



Psychological Distress Increases Needle Sharing among Cocaine users: Results from the COSMO Study

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Abstract

Objective: Cocaine use and mental health disorders have both been separately identified as risk factors for blood borne virus infection. However, the contribution of specific underlying aspects of mental health to risks is not well documented. The aim of this study was to examine the association between psychological distress and risk behaviors for HIV and Hepatitis C infection among cocaine users.

Methods: Individuals who either smoked or injected cocaine were recruited in community-based and addiction treatment programs located in downtown Montreal. Participants were asked to complete an interviewer-administered questionnaire assessing psychological distress based on the Kessler scale (K10). Three-month risk behaviors outcomes included drug injection material sharing (needle, dilution water, cooker, filters, backloading, frontloading or wash), and smoking equipment sharing. Socio-demographic data, severity of cocaine dependence and other substances use information were also collected. Statistical analyses were conducted using logistic regression.

Results: Severe psychological distress was reported by 202 (34.3%) out of 589 participants (86.2% male; 76.6% ≥ 30y.o.). The prevalence of sharing was: 14.8% for needles, 24.9% for other injection equipment (378 injectors) and 68.3% for smoking material (508 smokers). Multivariate analysis showed that injectors with severe psychological distress were more likely to report needle sharing (Adjusted Odds Ratio (AOR): 2.1, 95% CI: 1.1-3.8). No significant association was found between K10 score and sharing of other paraphernalia.

Conclusion: Severe psychological distress increases the risk of needle sharing, a major risk factor for HIV and HCV infection, but not sharing of other paraphernalia. These results suggest differential psychological mechanisms according to sharing practices. They also support the importance of screening for psychological distress in order to implement adequate preventive interventions aimed at cocaine users.

Keywords: Psychological distress; Risk taking; Needle sharing; Cocaine; Blood-Borne Pathogens; Drug users; Substance abuse; Intravenous

Introduction

According to the latest estimates from the United Nations Office on Drugs and Crime, 17 million people, representing 0.37% of the world population, have used cocaine in 2011 [1]. In Canada, cocaine is the most frequently injected substance among the estimated 125,000 people who inject drugs (PWID) [2,3]. This is of concern since injection drug use is one of the main drivers of HIV and HCV transmission worldwide [4,5]. Among PWID, blood borne infections

are transmitted mainly through the sharing of injection equipment or through injection preparation practices such as backloading and frontloading, which implies the use of a syringe to split drugs and then fill each partners' syringe [6-8]. Although the risk of blood borne pathogens infection exists for any injected substance, it is higher for cocaine, partly because the short half-life of the molecule leads to repeated injection [9-13]. Likewise, it has been estimated that cocaine users were 3 to 15 times more likely to share needles than other injection drug users [14,15]. Crack smoking has also been found to increase risks of HIV and HCV infections, mainly via increased unsafe sexual behaviors and shared use of crack-smoking implements [16-21].

The presence of mental health disorders further compromises the ability of drug users to adopt safe consumption behaviors [22]. Previous studies have suggested that individuals who had a psychiatric diagnosis of anxiety, antisocial or borderline personality disorders were more likely to share injection equipment [23,34]. Underlying mechanisms linking psychiatric disorders to risky behaviors, however, are not fully understood. It is not entirely clear if specific psychiatric symptoms, social consequences of psychiatric disorder, their cognitive correlates or their general impact on functioning and well-being mediate these associations. In order to develop preventive interventions tailored for the needs of this vulnerable population and identify at-risk individuals, it is crucial to understand the psychological mechanisms involved in their specific patterns of drug related risk-taking. Among these, psychological distress may represent a relevant marker and aspect of mental illnesses predisposing to sharing behaviors. A few studies have suggested that psychological distress could be associated with injection equipment sharing among PWID [35,36]. Nonetheless, few studies have addressed the relation between psychological distress and risks of HIV and HCV transmission related to the different types of material sharing, measured as separate entities, among cocaine users. Since each type of paraphernalia conveys a specific level of risk and is associated with different perceptions from users, it appears sensible to address them as separate outcomes.

Herein, we conducted a cross-sectional study to examine the association between psychological distress and sharing of different types of injection and smoking equipment among cocaine users.

Methods

The study population was drawn from COSMO, an ongoing prospective cohort study being conducted in Montreal, Canada, that is assessing the impact of mental health disorders on HIV and HCV risk behaviors among cocaine users. Eligibility criteria included smoking or injection of cocaine in the previous month, fluency in French or English, being able to consent and being 14 years of age or older. All participants signed an informed consent in compliance with institutional review board regulations of the Centre Hospitalier de l'Université de Montréal (CHUM), and of the Faculté de Médecine et des Sciences de la Santé (FMSS) de Sherbrooke.

Participants were recruited mainly in community-based programs located in downtown Montreal, including homeless day programs, shelters, and needle exchange programs. A smaller group was recruited at the CHUM's emergency room and addiction service (5%). After providing consent, participants underwent a 90 minutes baseline interviewed-administered questionnaire. The "Life history calendar" technique was used to help situate events in time in order to minimise recall bias [37]. Recent life events were put on a visual calendar that was used to better define the time period assessed during the interview.

To facilitate accessibility for the participants, interviews were conducted in a research office located in close proximity to the recruitment sites. They were offered CAD30\$ as compensation. Participants were also invited to participate in follow-up visits for the prospective phases of the study.

The study assessed for injection or smoking material sharing, defined as using paraphernalia that had already been used by someone else in the preceding 3 months. Three dichotomous variables representing different categories of material sharing were used for

analyses: 1-needle sharing; 2-other injection material sharing, including dilution water, cookers, filters, sharing while backloading/frontloading (defined as sharing drug using a syringe that has already been used by another person) and "doing a wash" (defined as injecting drug residues extracted from a cotton, a filter or a container used by another person); 3-crack pipes sharing.

The main explanatory variable was psychological distress, assessed by the K10 scale developed and validated by Kessler et al. [38]. It consists of 10 questions on non-specific psychological distress and measures the level of anxiety and depressive symptoms a person may have experienced in the previous four-week period. The final score ranges between 10 and 50 and a score equal or greater than 30 was considered as severe psychological distress. It can be administered in less than 10 minutes with minimal training requirements. The decision to use the K10 scale as a dichotomous variable and the choice of the cut-off were based on validation studies and on previous studies using this scale [39-41]. Dichotomisation of the psychological distress variable also appeared more clinically relevant than its use as a continuous variable.

Other explanatory variables were selected based on previous studies addressing risk factors for injection and smoking material sharing. They were integrated in the analyses as potential confounders of the association between psychological distress and sharing behaviors. These variables included age, gender, ethnicity, level of education, living with a partner, homelessness (defined as having lived or slept in a shelter or in any place not intended for housing in the past 3 months), unstable income (defined as having no regular source of income in the past 3 months), polyuse (defined as using 2 or more substances excluding cannabis in the past 3 months), polyinjection (defined as injection of 2 or more different substances in the past 3 months), regular cannabis use (defined as 4 days of use or more by week in the past month), cocaine and alcohol binge in the past month (defined as using large amounts on a short period of time, until feeling physically unable to use more) and attendance to an addiction or an opiate treatment program in the past 3 months. Finally, the severity of dependence to cocaine was estimated using the severity of dependence scale (SDS) [41]. The SDS is a five items tool measuring the intensity of dependence to a drug over the past 3 months. The score ranges between 0 and 15. Cocaine dependence was determined by a SDS score of 4 or higher [42].

Statistical Analysis

Analyses were carried out for each of the three outcomes separately. Analyses for the outcomes "needle sharing" and "sharing of injection material other than needle" were conducted among all the participants who reported having injected drugs in the past 3 months. Analyses for the outcome "crack pipe sharing" were conducted among all the participants who reported having smoked crack in the past 3 months. Bivariate analyses (Pearson chi-square and logistic regressions) were performed between explanatory variables and each of the three dichotomous outcome variables. A multivariate logistic regression model was conducted for each of the three outcomes. Explanatory variables with a p-value ≤ 0.20 in bivariate regression analyses were included in the multivariate models. Following the purposeful selection procedure, significant variables at a level alpha of 0.05 and those with a confounding effect were kept in the final models. A variable was considered confounding if its removal from the model changed a significant coefficient by more than 20%. From the final

models, adjusted odds ratios (AOR) and 95% confidence intervals were derived. SPSS 18.0 software was used to perform the analyses.

Results

Baseline data from the 589 participants recruited between October 2010 and April 2013 were included in our analyses. The mean age was

40 years (SD 11.0) and 76.6% were aged 30 or older. The majority of participants were males (86.2%) and were born in Canada (94.2%). 51.6% had completed high school, 32.3% were homeless, 32.5% had an unstable source of outcome and 13.9% reported living with a partner. Detailed characteristics of the study population are reported in Table 1.

Participant Characteristics	N = 589 N (%)	Severe psychological distress N=202 N (%)	No severe psychological distress N=387 N (%)	P value
Age (≥ 30 year old)	451 (76.6)	164 (81.2)	287 (74.2)	0.06
Gender (Male)	508 (86.2)	161 (79.7)	347 (89.7)	0.00
Born in Canada	555 (94.2)	192 (95.0)	363 (93.8)	0.54
Homelessness	190 (32.3)	74 (36.6)	116 (30.0)	0.10
Living with a partner	82 (13.9)	28 (13.9)	54 (14.0)	0.98
Completed high school	304 (51.6)	99 (49.0)	205 (53.0)	0.36
Unstable source of income	191 (32.5)	58 (28.7)	133 (34.4)	0.16
High SDS score (≥ 4)	344 (58.1)	149 (73.8)	195 (50.4)	0.00
Cocaine binge	144 (24.4)	57 (28.2)	87 (22.4)	0.12
Alcohol binge	295 (50.1)	118 (58.4)	177 (45.7)	0.00
Polyuse (more than 2 substances excluding cannabis)	463 (78.6)	167 (82.7)	296 (76.5)	0.08
Polyinjection (more than 2 substances among 378 injectors)	231 (61.1)	123 (61.0)	224 (57.9)	0.78
Opioid substitution treatment	35 (5.9)	14 (6.9)	21 (5.4)	0.47
Regular cannabis use (≥ 4 days/week)	241 (41)	115 (56.9)	233 (60.2)	0.44

Table 1: Sociodemographic, drug use and behaviors according to severe psychological distress, as ascertained by a K10 score ≥ 30, among 589 cocaine users recruited between October 2010 and April 2013, in Montreal, Quebec, Canada. P-value by Pearson chi-square test

Severe psychological distress was found among 34.3% of the sample. Of the 378 (64% of total sample) participants who injected drugs, 14.8% reported needle sharing and 24.9% other injection equipment

sharing. Among the 508 participants who reported having smoked crack, 68.3% reported having shared crack pipes in the past 3 months (Table 2).

	Needle Sharing (n = 378)			Injection equipment sharing (n = 378)			Crack pipe sharing (n = 508)		
	OR	p-value	95%CI	OR	p-value	95%CI	OR	p-value	95%CI
Severe psychological distress (K10 score ≥ 30)	1.8	0.04	1.0-3.2	1.0	0.94	0.6-1.6	1.1	0.78	0.7-1.6
Age (≥ 30 year old)	0.9	0.71	0.4-1.8	0.9	0.63	0.5-1.6	1.7	0.01	1.1-2.7
Gender (Male)	2.4	0.01	1.2-4.8	1.6	0.11	0.9-3.0	1.4	0.22	0.8-2.5
Born in Canada	0.5	0.31	0.1-1.9	1.0	0.99	0.3-3.8	0.9	0.86	0.4-2.0
Homelessness	0.9	0.81	0.5-1.7	1.0	0.97	0.6-1.7	1.4	0.10	0.9-2.1
Living with a partner	3.4	0.00	1.8-6.5	2.3	0.00	1.3-4.1	0.9	0.82	0.6-1.6
Completed high school	1.3	0.42	0.7-2.3	1.4	0.15	0.9-2.3	1.1	0.74	0.7-1.6
Unstable source of income	1.6	0.14	0.9-2.8	1.2	0.46	0.7-2.0	0.9	0.75	0.6-1.4

High SDS score (≥ 4)	1.8	0.06	1.0-3.30	1.4	0.20	0.9-2.2	1.7	0.01	1.1-2.4
Cocaine binge	1.5	0.24	0.8-2.8	1.4	0.27	0.8-2.3	1.6	0.03	1.1-2.6
Alcohol binge	1.0	0.91	0.6-1.8	1.0	0.95	0.6-1.6	1.9	0.01	1.3-2.8
Polyuse	1.2	0.69	0.5-2.5	2.9	0.01	1.3-6.3	1.8	0.01	1.2-2.8
Polyinjection	1.3	0.41	0.7-2.3	2.1	0.01	1.2-3.5	1.3	0.17	0.9-1.9
Opioid substitution treatment	1.6	0.29	0.7-3.9	1.5	0.26	0.2-3.3	0.7	0.34	0.4-1.5
Regular use of cannabis	0.9	0.67	0.5-1.6	1.1	0.72	0.7-1.8	0.6	0.08	0.4-0.9

Table 2: Bivariate logistic regression analyses of predictors for material sharing outcomes among 589 cocaine users recruited between October 2010 and April 2013, in Montreal, Quebec, Canada. OR: Odd Ratio; 95% CI: 95% Confidence Interval; P-value by Pearson chi-square test

Results of bivariate analyses and final multivariate logistic regression models displaying adjusted odds ratios and 95% confidence intervals are presented in Tables 2 and 3, respectively. Multivariate logistic regression showed that participants with severe psychological distress (AOR: 2.1, 95% CI : 1.1-3.8) were more likely to share needles, after adjusting for other risk factors. In both bivariate and multivariate analyses, severe psychological distress was significantly associated with needle sharing but not with sharing of other paraphernalia, either other injection material or crack pipe (Table 3).

Discussion

Needle and other drug paraphernalia sharing is the leading cause of HIV and HCV transmission in North America [4,5]. Cocaine use and mental health disorders have both been identified as risk factors for material sharing [9-13,22,23-34]. Over a third of our participants reported severe psychological distress, a higher proportion compared with the 20% prevalence rate found in the Canadian population [43]. The current study documented the association between psychological distress and different categories of paraphernalia sharing in a population of cocaine users. The major finding of our study is that severe psychological distress increases the risk of sharing needles but not sharing of other paraphernalia.

Our results regarding needle sharing are consistent with previous literature suggesting a correlation between psychiatric symptoms severity and the propensity of PWID to share needles [25-27,29,30,34,44]. More specifically, two studies have previously demonstrated an association between severe psychological distress and injection material sharing (including needles) among an undifferentiated sample of PWID [35,36]. The present study confirms this association among a population of cocaine users. On the other hand, our study shows no association between the severity of psychological distress and paraphernalia sharing other than needles among injectors. The higher prevalence of paraphernalia sharing other than needles has frequently been reported among PWID [45]. It suggests that different perceptions and stigmas surround each type of material sharing and that some practices might be considered as less harmful. In the past decade, a lot of effort has been devoted to decrease the rate of needle sharing, especially through increased counselling and implementation of needle distribution and exchange programs. In Montreal, two prospective cohort studies have shown evidence of a decline in needle sharing in the past two decades [46,47]. The rate of needle sharing reported in our study is relatively low, which is consistent with the effectiveness of the preventive services implemented. As for other injection material, the situation remains

worrying. It is possible that PWID are ambivalent toward the need to systematically use clean material other than needle. In fact, qualitative studies have shown that many PWID perceive HCV infection as an inevitable consequence of the injecting lifestyle [48,49]. Therefore there is a need for innovative preventive efforts that target paraphernalia sharing other than needles.

	Needle		Injection material excluding needle		Crack pipes	
	N=378	N=378	N=378	N=378	N=508	N=508
	AOR	95% CI	AOR	95% CI	AOR	95% CI
Severe psychological distress	2.1	1.1-3.8	1.1	0.6-1.8	0.8	0.5-1.2
Control variables						
Age (≥ 30 year old)					2.1	1.3-3.4
Homelessness					1.6	1.0-2.5
Living with a partner	3.8	2.0-7.3	2.3	1.3-4.1		
High SDS score (≥ 4)					1.8	1.2-2.8
Alcohol binge					2.3	1.5-3.4
Polyuse					2.2	1.4-3.6
Polyinjection			2.1	1.2-3.5		
Regular use of cannabis					0.6	0.4-0.9

Table 3: Multivariate logistic regression analyses of the association between material sharing outcomes and severe psychological distress, accounting for sociodemographic and behavioural co-variables, among 589 cocaine users recruited between October 2010 and April 2013, in Montreal, Quebec, Canada.

Our data are also consistent with an emerging literature suggesting that specific dimensions of mental health disorders may come into play in the manifestation of risk behaviors. Previous studies have suggested that severe anxiety symptoms may cause difficulty concentrating and impulsive behaviors which may in turn lead to impaired decision making and increased risk taking [50,51]. Likewise,

it has been argued that depressive symptoms increase risky behaviors through a feeling of hopelessness and despair, leading individuals to care less about deleterious health outcomes. It is plausible that psychological distress preferentially affects behaviors that are more stigmatized and carry higher infection risks and, therefore, are more systematically avoided. Furthermore, if a behavior is perceived as relatively risk-free, and is commonly adopted by drug users (such as crack pipe sharing), it may not be perceived as self-destructive or dangerous and may not be influenced by altered decision-making. This could explain the association of psychological distress with needle sharing, but not other paraphernalia.

Some limitations include the self-recruitment process, which may have affected the representativeness of the sample. Also, data collection by interview-administered questionnaires may have led to minimization of certain stigmatized behaviors. Recall bias may have occurred because of the broad period of time covered by the questions. Finally, the cross-sectional design could not ascertain causality. We hypothesized that psychological distress increases the rate of needle sharing, but the opposite could also be true. Indeed, having shared needles could eventually lead to psychological distress. A longitudinal follow-up of this cohort will help better understand the direction of the association, adding a temporal consideration to the analyses.

Despite these limitations, the results of this study help characterise a sub-group of drug users who are more vulnerable to HIV and HCV infection, and to identify an easy-to-assess, valid marker of mental health that is related to risk-taking behaviors. It also highlights the need to consider psychological distress in the development of preventive strategies aimed at cocaine users, possibly by targeting this aspect of mental health to indirectly decrease drug use practices leading to blood borne pathogens infections. Multidisciplinary research initiatives that would include epidemiological as well as neuropsychological and clinical measures of mental health and risky behaviors could be tremendously promising for that purpose.

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References

1. Office on Drugs and Crime World, United Nations (2013) World Drug Report 2013. United Nations Publications.
2. Agence de la santé publique du Canada (2010) Le VIH/sida chez les utilisateurs drogues injectables au Canada.
3. Canadian Center on Substance Abuse (2008). Injection Drug Users Overview 2008.
4. Nelson PK, Mathers BM, Cowie B, Hagan H, Des Jarlais D, et al. (2011) Global epidemiology of hepatitis B and hepatitis C in people who inject drugs: results of systematic reviews. *Lancet* 378: 571-583.
5. Mathers BM, Degenhardt L, Phillips B, Wiessing L, Hickman M, et al. (2008) Global epidemiology of injecting drug use and HIV among people who inject drugs: a systematic review. *Lancet* 372: 1733-1745.
6. Jose B, Friedman SR, Neaigus A, Curtis R, Grund JP, et al. (1993) Syringe-mediated drug-sharing (backloading): a new risk factor for HIV among injecting drug users. *AIDS* 7: 1653-1660.
7. Grund JP, Kaplan CD, Adriaans NF, Blanken P (1991) Drug sharing and HIV transmission risks: the practice of frontloading in the Dutch injecting drug user population. *J Psychoactive Drugs* 23: 1-10.
8. Grund JP, Kaplan CD, Adriaans NF, Blanken P, Huisman J (1990) The limitations of the concept of needle sharing: the practice of frontloading. *AIDS* 4: 819-821.
9. Roy E, Haley N, Godin G, Boivin JF, Claessens C, et al. (2008) L'hépatite C et les facteurs psychosociaux associés au passage à l'injection chez les jeunes de la rue - Rapport final. Agence de la santé et des services sociaux de Montréal. 2008.
10. Roy E, Alary M, Morissette C, Leclerc P, Boudreau JF, et al. (2007) High hepatitis C virus prevalence and incidence among Canadian intravenous drug users. *Int J STD AIDS* 18: 23-27.
11. Wood E, Lloyd-Smith E, Li K, Strathdee SA, Small W, et al. (2007) Frequent needle exchange use and HIV incidence in Vancouver, Canada. *Am J Med* 120: 172-179.
12. Tyndall MW, Currie S, Spittal P, Li K, Wood E, et al. (2003) Intensive injection cocaine use as the primary risk factor in the Vancouver HIV-1 epidemic. *AIDS* 17: 887-893.
13. Camacho LM, Brown BS, Simpson DD (1996) Psychological dysfunction and HIV/AIDS risk behavior. *J Acquir Immune Defic Syndr Hum Retrovirol* 11: 198-202.
14. Havens JR, Oser CB, Leukefeld CG (2011) Injection risk behaviors among rural drug users: implications for HIV prevention. *AIDS Care* 23: 638-645.
15. Levounis P, Galanter M, Dermatis H, Hamowy A, De Leon G (2002) Correlates of HIV transmission risk factors and considerations for interventions in homeless, chemically addicted and mentally ill patients. *J Addict Dis* 21: 61-72.
16. Booth RE, Watters JK, Chitwood DD (1993) HIV risk-related sex behaviors among injection drug users, crack smokers, and injection drug users who smoke crack. *Am J Public Health* 83: 1144-1148.
17. Booth RE, Kwiatkowski CF, Chitwood DD (2000) Sex related HIV risk behaviors: differential risks among injection drug users, crack smokers, and injection drug users who smoke crack. *Drug Alcohol Depend* 58: 219-226.
18. Harzke AJ, Williams ML, Bowen AM (2009) Binge use of crack cocaine and sexual risk behaviors among African-American, HIV-positive users. *AIDS Behav* 13: 1106-1118.
19. Jones DL, Irwin KL, Inciardi J, Bowser B, Schilling R, et al. (1998) The high-risk sexual practices of crack-smoking sex workers recruited from the streets of three American cities. The Multicenter Crack Cocaine and HIV Infection Study Team. *Sex Transm Dis* 25: 187-193.
20. Schönnesson LN, Atkinson J, Williams ML, Bowen A, Ross MW, et al. (2008) A cluster analysis of drug use and sexual HIV risks and their correlates in a sample of African-American crack cocaine smokers with HIV infection. *Drug Alcohol Depend* 97: 44-53.
21. Tortu S, McMahon JM, Pouget ER, Hamid R (2004) Sharing of noninjection drug-use implements as a risk factor for hepatitis C. *Subst Use Misuse* 39: 211-224.
22. Disney E, Kidorf M, Kolodner K, King V, Peirce J, et al. (2006) Psychiatric comorbidity is associated with drug use and HIV risk in syringe exchange participants. *J Nerv Ment Dis* 194: 577-583.
23. Wild TC, el-Guebaly N, Fischer B, Brissette S, Brochu S, et al. (2005) Comorbid depression among untreated illicit opiate users: results from a multisite Canadian study. *Can J Psychiatry* 50: 512-518.
24. Kelley JL, Petry NM (2000) HIV risk behaviors in male substance abusers with and without antisocial personality disorder. *J Subst Abuse Treat* 19: 59-66.
25. Mandell W, Kim J, Latkin C, Suh T (1999) Depressive symptoms, drug network, and their synergistic effect on needle-sharing behavior among street injection drug users. *Am J Drug Alcohol Abuse* 25: 117-127.
26. Johnson ME, Yep MJ, Brems C, Theno SA, Fisher DG (2002) Relationship among gender, depression, and needle sharing in a sample of injection drug users. *Psychol Addict Behav* 16: 338-341.
27. Kleinman PH, Millman RB, Robinson H, Lesser M, Hsu C, et al. (1994) Lifetime needle sharing: a predictive analysis. *J Subst Abuse Treat* 11: 449-455.

28. Lundgren LM, Amodeo M, Chassler D (2005) Mental health status, drug treatment use, and needle sharing among injection drug users. *AIDS Educ Prev* 17: 525-539.
29. Mandell W, Kim J, Latkin C, Suh T (1999) Depressive symptoms, drug network, and their synergistic effect on needle-sharing behavior among street injection drug users. *Am J Drug Alcohol Abuse* 25: 117-127.
30. Stein MD, Solomon DA, Herman DS, Anderson BJ, Miller I (2003) Depression severity and drug injection HIV risk behaviors. *Am J Psychiatry* 160: 1659-1662.
31. Braine N, Des Jarlais DC, Ahmad S, Purchase D, Turner C (2004) Long-term effects of syringe exchange on risk behavior and HIV prevention. *AIDS Educ Prev* 16: 264-275.
32. Braine N, Des Jarlais DC, Goldblatt C, Zadoretzky C, Turner C (2005) HIV risk behavior among amphetamine injectors at U.S. syringe exchange programs. *AIDS Educ Prev* 17: 515-524.
33. Llibre JM, Bolibar I, Bleda MJ, Fábregas N, Martínez M, et al. (1999) [Determinants associated with the presence of risk behaviors in HIV infected patients]. *Med Clin (Barc)* 112: 539-541.
34. Perdue T, Hagan H, Thiede H, Valleroy L (2003) Depression and HIV risk behavior among Seattle-area injection drug users and young men who have sex with men. *AIDS Educ Prev* 15: 81-92.
35. Gu J, Lau JT, Chen H, Tsui H, Ling W (2011) Prevalence and factors related to syringe sharing behaviours among female injecting drug users who are also sex workers in China. *Int J Drug Policy* 22: 26-33.
36. Latkin CA, Buchanan AS, Metsch LR, Knight K, Latka MH, et al. (2008) Predictors of sharing injection equipment by HIV-seropositive injection drug users. *J Acquir Immune Defic Syndr* 49: 447-450.
37. Caspi A, Terrie E, Moffitt, Thornton A, Freedman D (1996) The life history calendar: A research and clinical assessment method for collecting retrospective event-history data. *Int J Methods Psychiatr Res* 6: 1001-114.
38. Kessler RC, Andrews G, Colpe LJ, Hiripi E, Mroczek DK, et al. (2002) Short screening scales to monitor population prevalences and trends in non-specific psychological distress. *Psychological medicine* 32: 959-976.
39. Andrews G1, Slade T (2001) Interpreting scores on the Kessler Psychological Distress Scale (K10). *Aust N Z J Public Health* 25: 494-497.
40. Kinner SA, George J, Campbell G, Degenhardt L (2009) Crime, drugs and distress: patterns of drug use and harm among criminally involved injecting drug users in Australia. *Australian and New Zealand journal of public health* 33: 223-227.
41. Gossop M, Darke S, Griffiths P, Hando J, Powis B, et al. (1995) The Severity of Dependence Scale (SDS): psychometric properties of the SDS in English and Australian samples of heroin, cocaine and amphetamine users. *Addiction* 90: 607-614.
42. González-Sáiz F, Domingo-Salvany A, Barrio G, Sánchez-Niubó A, Brugal MT, et al. (2009) Severity of dependence scale as a diagnostic tool for heroin and cocaine dependence. *Eur Addict Res* 15: 87-93.
43. Caron J, Liu A (2010) A descriptive study of the prevalence of psychological distress and mental disorders in the Canadian population: comparison between low-income and non-low-income populations. *Chronic Dis Can* 30: 84-94.
44. Shi J (2004) Depression severity and HIV risk behavior. *Am J Psychiatry* 161: 929.
45. Hagan H (2011) Agent, host, and environment: hepatitis C virus in people who inject drugs. *J Infect Dis* 204: 1819-1821.
46. Leclerc CR, Morissette E, Alary M (2012) Direction des risques biologiques et de la santé au travail. Surveillance des infections transmissibles sexuellement et par le sang. *Épidémiologie du VIH de 1995 à 2010. Épidémiologie du VHC de 2003 à 2010. Institut de santé publique du Québec.*
47. Bruneau J, Daniel M, Abrahamowicz M, Zang G, Lamothe F, et al. (2011) Trends in human immunodeficiency virus incidence and risk behavior among injection drug users in montreal, Canada: a 16-year longitudinal study. *Am J Epidemiol* 173: 1049-1058.
48. Rhodes T, Davis M, Judd A (2004) Hepatitis C and its risk management among drug injectors in London: renewing harm reduction in the context of uncertainty. *Addiction* 99: 621-633.
49. Roy E, Nonn E, Haley N, Cox J (2007) Hepatitis C meanings and preventive strategies among street-involved young injection drug users in Montréal. *Int J Drug Policy* 18: 397-405.
50. Reyes JC, Robles RR, Colón HM, Marrero CA, Matos TD, et al. (2007) Severe anxiety symptomatology and HIV risk behavior among Hispanic injection drug users in Puerto Rico. *AIDS Behav* 11: 145-150.
51. Beck AT, Epstein N, Brown G, Steer RA (1988) An inventory for measuring clinical anxiety: psychometric properties. *J Consult Clin Psychol* 56: 893-897.

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