	
Used sterile injection kit (container, filter, water)[b]	0.37 (0.17–0.80)		0.42 (0.23–0.79)	
Health status				
Drug overdose (past year)	1.89 (1.02–3.49)		2.21 (1.25–3.88)	
Self-reported poor physical health	3.11 (1.41–6.80)	3.73 (1.52–9.22)	2.94 (1.83–4.72)	2.82 (1.48–5.36)
Self-reported poor mental health	3.47 (1.64–7.35)		2.11 (1.01–4.41)	
At least one HIV test (past year)	2.30 (0.99–5.35)	4.53 (1.16–17.54)	1.04 (0.56–1.91)	
Knowledge[c,d]				
Modes of HCV transmission through shared injecting equipment (1)	0.68 (0.49–0.95)		0.72 (0.53–0.97)	
Perceptions[c,d]				
Benefits for oneself and for others from injecting with sterile equipment (13)	0.46 (0.30–0.69)	0.30 (0.15–0.58)	0.47 (0.32–0.69)	0.52 (0.33–0.88)
Barriers to injecting with sterile equipment (global)	2.03 (1.47–2.79)		1.41 (1.08–1.85)	
Difficulty to inject more safely due to lack of available sterile equipment, ease of use, and ability to carry injecting equipment without harassment (14)	1.63 (1.22–2.18)	2.16 (1.31–3.56)	1.35 (1.04–1.74)	
Personal relationships are compromised due to loss of trust and misperceptions about infection status of injecting partners (15)	1.57 (1.24–1.99)		1.41 (1.08–1.85)	
Effectiveness and accessibility of services and treatment for HCV infection (16)	0.67 (0.49–0.92)		0.63 (0.47–0.84)	
Self-efficacy/perceived control over safer injecting (global)	0.09 (0.05–0.16)		0.16 (0.10–0.43)	
Self-efficacy for safer injecting, to modify injecting practices, and to overcome pressure to share equipment (11)	0.12 (0.07–0.20)		0.17 (0.12–0.26)	
Capacity to convince others to safely inject with sterile equipment and refrain from sharing (12)	0.26 (0.10–0.38)		0.36 (0.26–0.51)	0.54 (0.34–0.84)

OR = odds ratio, CI = confidence interval.

Note: adjusted for age, sex, HCV status. Variables tested but not significant: gender, age, education, income, years injecting, and psychosocial scales from Table 2 (all global and component scales were considered).

[a] Refers to past 6 months.

[b] Refers to past month.

[c] Number in parenthesis refers to corresponding scale number as listed in Table 3.

[d] Scales highly correlated with each other were not included in the multivariable models. In these situations, only the most significantly associated scales were considered.