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ORIGINAL ARTICLE

Pre-incarceration HIV risk behaviours of male and female inmates

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Abstract

In most countries, HIV and AIDS rates are higher among inmates than in the general population. As part of a series of studies aimed at examining the plausible links between HIV and incarceration in a State prison system in the United States (US), the present study examined pre-incarceration sexual and injection drug use behaviours of inmates and their demographic correlates. Two-hundred-and-sixteen female and 260 male inmates randomly selected from 17 Illinois State prisons completed a structured questionnaire. Findings indicate that the rate of inconsistent condom use with multiple anal and vaginal sexual partners among study participants ranged from 11 to 49%. Fourteen per cent of the women and 25% of the men reported ever injecting drugs, while 13% of the women and 7% of the men had ever shared needles. Demographic correlates of risk behaviours differed between gender and for specific behaviours. The findings indicate that persons entering prison generally exhibit risk behaviours that may increase their chances of acquiring HIV. Comprehensive HIV prevention programmes should be made available to inmates in US prisons and be accessible to them upon release. Studies are needed to examine how individual and structural factors interact to increase HIV and incarceration risk.

Keywords: *AIDS, HIV, injection drug use, sexual behaviour*

Introduction

Worldwide, high rates of the human immunodeficiency virus (HIV) infection, hepatitis B and C, and other sexually transmitted infections (STI) occur among persons entering the correctional system and among the incarcerated population (Solomon, Flynn, Muck, & Vertefeuille, 2004; WHO/UNODC/UNAIDS, 2007a). The range of HIV prevalence rates among incarcerated populations vary widely within and across countries. Very high HIV rates have been reported in some studies of inmates in African countries, 1.6% in Senegal, 27.8% in Cote d'Ivoire, 41.2% in South Africa (Dolan, Kite, Black, Aceijas, Stimson, &

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Reference Group, 2007) and 6.7% among a sample of male prisoners in Nigeria (Dada, Akanmu, & Esan, 2006). In Russia, 4% of the prison population were living with HIV/AIDS at the end of 2002 (Bobrik, Danishevski, Eroshina, & McKee, 2005), while in Ukraine, at the end of 2004, between 15 and 30% of inmates were infected with HIV (Zhivago, 2005). In Iran, HIV rates ranged from 2.3% (Afshar, 2003) to 30.7% among incarcerated drug users (Nassirimanesh, 2002; Afshar, 2003; Rowhani-Rahbar, Tabatabaee-Yazdi, & Panahi, 2004). Varying prevalence rates have been reported in Western Europe (Martin, Cayla, Moris, Alonso, & Perez, 1998; Rotily, Weilandt, Bird, Kall, an Haastrecht, Iandolo, et al., 2001; Babudieri, Starnini, Brunetti, Carbonara, D'Offizi, Monarca, et al., 2003) and in Canada (Calzavara, Burchell, Schlossberg, Myers, Escobar, & Wallace, 2003). In the United States of America (USA), 1.6% of male inmates and 2.4% of female inmates in state and federal prisons were living with HIV and AIDS at the end of 2006 (Maruschak, 2008).

Persons entering the correctional system typically exhibit high rates of risk behaviours such as injection drug use (IDU), needle sharing, and unprotected sexual intercourse with multiple partners (Conklin, Lincoln, & Tuthill, 2000; Wohl, Johnson, Jordan, W., Lu, Beall, Currier, et al., 2000; Chen, Bovee, & Kerndt, 2003; MacGowan, Margolis, Gaiter, Morrow, Zack, Askew, et al., 2003). While they are incarcerated, inmates engage in risk behaviours that can predispose them to STIs and HIV, mainly unprotected sexual intercourse, IDU and needle sharing (Mahon, 1996; Swartz, Lurigio, & Weiner, 2004; Abiona, Adefuye, Balogun, & Sloan, 2009). Despite the fact that these behaviours occur less commonly in prison than outside prison, the risk of disease transmission is increased during incarceration because HIV prevention methods such as condoms and sterile injecting equipment are rarely available in prison, virtually guaranteeing that prisoners who do engage in risk behaviours will be at high risk.

HIV transmission occurring in prison has been documented in the USA [Mutter, Grimes, & Labarthe, 1994; Krebs & Simmons, 2002; Centers for Disease Control and Prevention (CDC), 2006; Macher, Kibble, & Wheeler, 2006] and internationally (Gore, Bird, Burns, Goldberg, Ross, & Macgregor, 1995; Taylor, Goldberg, Emslie, Wrench, Gruer, Cameron, et al., 1995; Dolan & Wodak, 1999; Thaisri, Lerwitworapong, Vongsheree, Sawanpanyalert, Chadbanchachai, Rojanawiwat, et al., 2003; Bobrik et al., 2005). The high HIV prevalence rates among persons entering jails and prisons, however, suggest that most HIV infections occurred before rather than during incarceration (Macalino, Vlahov, Sanford-Colby, Patel, Sabin, Salas, et al., 2004; Solomon et al., 2004; de Ravello, Brantley, Lamarre, Qayad, Aubert, & Beck-Sague, 2005; Weinbaum, Sabin, & Santibanez, 2005). This is not surprising, because studies have shown that incarcerated individuals are more likely to engage in risk behaviours outside jails and prisons, rather than within the correctional system (Wohl et al., 2000; Moseley & Tewksbury, 2006; Seal, Margolis, Morrow, Belcher, Sosman, Askew, et al., 2008). Various researchers believe that correctional facilities provide a critical opportunity to provide HIV prevention interventions and treatment to inmates (Grinstead, Zack, Faigeles, Grossman, & Blea, 1999; Wohl et al., 2000) because prisoners, who mainly come from under-served at-risk populations are easier to reach in the prison, they have fewer opportunities to engage in high risk behaviours, and they have access to health services (Braithwaite & Arriola, 2008).

Very few studies have examined the pre-incarceration risk behaviours of women (Cotten-Oldenburg, Jordan, Martin, & Kupper, 1999; Khan, Wohl, Weir, Adimora, Moseley, Norcott, et al., 2008). However, women are an important group to be considered in HIV intervention programs because those who are at risk for incarceration, in contrast to

others, are also at greater risk for HIV infection (Harawa & Adimora, 2008). Relevant pre-incarceration information on female inmates will highlight gender differences in behaviours.

This *ex post facto* study is part of a series of studies aimed at examining the plausible links between incarceration and HIV infection in Illinois prisons. The study findings will contribute to the existing literature on the risk behaviours of inmates by investigating the pre-incarceration sexual and injection drug use behaviours of men and women who had spent less than 1 year in prison during the current incarceration.

Methods

Sample

This study is a sub-analysis of data collected from a larger cross-sectional study that described the HIV risk behaviours of 1293 male and 526 female inmates before and during incarceration. Participants were randomly selected from 17 correctional facilities in the State of Illinois, USA. In the larger study, presented elsewhere (Abiona et al., 2009), we found that very few inmates engaged in risk behaviours during incarceration. Any sexual intercourse was reported by 18.8% of the women and 4.8% of the men; 5% of the women compared with 30% of the men who had sexual intercourse had performed anal sex, while 34% of the women and 55% of the men had had vaginal sex. IDU was reported by 0.9% of participants. Among inmates who had ever injected drugs, 3.8% of the women and 7.4% of the men injected drugs in prison. Among participants who had tattoos, more men (28.9%) than women (13.3%) reported getting tattoos in prison. Body piercing was largely uncommon.

The analysis presented in this manuscript selected inmates who had spent a period of less than 1 year in prison during the present incarceration. Four-hundred-and-seventy-six inmates met this criterion. Details of the sample size estimation, participant selection, and data collection procedures have been described elsewhere (Abiona et al., 2009). All study protocols, informed consent processes, research instrument, recruitment and data collection procedures were approved by the Institutional Review Board (IRB) at Chicago State University.

Questionnaire

Data were collected using a structured questionnaire adapted from related published articles (Castro, Shansky, Scardino, Narkunaj, Coe, & Hammett, 1991; Mahon, 1996; Krebs & Simmons, 2002). The questionnaire had sections on demographic characteristics, incarceration history, and HIV risk behaviours prior to and during the current incarceration. The HIV risk behaviours included IDU, sharing injection equipment and sexual practices. Details on the development of the research instrument are reported in a separate article (Abiona et al., 2009).

Information on sexual behaviour was elicited with the question: 'In the six months before you were arrested, how many anal sexual (or vaginal) partners did you have?' (0, 1, 2-3, more than 3). This was recoded as '0-1' and '2 or more' (multiple) partners. Participants were also asked how often they had used condoms for anal and vaginal sexual intercourse in the 6 months before they were arrested. Responses were 'Never used a condom', 'Rarely used a condom', 'Sometimes used a condom', 'Most of the time used a condom', and 'Always used a condom'. For data analysis purposes, this information

was recoded as 'Inconsistent condom use' for 'Never, Rarely, Sometimes and Most of the time' and 'Consistent condom use' for 'Always used a condom'. Participants were asked to respond 'Yes or 'No' to questions about IDU and needle sharing during the 6 months before arrest.

Dependent and independent variables

There were three outcome variables:

- ever injected drugs;
- unprotected sexual intercourse with multiple anal partners;
- unprotected sexual intercourse with multiple vaginal partners.

The latter two variables were defined as inconsistent condom use with 2 or more anal or vaginal partners in the 6 months before arrest. The independent variables were demographic factors:

- age;
- marital status;
- ethnicity;
- the number of times incarcerated.

To examine the relationship between risk factors, when one risk behaviour is a dependent variable, the other risk behaviours were included in the independent variables.

Statistical analyses

Analyses were performed using the Statistical Package for Social Sciences software version 16 for Windows. Gender comparison of risk behaviours was explored using the Chi-Square test. Bivariate analyses using binary logistic regression were conducted to identify independent variables that were associated with the dependent variables. Variables with p -values ≤ 0.25 in bivariate analyses (Hosmer & Lemeshow, 2000) were entered into multivariate logistic regression models using the enter method, to identify independent predictors of each outcome of interest. Odds ratios (OR), Adjusted odds ratios (AOR), and 95% confidence intervals (CI) were calculated. At the multivariate level, a p -value ≤ 0.05 was accepted as being statistically significant.

Results

Sample characteristics

The sample consisted of 476 participants, 216 (45.4%) women and 260 (54.6%) men. Three-quarters of the men and women were currently unmarried, and half of the participants were African American (50.8%, men and 50.5%, women). Two-thirds of the men (66%) and half of the women (52%) had been incarcerated two or more times. About a quarter (27%) of the women and 40% of the men were less than 30 years old. Sixty-two per cent of the women and 85% of the men reported that they were heterosexual. Most participants (95% of the women and 89% of the men) had taken an HIV test at least once (see Table 1).

Table 1. Demographic characteristics of the study participants.

Characteristic	Female (<i>n</i> = 216) Frequency (%)	Male (<i>n</i> = 260) Frequency (%)
Age group (years)		
<30	58 (26.9)	104 (40.0)
30–39	69 (31.9)	79 (30.4)
40 and above	89 (41.2)	77 (29.6)
Marital status		
Never been married	99 (45.8)	143 (55.0)
Married/living with someone as married	55 (25.5)	64 (24.6)
Separated/divorced/widowed	61 (28.7)	53 (20.4)
Ethnicity		
African American	109 (50.5)	132 (50.8)
White	89 (41.2)	88 (33.8)
Hispanic/Latinos	4 (1.8)	22 (8.5)
Others (Native American, Asian American, etc.)	14 (6.5)	18 (6.9)
Sexual orientation		
Heterosexual	134 (62.0)	220 (84.6)
Non-heterosexual	82 (38.0)	40 (15.4)
Number of times incarcerated		
1	104 (48.1)	88 (33.8)
2 or more	112 (51.9)	172 (66.2)
Ever had a HIV test		
Yes	205 (94.9)	231 (88.8)
No	11 (5.1)	27 (10.4)

High risk sexual behaviour

High risk sexual behaviours of participants are shown in Table 2. More men than women reported multiple sexual partners in the 6 months before arrest. A quarter of the men and 17% of the women reported multiple anal sexual partners ($p = 0.04$), while 57% of the men

Table 2. High risk behaviours before incarceration among study participants.

	Women		Men		<i>p</i> -Value
	<i>n</i>	Frequency (%)	<i>n</i>	Frequency (%)	
Multiple anal sexual partners in the 6 months before arrest	216	37 (17.1)	260	64 (24.6)	0.04
Multiple vaginal sexual partners in the 6 months before arrest	216	94 (43.5)	260	147 (56.5)	0.005
Inconsistent condom use with multiple anal sexual partners in the 6 months before arrest	216	24 (11.1)	260	35 (13.5)	0.44
Inconsistent condom use with multiple vaginal sexual partners in the 6 months before arrest	216	87 (40.3)	260	129 (49.6)	0.04
Ever injected drugs	216	56 (25.9)	260	37 (14.2)	0.001
Injected drugs in the 6 months before arrest*	56	36 (64.3)	37	23 (62.2)	0.83
Ever shared needles	216	28 (12.9)	260	18 (6.9)	0.03
Shared needles in the 6 months before arrest**	28	14 (50.0)	18	12 (66.7)	0.26

**n* = Number of participants who had ever injected drugs.

***n* = Number of participants who had ever shared needles.

and 44% of the women reported multiple vaginal sexual partners ($p=0.005$). Eleven per cent and 14% of the women and men, respectively, did not use condoms consistently with multiple anal sexual partners. More men (50%) than women (40%) did not use condoms consistently with multiple vaginal partners ($p=0.04$).

Injection drug use and needle sharing

More women (25%) than men (14%) reported ever injecting drugs ($p=0.001$). Over 60% of these participants injected drugs in the 6 months before they were arrested. More women (13%) than men (7%) also reported ever sharing needles for injection drugs ($p=0.03$). Half of these women and two thirds of the men reported sharing needles in the 6 months before arrest (Table 2).

Bivariate and multivariate analyses of factors associated with unprotected sex with multiple anal partners

Factors associated with unprotected sex with multiple anal partners are presented in Table 3. Among women, age, history of IDU, and use of condoms with multiple vaginal partners were associated with unprotected sex with multiple anal partners. In multivariate analysis, women who reported inconsistent condom use with multiple vaginal partners were more likely to report inconsistent condom use with multiple anal partners (AOR, 95%

Table 3. Univariate and multivariate logistic regression analyses of the correlates of inconsistent condom use with multiple anal partners among male and female inmates.

	Women $n=37$ (17.1%)		Men $n=64$ (24.6%)	
	Univariate OR (95% CI)	Multivariate AOR (95% CI)	Univariate OR (95% CI)	Multivariate AOR (95% CI)
Ethnicity				
White	1		1	1
African American	0.91 (0.52–1.59)		1.13 (0.65–1.96)	1.38 (0.74–2.59)
Hispanic	0.89 (0.12–6.63)		2.53 (0.96–6.65)*	2.76 (0.99–7.82)
Others	1.04 (0.32–3.35)		5.78 (1.16–28.81)*	5.79 (1.13–29.55)**
Marital status				
Unmarried	1		1	
Married	0.72 (0.39–1.33)		1.19 (0.68–2.09)	
Age (years)				
<30	1	1	1	1
30–39	1.19 (0.59–2.41)	1.13 (0.53–2.37)	0.54 (0.30–0.98)*	0.55 (0.28–1.07)
40 and above	0.60 (0.31–1.18)*	0.57 (0.28–1.15)	0.55 (0.31–0.99)*	0.42 (0.21–0.84)**
No. of times incarcerated				
Once	1		1	1
Two times or more	1.11 (0.65–1.89)		1.43 (0.85–2.40)*	1.74 (0.92–3.29)
Ever injected drugs				
No	1	1	1	1
Yes	1.51 (0.81–2.79)*	1.61 (0.84–3.12)	1.79 (0.88–3.64)	1.55 (0.67–3.57)
Condom use with multiple vaginal partners				
Consistent	1	1	1	1
Inconsistent	12.04 (2.73–53.12)*	13.01 (2.89–58.54)***	3.70 (1.34–10.25)*	3.38 (1.08–10.56)**

* $p < 0.25$; ** $p < 0.05$; *** $p < 0.001$.

CI = 13.01, 2.89–58.54; $p < 0.001$). Among men, ethnicity, age, frequency of incarceration, and use of condoms with multiple anal sex partners were associated with unprotected sex with multiple anal partners in bivariate analysis. In multivariate analyses, belonging to a race other than White, African American, or Hispanic (AOR, 95% CI = 5.79, 1.13–29.55; $p < 0.05$) and inconsistent condom use with multiple vaginal partners (AOR, 95% CI = 3.38, 1.08–10.56; $p < 0.05$) were associated with unprotected sex with multiple anal partners. Compared with younger men, men who were more than 40 years of age or older were less likely to report unprotected sex with multiple anal partners (AOR, 95% CI = 0.42, 0.21–0.84); $p < 0.05$).

Bivariate and multivariate analyses of factors associated with unprotected sex with multiple vaginal partners

Among women, frequency of incarceration and inconsistent condom use with multiple anal sex partners were associated with unprotected sex with multiple vaginal partners in bivariate analysis. In multivariate analysis, only inconsistent condom use with multiple anal sex partners was associated with unprotected sex with multiple vaginal partners (AOR, 95% CI = 12.58, 2.84–55.80; $p < 0.001$). Among men, only inconsistent condom use with multiple anal sex partners was associated with unprotected sex with multiple vaginal partners (AOR, 95% CI = 3.35, 1.20–9.34; $p < 0.05$; Table 4).

Table 4. Univariate and multivariate logistic regression analyses of the correlates of inconsistent condom use with multiple vaginal partners among male and female inmates.

	Women $n = 94$ (43.5%)		Men $n = 147$ (56.5%)	
	Univariate OR (95% CI)	Multivariate AOR (95% CI)	Univariate OR (95% CI)	Multivariate AOR (95% CI)
Ethnicity				
White	1	1	1	1
African American	0.69 (0.26–1.83)		0.79 (0.30–2.07)	
Hispanic	0.65 (0.09–4.82)		0.86 (0.17–4.48)	
Others	0.76 (0.23–2.44)		1.39 (0.72–2.85)	
Marital status				
Unmarried	1		1	
Married	2.06 (0.58–7.32)		0.98 (0.37–2.59)	
Age, years				
<30	1		1	1
30–39	1.76 (0.53–5.86)		0.35 (0.11–1.06)*	0.40 (0.13–1.25)
40 and above	1.22 (0.43–3.48)		0.38 (0.12–1.17)*	0.43 (0.14–1.37)
No. of times incarcerated				
Once	1	1	1	1
Two times or more	0.51 (0.19–1.31)*	0.45 (0.17–1.21)	1.44 (0.61–3.38)	
Ever injected drugs				
No	1		1	
Yes	0.86 (0.31–2.34)		1.00 (0.54–1.84)	
Condom use with multiple anal partners				
Consistent	1	1	1	1
Inconsistent	12.04 (2.73–53.12)*	12.58 (2.84–55.80)***	3.70 (1.34–10.25)*	3.35 (1.20–9.34)**

* $p < 0.25$; ** $p < 0.05$; *** $p < 0.001$.

Bivariate and multivariate analyses of factors associated with injection drug use

Among women, ethnicity and condom use with multiple anal sex partners met the criteria for inclusion as independent variables into the multivariate model to determine factors associated with injection drug use. African American women were less likely than White women to report IDU (AOR, 95% CI = 0.18, 0.09–0.37; $p < 0.001$). Among men, ethnicity, age, frequency of incarceration, and use of condoms with multiple anal sex partners were included in the multivariate model. African American and Hispanic men were less likely to report IDU (AOR, 95% CI = 0.09, 0.03–0.25; $p < 0.001$; AOR, 95% CI = 0.08, 0.01–0.66; $p < 0.05$, respectively). Men who had been incarcerated two or more times (AOR, 95% CI = 7.62, 2.46–23.65; $p < 0.001$) and those who reported inconsistent condom use with multiple anal sex partners were more likely to have ever injected drugs (AOR, 95% CI = 2.34, 1.01–5.40; $p < 0.05$; Table 5).

Discussion

Our study participants reported sexual and IDU behaviours prior to incarceration that can predispose them to HIV, hepatitis, and other STIs. Our findings are consistent with previous studies that revealed that individuals entering the correctional system exhibit high levels of risky behaviours (Conklin et al., 2000; Wohl et al., 2000; Chen et al., 2003; MacGowan et al., 2003). Men in our study were significantly more likely than women to have multiple sexual partners, and the rates of unprotected sex with multiple partners were high among both men and women. Rates of unprotected vaginal sex with multiple partners

Table 5. Univariate and multivariate logistic regression analyses of the correlates of injection drug use among male and female inmates.

	Women		Men	
	Univariate OR (95% CI)	multivariate AOR (95% CI)	Univariate OR (95% CI)	multivariate AOR (95% CI)
Ethnicity				
White	1	1	1	1
African American	0.18 (0.09–0.37)*	0.18 (0.09–0.37)***	0.11 (0.04–0.29)*	0.09 (0.03–0.25)***
Hispanic	1.34 (0.18–9.96)	1.36 (0.18–10.22)	0.11 (0.01–0.88)*	0.08 (0.01–0.66)**
Others	0.40 (0.10–1.56)	0.39 (0.10–1.55)	0.59 (0.12–3.00)	0.40 (0.07–2.18)
Marital status				
Unmarried	1		1	
Married	0.96 (0.48–1.93)		1.19 (0.54–2.63)	
Age (years)				
<30	1		1	1
30–39	0.73 (0.33–1.59)		0.51 (0.20–1.30)*	0.63 (0.23–1.75)
40 and above	0.69 (0.33–1.44)		1.05 (0.48–2.33)	1.96 (0.78–5.09)
No. of times incarcerated				
Once	1		1	1
Two times or more	0.99 (0.54–1.83)		3.73 (1.39–9.95)*	7.62 (2.46–23.65)***
Condom use with multiple anal partners				
Consistent	1	1	1	1
Inconsistent	1.51 (0.81–2.9)*	1.51 (0.79–2.92)	1.79 (0.88–3.63)*	2.34 (1.01–5.40)**
Condom use with multiple vaginal partners				
Consistent	1		1	
Inconsistent	0.86 (0.31–2.34)		1.19 (0.54–2.63)	

* $p < 0.05$; ** $p < 0.05$; *** $p < 0.001$.

reported by men and women in our study (49.6 and 40.3%, respectively), was lower than the 62% reported for participants in a similar study conducted in four prisons in the State of Illinois, USA (Swartz et al., 2004). The rate of unprotected vaginal intercourse found among men in our study is similar to that obtained among men in three States in the USA (49.6 vs. 45.3%; Seal et al., 2008) and the rate among women is similar to that reported in a previous study (40.3 vs. 35%) (Cotten-Oldenburg et al., 1999). A quarter of the women and 14% of the men in our study reported IDU. Compared with some other studies, IDU was low in our study (Cotten-Oldenburg et al., 1999; Belenko, Shedlin, & Chaple, 2005).

In our study, male and female participants who reported inconsistent condom use with multiple anal sex partners were more likely to report the same with multiple vaginal sex partners. This finding suggests a clustering of sexual risk behaviours among the same cohorts of people. Younger men, and Native or Asian American men were more likely to report inconsistent condom use with multiple anal partners. In some previous studies among similar populations of men, demographic factors were not found to be predictors of sexual behaviour (Braithwaite & Stephens, 2005; Margolis, MacGowan, Grinstead, Sosman, Kashif, Flanigan, et al., 2006). Among the women in our study, no demographic factor was associated with risky sexual behaviour. Furthermore, while other studies have found associations between drug abuse and risky sexual behaviours (Braithwaite & Stephens, 2005), injection drug use was not a predictor of risky sexual behaviour in our study. The few numbers of participants reporting injection drug use may be responsible for this finding.

Among our study participants, IDU was less commonly reported among minority ethnic groups compared with Whites. Previous studies have reported more illicit drug use among African Americans in jails and prisons (Freudenberg, Moseley, Labriola, Daniels, & Murrill, 2007). On the contrary, less IDU have been reported among African American inmates (Belenko et al., 2005) and among the general African American population [Golub & Johnson, 2001; Substance Abuse and Mental Health Services Administration (SAMHSA), 2003]. We also found IDU to be significantly associated with being incarcerated two or more times compared with being incarcerated once.

Our study findings have significant implications for HIV prevention among inmates while in prison and after release. First, the association of different demographic factors with different risk behaviours found among our study participants suggests that generally, all inmates are at risk for HIV. Therefore, all inmates require HIV prevention interventions; albeit such intervention should be appropriate. Second, studies have shown that structural factors such as housing (Margolis et al., 2006), employment, and issues with re-integration into the community post-release are associated with HIV risk behaviours among ex-offenders. Consequently, structural factors fuelling the HIV epidemic should be addressed in HIV prevention programs. The gender differences in the risk behaviours studied warrant the need for gender specific interventions.

The findings of this study need to be interpreted with some caution. Although the surveys were anonymous, results presented are based on self reports, therefore social desirability bias cannot be ruled out as possible explanations for the somewhat low rates of risk behaviours reported. In addition, inmates who declined to participate may have differed significantly from those who participated in the survey. Caution should therefore be exercised not to generalize these study results to the entire inmate population. Our study did not include all the possible risk factors and determinants; hence we may have missed important associations that may have helped to explain our results better and which may have provided useful information for developing interventions. Given these limitations, our

study has generated questions for further research. Further studies are required to examine how individual factors interact with contextual factors to increase both HIV and incarceration risks.

Inmates in our study engaged in risk behaviours that can increase their chances of being infected with HIV before incarceration. In the absence of mechanisms to eliminate the occurrence of risk behaviours in USA prisons, there is an urgent need for effective HIV prevention interventions to be implemented in correctional facilities across the country. The prison environment, being a closed milieu, creates a great opportunity for comprehensive HIV prevention programs for inmates. A comprehensive HIV intervention programme will include HIV counselling and testing, prevention education, behaviour change communication among infected and uninfected individuals, provision of condoms, water-based lubricants, dental dams to decrease sexual transmission of infection, provision of bleach, and other disinfectants for sterilizing needles and syringes, provision of sterile injecting equipment, safer tattooing initiatives, opioid substitution therapies, and other drug dependence treatments, provision of 'drug-free' units, and treatment, care, and support for HIV infected individuals (Laufer, Arriola, & Dawson-Rose, 2002; WHO/UNODC/UNAIDS, 2007a).

Interventions in the US have typically included HIV counselling and testing, prevention education, and treatment, care and support services; specific interventions targeted at unprotected sexual intercourse and IDU such as provision of condoms and provision of sterile injection equipment are rarely found in USA prisons. However, these other components have been implemented and evaluated in other countries with successful outcomes (Dolan, Lowe, & Shearer, 2004; Dolan & Wodak, 1999; WHO/UNODC/UNAIDS, 2007a; WHO/UNODC/UNAIDS, 2007b).

In conclusion, we recommend that HIV prevention programs, which include all the elements listed above, be made available in USA prisons, and that such programmes be initiated as soon as possible after incarceration. In addition, prevention programmes should be accessible to inmates upon release, with links to such programmes being created before inmates are released.

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