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_____ Research Report _____
**Relationships between Lifetime Health Risk-
Behaviours and Self-Reported Human
Immunodeficiency Virus and Hepatitis C Virus
Infection Status among Canadian Federal Inmates**

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Relationships between Lifetime Health Risk-Behaviours and Self-Reported Human Immunodeficiency Virus and Hepatitis C Virus Infection Status among Canadian Federal Inmates

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Correctional Service of Canada

February 2012

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Executive Summary

Key words: *self-report, illicit drug use, risky sexual behaviour, HIV, HCV, inmates*

Previous research suggests that people may misreport undesirable, illegal, and/or stigmatizing characteristics, but that the accuracy of self-report can be improved by increasing the anonymity and confidentiality of the self-report process. In 2007, Correctional Service Canada (CSC) conducted the National Inmate Infectious Diseases and Risk-Behaviours Survey (NIIDRBS), a self-administered paper questionnaire completed by a large sample of Canadian federal inmates (n=3,370). The questionnaire focussed on issues relevant to blood-borne and sexually transmitted infections, particularly human immunodeficiency virus (HIV) and hepatitis C virus (HCV). To maximize the accuracy of the survey data, CSC emphasized confidentiality and anonymity by having an external private company administer, retain, and eventually destroy the anonymous paper questionnaires; CSC staff never saw a completed questionnaire. Although an external criterion with which to assess inmate veracity is not available, information captured by the NIIDRBS allows for an examination of associations between self-reported lifetime health risk-behaviours (i.e., injection drug use and sex-trade involvement) and self-reported HIV and HCV infection status. Concordance with associations established in past research would increase confidence in the accuracy of NIIDRBS data.

Confidence in the accuracy of NIIDRBS data was strengthened when previously established relationships between health risk-behaviours and infection status were observed. Among men, ever injecting drugs and ever being a sex-trade worker were associated with increased odds of self-reported HIV; and, ever injecting drugs was associated with increased odds of self-reported HCV. Among women, insufficient HIV cases existed for analysis, but ever injecting drugs and ever being a sex-trade worker were associated with increased odds of self-reported HCV. For both men and women, those reporting both ever injecting drugs and ever having sex with an injection drug user had an odds of self-reported HCV that was at least 35 times greater than those reporting neither risk-behaviour; an increase more than three times greater than that observed among inmates reporting injection drug use only. The substantially elevated risk among couples who inject may be related to riskier injecting practices such as sharing injecting equipment.

After adjusting for both injection drug use and sex-trade risk-behaviours, Aboriginal women had an odds of self-reported HCV that was 1.80 times greater (95% CI: 1.15, 2.81) than that of non-Aboriginal women. This suggests there may be additional important factors associated with HCV infection that were not captured in the analyses and that differ between Aboriginal and non-Aboriginal women (e.g., riskier drug injecting and sexual behaviours among Aboriginal women relative to non-Aboriginal women).

The primary limitations of this research, such as measurement error, social desirability bias, non-response, and an inability to establish causal relationships, are typical of cross-sectional self-report surveys that attempt to capture detailed information about sensitive issues over time. Future research should explore if similar relationships are observed when using data collected by CSC's infectious disease surveillance system; a system that relies on face to face interviews and biosampling conducted by CSC healthcare staff.

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Introduction

Accuracy of Self-Reported Health Risk-Behaviours and Infection Status

A major concern with self-report is misreporting of undesirable, illegal, and/or stigmatizing characteristics, such as drug use, sexual behaviour, and human immunodeficiency virus (HIV) or hepatitis C virus (HCV) infection status. For example, targeted infectious disease testing on the basis of risk-behaviours has been criticised because of its reliance on self-report. Substantial proportions of HIV-infected people are missed because they choose not to disclose high-risk behaviours, do not perceive themselves to be at risk, or may be unknowingly at risk from an infected sex partner (Branson et al., 2006; Chou, Huffman, Fu, Smits and Korthuis, 2005; US Preventive Services Task Force, 2005). In regards to accuracy of self-reported infection status, research conducted on both community and inmate populations indicates rates based on self-report underestimate those based on biosampling (Rindskopf, Strauss, Falkin, and Deren, 2003; Thornton et al., 2000). The prevalence of HIV in a large international sample of street recruited, out of treatment, adult drug users was estimated at 5.3% and 10.6% using self-report and biosampling respectively (Rindskopf et al., 2003). Among inmates in the Republic of Ireland, self-reported prevalence of hepatitis B, HCV and HIV were 5%, 19% and 2%, respectively, while prevalence based on oral fluid assays of antibodies were 9%, 37% and 2%, respectively (Thornton et al., 2000). Further, Thornton et al. (2000) found that infection status was not always misreported as negative; some inmates reported being infected when oral fluid testing for antibodies was negative.

Accuracy of Self-Reported Health Risk-Behaviours in Correctional Populations

Underreporting of undesirable, illegal, and/or stigmatizing behaviour may be exacerbated in the correctional environment. Research involving recently admitted jail inmates indicates that only about half of recent drug use, identified through biosampling (urinalysis or hair analysis), is self-reported in confidential interviews (Farabee and Fredlund, 1996; Harrison, 1997; Hser, 1997). Similarly, more than 50% of HIV cases identified during voluntary HIV testing in the North Carolina Department of Corrections did not have HIV risk-behaviours on their risk assessment (Rosen et al., 2007). Similarly, about 66% and 44% of HCV infected men and women entrants to the Rhode Island Department of Corrections did not report injection drug use to the

nurse (Macalino, Dhawan, and Rich, 2005). Conversely, research conducted by non-prison staff, employing anonymous self-administered questionnaires and saliva samples, revealed that more than 90% of all HIV and HCV-positive inmates reported injection drug use on their self-administered questionnaire (Poulin et al., 2007). The research reported by Rosen et al. (2009) and Macalino et al. (2005) differs from that reported by Poulin et al. (2007) in the degree of anonymity and confidentiality during the self-report process. Rosen et al. (2009) and Macalino et al. (2005) conducted their research on data routinely collected on inmates during their incarceration; data which requires inmates to self-report to correctional personnel. Conversely, Poulin et al.'s (2007) study was independent of correctional procedures. The additional anonymity and confidentiality afforded by independent research may have resulted in inmates being more forthcoming in the self-report of their risk-behaviours.

Improving the Accuracy of Self-Reported Health Risk-Behaviours

There is evidence to suggest that increasing the anonymity and confidentiality of the self-report process may increase the accuracy of self-report, particularly in regards to stigmatizing or illegal behaviour. When inmates in Pennsylvania state prisons had their drug use during their last 30 days of freedom examined by both self-administered questionnaires and face to face interviews, the prevalence of self-reported drug use was greater on the self-administered questionnaire (McElrath, 1994). Des Jarlais et al. (1999) found that randomly selected drug users at syringe-exchange programmes in four U.S. cities reported a higher rate of sensitive HIV risk-behaviours and a lower rate of protective behaviour during audio computer assisted self-interviews compared to face to face interviews. Similarly, a recent meta-analysis of quantitative interviewing tools indicated the odds of self-reporting "ever being forced to have sex" and "a greater number of sex partners" was greater for non-face to face interviewing (e.g., audio computer assisted self-interview) compared to face to face interviews (Phillips, Gomez, Boily, and Garnett, 2010).

Rationale for Present Research

Previous research suggests that people may misreport undesirable, illegal, and/or stigmatizing characteristics, but that the accuracy of self-report could be improved by increasing the anonymity and confidentiality of the self-report process. In 2007, Correctional Service

Canada (CSC) conducted the National Inmate Infectious Diseases and Risk-Behaviours Survey (NIIDRBS), a self-administered paper questionnaire completed by a large sample of Canadian federal inmates (n=3,370). The questionnaire focussed on issues relevant to blood-borne and sexually transmitted infections, particularly HIV and HCV. To maximize the accuracy of the survey data, CSC emphasized confidentiality and anonymity by having an external private company administer, retain, and eventually destroy the anonymous paper questionnaires; CSC staff never saw a completed questionnaire. Although an external criterion with which to assess inmate veracity is not available, information captured by the NIIDRBS allows for an examination of associations between self-reported lifetime health risk-behaviours and self-reported HIV and HCV infection status. Concordance with associations established in past research would increase confidence in the accuracy of NIIDRBS data. Thus, this research examines the accuracy of NIIDRBS data by examining associations between self-reported lifetime health risk-behaviours and self-reported HIV and HCV infection status. If inmates ever told they have a HIV and/or HCV infection report proportionally more injection drug use and sexual risk-behaviour than inmates never told they have an infection, confidence in the findings of the NIIDRBS is strengthened.

Method

Questionnaire development, sampling, and survey implementation have been previously described in detail (Zakaria, Thompson, and Borgatta, 2010; Zakaria, Thompson, Jarvis, and Borgatta, 2010). Briefly, a self-administered questionnaire focussing on blood-borne and sexually transmitted infections was voluntarily completed by a large representative sample of Canadian federal inmates in 2007 (3006 men, 351 women, and 13 transgender). Since accuracy of self-report is of particular importance to this research, it should be noted that several measures were taken to optimize the accuracy of inmates' responses. First, inmates were involved with the design of the questionnaire to ensure acceptability of content. Second inmates were assured their answers would remain anonymous and confidential, and would be used to improve inmate health. Finally, no personal identifiers were collected on the questionnaires which were administered, collected, retained, and eventually destroyed by a private external company. CSC research staff were only provided an anonymous database; they never saw any of the completed questionnaires. Details of the measures used in this research and a brief overview of the analytical approach follow.

Measures

Ever being told you have HIV/HCV

An “ever being told you’re infected” variable was derived for each of HIV and HCV using self-reported infection status before, at, and since admission to CSC. The following hierarchy was used: inmates indicating they had ever tested positive or self-reporting as positive were considered to have ever been told they have an infection; all other inmates were assigned according to their response to the questions “have you ever been told you have HIV?” and “have you ever been told you had hepatitis C?” (response options: no and yes).

Lifetime health risk-behaviours

Ever injecting drugs

Inmates who reported ever using drugs were asked if they had "ever injected drugs" (response options: no and yes). In addition, inmates reporting recent¹ drug use in a penitentiary were asked if they had injected drugs recently in a penitentiary (response options: no and yes); and, inmates reporting drug use during the last six months they were free in the community were

¹ This period could range up to 7 months depending on the inmate’s admission and survey completion dates.

asked if they had injected drugs during these last six months of freedom (response options: no and yes). Based on responses, inmates were classified hierarchically as follows: those responding yes to any of these questions were classified as ever injecting drugs; those responding no to "ever injecting drugs" or no to ever using drugs were classified as never injecting drugs; and all others were considered to be missing this information.

Ever having oral, anal, or vaginal sex with someone who injected drugs

All inmates were asked if they had ever had oral, anal or vaginal sex with someone who injected drugs (response options: no, yes and don't know). Only inmates responding "yes" were classified as having had sex with someone who injects drugs. Inmates responding "don't know" were classified as "no" while those not responding were considered to be missing this information.

Ever been a sex-trade worker

All inmates were asked if they had ever been a sex-trade worker (e.g., male or female prostitute/escort) (response options: no and yes). Inmates not responding were considered to be missing this information.

Ever had sex with a sex-trade worker

All inmates were asked if they had ever had oral, anal or vaginal sex with a sex-trade worker (e.g., male or female prostitute/escort) (response options: no and yes). Inmates not responding were considered to be missing this information.

General Analytical Approach

All analyses used SAS[®] 9.1 or 9.2 survey procedures (SAS Institute Inc., 2004, 2008) that take the complex sampling design into account. Inferences to the population use common decision criteria (e.g., two-tailed alpha of 0.05). To calculate the variance of an estimate, Taylor series (linearization)² was used with the finite population correction factor. The Rao-Scott chi-square test³ was used for bivariate analyses of categorical data and binary logistic regression⁴

² See SAS Institute Inc. (2004, p. 166) for details.

³ See SAS Institute Inc. (2004, p. 4216) for details.

was used for multivariable analysis (Hosmer and Lemeshow, 2000). All results are presented separately for men and women and highlight significant differences between Aboriginal and non-Aboriginal inmates when they exist.

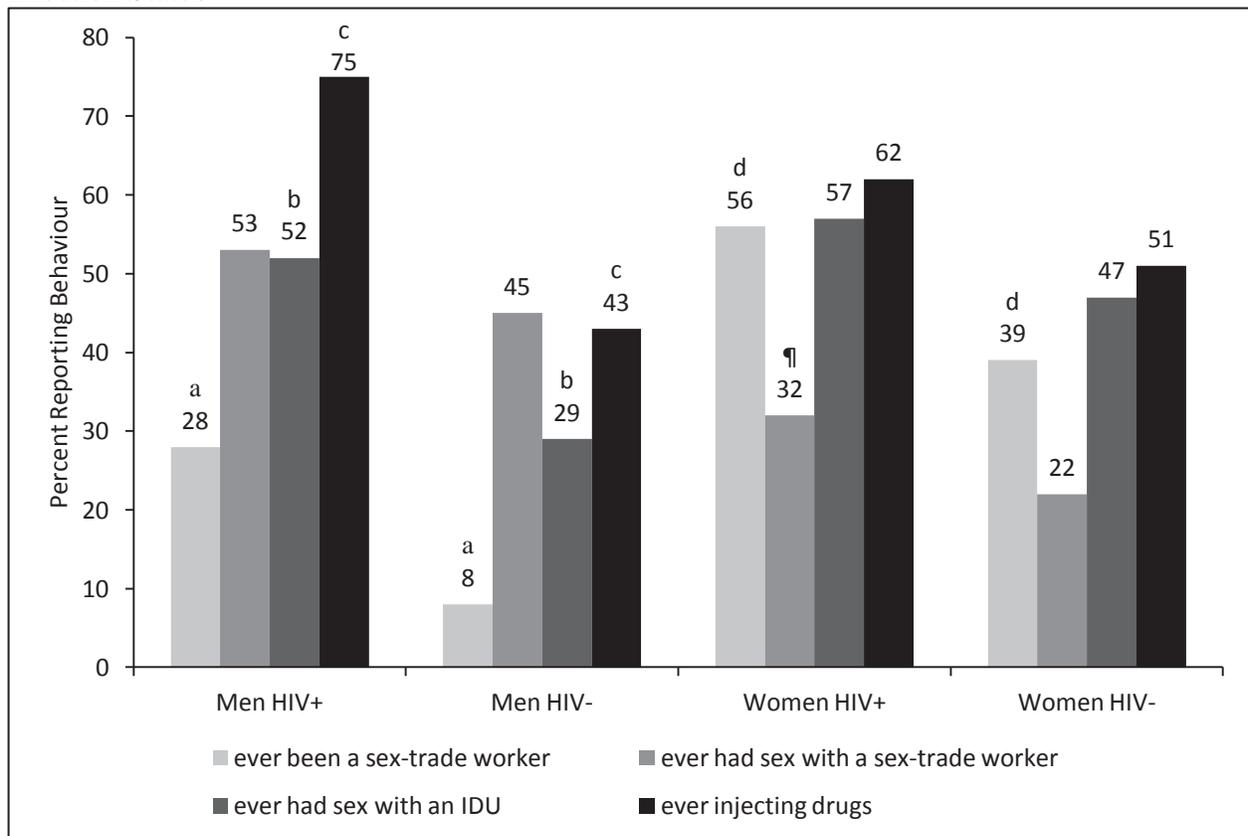
⁴ See SAS Institute Inc. (2008, p. 6361) for details.

Results

Relationships between Self-Reported Lifetime Health Risk-Behaviours and Self-Reported HIV Infection Status

Compared to men who had never been told they have HIV, men who had ever been told they have HIV were 3.5 times more likely to report ever being a sex-trade worker ($\chi^2(1, n = 2449) = 34.08, p < 0.05$), 1.8 times more likely to report ever having sex with an injection drug user ($\chi^2(1, n = 2581) = 16.42, p < 0.05$), and 1.7 times more likely to report ever injecting illicit drugs ($\chi^2(1, n = 2630) = 27.78, p < 0.05$). Among women, the comparisons were less dramatic. Compared to women who had never been told they have HIV, women who had ever been told they have HIV were 1.4 times more likely to report ever being a sex-trade worker ($\chi^2(1, n = 307) = 5.52, p < 0.05$) (see Figure 1).

Figure 1. Lifetime Health Risk-Behaviours Reported by Gender and Self-Reported HIV Infection Status



Note. Estimates with the same letter significantly differ ($p < 0.05$). HIV = human immunodeficiency virus; IDU = injection drug use.

¶Greater than 20% to 50% missing data (based on weighted distribution).

Self-reported lifetime health risk-behaviours independently associated with self-reported HIV infection status

Among the men, adequate numbers of self-reported HIV-positive inmates existed to perform binary logistic regression to identify factors independently associated with infection (see Table 1). Since injection drug use and sex with an injection drug user may interact, the two constructs were captured by one comprehensively defined variable.

Table 1
Logistic Regression of Ever Told had HIV Infection on Lifetime IDU and Sex-Trade Risk-Behaviours for Canadian Federal Male Inmates

	n = 2356 (84 HIV-positive, 2272 HIV-negative) N = 13222
IDU Risk-Behaviours (ever)	29.28 (3) ^{a*}
no IDU/no sex with IDU (reference group)	1.00
sex with IDU	1.38 (0.25, 7.59) ^b
IDU	3.29 (1.74, 6.23)*
IDU & sex with IDU	5.46 (2.92, 10.20)*
Sex-Trade Risk-Behaviours (ever)	17.54 (2)*
no sex-trade involvement (reference group)	1.00
sex with sex-trade worker	0.77 (0.45, 1.34)
being a sex-trade worker	2.65 (1.43, 4.90)*
Aboriginal Self-Identification	2.76 (1)
non-Aboriginal (reference group)	1.00
Aboriginal	0.52 (0.24, 1.13)
Model Fit Statistics	
Overall likelihood ratio test (df)	285.04 (6)*
Coefficient of determination	0.14

Note. For both IDU and sex-trade risk-behaviours, inmates are classified according to the riskiest behaviour self-reported as ever occurring. HIV = human immunodeficiency virus; IDU = injection drug use; n = sample size; N = estimated population size.

^apartial likelihood ratio test for specific effect (degrees of freedom). ^bodds ratio (95% confidence interval).

*p < 0.05.

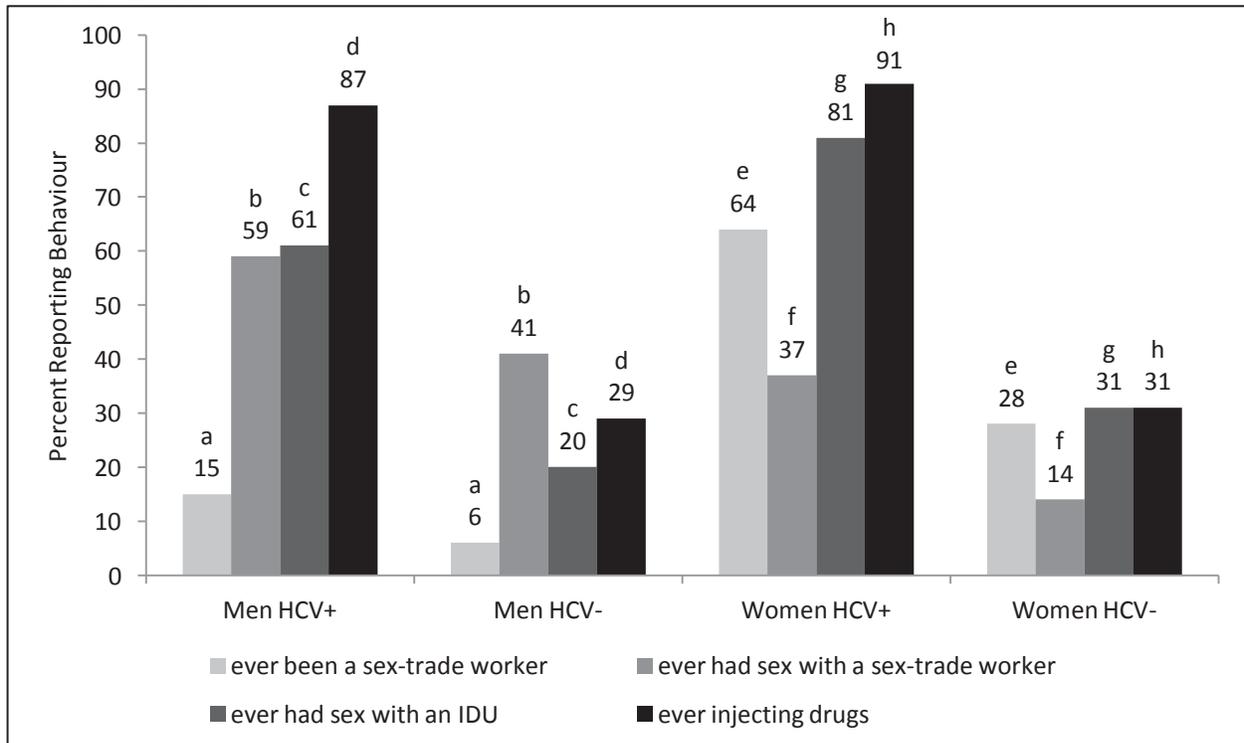
Logistic regression indicated that both injection drug use and sex-trade risk-behaviours were independently associated with an inmate ever being told they have HIV. Compared to inmates who never injected drugs and never had sex with an injection drug user, inmates who reported ever having sex with an injection drug user did not demonstrate a significant increase in the odds of HIV infection (odds ratio (OR) = 1.38, 95% CI: 0.25, 7.59) but inmates who reported ever injecting drugs (OR = 3.29, 95% CI: 1.74, 6.23) or both ever injecting drugs and ever having sex with an injection drug user (OR = 5.46, 95% CI: 2.92, 10.20) did demonstrate significantly increased odds of HIV infection. Compared to men who had never been involved in the sex-

trade, men who ever reported sex with a sex-trade worker did not demonstrate an increased odds of HIV infection (OR = 0.77, 95% CI: 0.45, 1.34), but men who reported ever being a sex-trade worker did demonstrate an increased odds of HIV infection (OR = 2.65, 95% CI: 1.43, 4.90). After adjusting for injection drug use and sex-trade risk-behaviours, Aboriginal self-identification was not associated with HIV infection.

Relationships between Self-Reported Lifetime Health Risk-Behaviours and Self-Reported HCV Infection Status

Compared to men who had never been told they had HCV, men who had ever been told they had HCV were 2.5 times more likely to report ever being a sex-trade worker ($\chi^2(1, n = 2418) = 31.44, p < 0.05$), 1.4 times more likely to report ever having sex with a sex-trade worker ($\chi^2(1, n = 2448) = 46.25, p < 0.05$), 3 times more likely to report ever having sex with an injection drug user ($\chi^2(1, n = 2549) = 286.09, p < 0.05$), and 3 times more likely to report ever injecting illicit drugs ($\chi^2(1, n = 2597) = 547.66, p < 0.05$) (see Figure 2).

Figure 2. Lifetime Health Risk-Behaviours Reported by Gender and Self-Reported HCV Infection Status



Note. Estimates with the same letter significantly differ ($p < 0.05$). HCV = hepatitis C virus; IDU = injection drug use.

Women demonstrated similar patterns. Compared to women who had never been told they had HCV, women who had ever been told they had HCV were 2.3 times more likely to report ever being a sex-trade worker ($\chi^2(1, n = 308) = 104.79, p < 0.05$), 2.6 times more likely to report ever having sex with a sex-trade worker ($\chi^2(1, n = 293) = 52.11, p < 0.05$), 2.6 times more likely to report ever having sex with an injection drug user ($\chi^2(1, n = 309) = 188.56, p < 0.05$), and 2.9 times more likely to report ever injecting illicit drugs ($\chi^2(1, n = 315) = 316.65, p < 0.05$) (see Figure 2).

Self-reported lifetime health risk-behaviours independently associated with self-reported HCV infection status

For both men and women, adequate numbers of self-reported HCV-positive inmates existed to perform binary logistic regression to identify factors independently associated with infection (see Table 2). Among men, only injection drug use risk-behaviour was independently associated with an inmate ever being told they had HCV. Compared to men who never injected drugs and never had sex with an injection drug user, the odds of HCV infection progressively increased with riskier behaviour: ever having sex with an injection drug user increased the odds of infection by a factor of 2.25 (95% CI: 1.29, 3.92); ever injecting drugs increased the odds of infection by a factor of 10.09 (95% CI: 7.19, 14.14); and, ever injecting drugs and ever having sex with an injection drug user increased the odds of infection by a factor of 34.95 (95% CI: 24.32, 50.23).

Among women, injection drug use risk-behaviours, sex-trade risk-behaviours, and Aboriginal self-identification were all independently associated with ever being told one had HCV. Compared to women who never injected drugs and never had sex with an injection drug user, the odds of HCV infection increased by a factor of 11.54 (95% CI: 5.22, 25.47) among women who ever injected drugs and increased by a factor of 47.42 (95% CI: 24.07, 93.42) among women who ever injected drugs and ever had sex with an injection drug user. In regards to sex-trade risk-behaviours, women ever being sex-trade workers had an odds of HCV infection that was 2.80 times greater (95% CI: 1.82, 4.31) than women never involved in the sex-trade. Finally, after adjusting for both injection drug use and sex-trade risk-behaviours, Aboriginal women continued to have an odds of infection that was 1.80 times greater (95% CI: 1.15, 2.81)

than that of non-Aboriginal women.

Table 2

Logistic Regression of Ever Told had HCV Infection on Lifetime IDU and Sex-Trade Risk-Behaviours for Canadian Federal Inmates by Gender

	Men n=2329 (578 HCV-positive, 1751 HCV-negative) N=13222	Women n=290 (101 HCV-positive, 189 HCV-negative) N=479
IDU Risk-Behaviours (ever)	423.85 (3) ^{a*}	160.59 (3)*
no IDU/no sex with IDU (reference group)	1.00	1.00
sex with IDU	2.25 (1.29, 3.92) ^{b*}	0.93 (0.20, 4.18)
IDU	10.09 (7.19, 14.14)*	11.54 (5.22, 25.47)*
IDU & sex with IDU	34.95 (24.32, 50.23)*	47.42 (24.07, 93.42)*
Sex-Trade Risk-Behaviours (ever)	0.64 (2)	22.11 (2)*
no sex-trade involvement (reference group)	1.00	1.00
sex with sex-trade worker	0.92 (0.71, 1.21)	1.66 (0.64, 4.27)
sex-trade worker	1.06 (0.72, 1.54)	2.80 (1.82, 4.31)*
Aboriginal Self-Identification	0.33 (1)	6.55 (1)*
non-Aboriginal (reference group)	1.00	1.00
Aboriginal	1.09 (0.81, 1.46)	1.80 (1.15, 2.81)*
Model Fit Statistics		
Overall likelihood ratio test (df)	3318.89 (6)*	213.43 (6)*
Coefficient of determination	0.73	0.44

Note. For both IDU and sex-trade risk-behaviours, inmates are classified according to the riskiest behaviour self-reported as ever occurring. HCV = hepatitis C virus; IDU = injection drug use; n = sample size; N = estimated population size.

^aPartial likelihood ratio test for specific effect (degrees of freedom). ^bOdds ratio (95% confidence interval).

*p < 0.05.

Discussion

Confidence in the accuracy of survey findings was strengthened when previously established relationships between risk-behaviours and infection status were reproduced using NIIDRBS data (see Tables 1 and 2). These findings are consistent with previous research indicating the relationships between self-reported characteristics and HIV status are similar whether one uses biological test results or self-reported infection status (Rindskopf et al., 2003).

Among men, the odds of self-reported HIV were significantly elevated among those reporting ever injecting drugs or ever being a sex-trade worker compared to those not reporting these behaviours (see Table 1). The odds of self-reported HCV were also significantly elevated among inmates reporting ever injecting drugs compared to inmates reporting never injecting drugs and never having sex with an injection drug user (see Table 2). Among women, the small number of self-reported HIV-positive cases precluded an examination of factors independently associated with HIV infection; however, adequate numbers existed to examine associations with HCV infection. The odds of ever being told one had HCV were significantly greater among women reporting ever injecting drugs or ever being a sex-trade worker compared to women not reporting these behaviours. For both men and women, of particular interest was the nature of the relationship between HCV infection and injection drug use risk-behaviours after adjusting for sex-trade risk-behaviours and Aboriginal self-identification. Specifically, compared to inmates reporting never engaging in injection drug use and never having sex with an injection drug user, inmates who reported ever engaging in both had their odds of HCV infection dramatically increased by a factor of 35 or greater; an increase more than three times greater than that experienced by inmates reporting only injection drug use (see Table 2). This elevated risk may be related to the riskier injecting practices of couples who use injection drugs such as sharing of injecting equipment not only within the sexual relationship but also within a larger network of injection drug users (Bryant, Brener, Hull and Treloar, 2010; Hahn, Evans, Davidson, Lum and Page, 2010).

Findings for men and women are consistent with recent Canadian research indicating the predominate risk factors for HIV infection are men who have sex with men, heterosexual contact, and injection drug use (Public Health Agency of Canada, 2010); and, the predominate risk factor for HCV is injection drug use (Public Health Agency of Canada, 2009).

After adjusting for both injection drug use and sex-trade risk-behaviours, Aboriginal women had an odds of self-reported HCV that was 1.80 times greater (95% CI: 1.15, 2.81) than that of non-Aboriginal women. This suggests there may be additional important factors associated with HCV infection that are not captured by the model and that differ between Aboriginal and non-Aboriginal women. In fact, findings from the NIIDRBS indicate that Aboriginal women may engage in riskier drug injecting and sexual behaviours compared to non-Aboriginal women (Thompson, Zakaria, and Grant, in press).

Limitations and Future Research

The primary limitations of this research, such as measurement error, social desirability bias, non-response, and an inability to establish causal relationships, are typical of cross-sectional self-report surveys that attempt to capture detailed information about sensitive issues over time. Since events taking place in the past are more difficult to recall, findings relating to more distant risk-behaviours and testing may be less accurate. Furthermore, differential recall may have occurred wherein offenders ever told they have HIV or HCV may be more likely to recall specific risk-behaviours relative to offenders never told they have HIV or HCV.

Other research designs employing biosampling may have been more accurate but are difficult to conduct in correctional settings and were precluded in this instance due to competing operational issues.

Future research should explore if similar relationships are obtained when using data collected by CSC's infectious disease surveillance system; a system that relies on face to face interviews and biosampling conducted by CSC healthcare staff.

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