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The role of prisons in the HIV epidemic among female injecting drug users

P. ESTÉBANEZ,[1] M. V. ZUNZUNEGUI,[2] M. D. AGUILAR,[3] N. RUSSELL,[4] I. CIFUENTES[5] & C. HANKINS[6]

[1]*Departamento de Medicina Social y Preventiva de Historia de la Ciencia y Ginecologia, Universidad Miguel Hernández, Alicante, Spain*, [2]*Département Médecine Sociale et Préventive, Université de Montréal, Québec, Canada*, [3]*TAISS, Madrid, España*, [4]*Research freelance, Mexico DF, Mexico*, [5]*Instituto Palacios para la Salud y Medicina de la Mujer, Madrid, Spain & [6]Epidemiology, Biostatistics and Occupational Health, McGill University, Direction de la santé publique de Montréal-Centre, Montréal, Québec, Canada*

Abstract *The objective of this study was to describe factors associated with imprisonment of female injecting drug users (IDUs) and to assess if female IDUs who have been in prison have different HIV risk behaviours when compared to females IDUs who have never been incarcerated. A seroepidemiological survey was conducted of 304 female IDUs recruited in outreach and treatment programmes in Madrid, Spain. Data on sociodemographic characteristics and recent and lifetime risk factors, sexual and reproductive history and history of imprisonment were collected. Bivariate analysis and a logistic regression model were used to identify factors associated with imprisonment. Risk factors for imprisonment were having illegal sources of income, not having a fixed address, leaving education before finishing primary school and starting injection of drugs early in adolescence. HIV risk behaviours were highly prevalent among this population of female IDUs and drug injection in prison was reported by more than one-third of those who had ever been imprisoned. In addition, recent HIV risk behaviour indicators were not associated with imprisonment, suggesting that incarceration did not lead to risk reduction after release from prison. Female IDUs who have been in prison have substantial reproductive health problems that require gynaecological care. These results point to the urgent need for prevention programmes which address HIV and other blood-borne infections using gender specific approaches for women IDUs incarcerated in Spanish prisons.*

Introduction

Prisons could play an important role in HIV prevention and control in educating injecting drug users (IDUs) on safe drug injecting and safe sex practices since a large proportion of injecting drug users are incarcerated at some point in their drug injecting careers. If effective health promotion and health care were provided in prisons along with the means of protection, inmates could reduce their sharing of injection equipment and increase their use of condoms (Boudin *et al.*, 1999). However, many studies have reported higher HIV

Address for correspondence: Pilar Estébanez, Universidad Miguel Hernández, Departamento de Salud Publica, Carretera de Alicante–Valencia Km 87, 03550 San Juan de Alicante, Spain.

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prevalence among IDUs who have been imprisoned than among IDUs who have never been incarcerated. An HIV outbreak has been reported in a Scottish prison (Goldberg *et al.*, 1998) and four cases of HIV infection acquired in prison in Australia (Dolan & Wodak, 1999) provide documented evidence of intramural HIV transmission, despite relatively low prevalences of HIV of between 1 and 2% in both prisons which is comparable to that of the general population. Elsewhere, most information about HIV infection and transmission in prison has come from cross-sectional studies of incarcerated IDUs (Bird *et al.*, 1992; Edwards *et al.*, 1999; Estébanez *et al.*, 1990; Hankins *et al.*, 1994; Martin *et al.*, 1990; Rozman *et al.*, 1998; Stark *et al.*, 1997; Zunzunegui *et al.*, 1993). Most of the cited studies are on male populations or do not report results separately by gender. Seropositivity increases with the number of times individuals are incarcerated (Estébanez *et al.*, 1990; 2000) and and the risk of HIV co-infection with tuberculosis increase with the total lifeyears spent in prison (Martin *et al.*, 2000). Nevertheless, the temporal sequence is difficult to establish since IDUs who are seropositive may have a higher probability of incarceration or IDUs who are incarcerated may have a higher probability of acquiring HIV infection while in prison or after release from prison.

The positive association which has been found between imprisonment and HIV seropositivity could be explained by the marginal living conditions of IDUs who end up going to jail. Poverty and marginalization could lead to risk behaviours such as the sharing of contaminated injection equipment or having unprotected sex prior to incarceration. An alternative explanation may also be true in that prison life itself could be an independent HIV risk factor as a result of the unavailability of sterile injection equipment or/and the unavailability of condoms for safe sex (Cayla, 1996; Dolan *et al.*, 1998; Edwards *et al.*, 1999). Detailed studies on HIV transmission in prisons have been conducted in correctional institutions for men but there is a lack of information on female inmates, drug use and HIV transmission. Early in 1990, a study of the rapid spread of HIV in the women's prison of Madrid found associations between injecting drug use and the number of episodes of incarceration (Estébanez *et al.*, 1990).

Using data from a survey of female IDUs in Madrid, this paper aims to describe the factors associated with imprisonment and to assess the influence of imprisonment on risk behaviours. If the HIV risk behaviours of women IDUs who have been incarcerated do not differ significantly from those of other female IDUs who have never been in prison, this would suggest that recent risk behaviour is not likely influenced by past prison experience.

Methods

Study population

Female IDUs ($n = 304$) were recruited from drug dependency units ($n = 107$), methadone services ($n = 50$) and community outreach services ($n = 147$) in Madrid, Spain between October 1995 and March 1996. Overall, 315 women were approached, of whom 11 (3.5%) refused to participate. This sample is a sub-set of a five-centre study (Paris, Madrid, Rome, London, Berlin) funded by the European Community (Estébanez *et al.*, 2000).

Data collection

A questionnaire was administered to all eligible women by trained interviewers in a face-to-face interview, and a specimen of blood for detection of HIV status was collected from all consenting participants who had not been recently tested. Those who had been tested were

asked to present their medical card indicating their HIV status. Many drug users carry these cards, which are issued by the medical services, to avoid problems with the police. The questionnaire was adapted to the IDU population using a theoretical framework based on ethnographic observations and plausible biological risk factors for transmission by sexual and parental routes. The questionnaire included information on sociodemographic characteristics, history of drug use, sexual behaviour, use of condoms and HIV testing. The recall period for recent drug and sexual risk practices was six months based on the work of McElrath *et al.* (1994).

HIV antibody testing was performed only after informed consent had been given. The fieldwork was conducted between October 1995 and January 1996.

Statistical analysis

A bivariate analysis was carried out to identify factors associated with imprisonment. The chi-square statistic was used as a measure of association and odds ratios (OR) calculated for all 2×2 contingency tables. A p value less than 0.05 was taken to be significant. With some variables, a linear trend test was used. In these cases the odds ratios (OR) and the 95% confidence intervals were calculated related to a reference stratum.

The grid of relationships modelled by Frischer *et al.* (1993) influenced our conceptual framework and multivariate analysis plan. A logical and hierarchical structure was used to determine the direct and indirect effects of the explanatory variables in the multivariate model. Possible explanatory variables were grouped into explanatory models and each group of variables was forced into the regression sequentially. The following three groups of explanatory variables were identified.

Model 1: Age. In order to evaluate the effect of age on the dependent variable (previous imprisonment), the biological age (coded into four categorical age groups: 24 or less; 25–29; 30–34; 35 +) was the sole variable used in this group.

Model 2: Socioeconomic status and marginalization. Based on the literature and results of the bivariate analysis, three variables were selected to define the general socioeconomic status of female IDUs: age at leaving full-time education (coded into four categorical age groups: 13 or less; 14–15; 16–18; 19 +), source of income during the past six months (illegal and prostitution versus legal), and place of residence during the previous six months (no fixed abode versus abode). In addition to socioeconomic status, two variables were chosen to characterize the highly marginalized nature of the sample population. These dichotomous variables (yes versus no) were: ever had sex clients and having a regular partner who was an IDU.

Model 3: Risk behaviours. Specific known risk behaviours for HIV infection were included in the third model: ever having had a regular HIV-positive partner; cocaine injecting; heroin plus cocaine injecting; age began injecting; and ever sharing needles.

Model 4: Gynaecological history and infections. The variables introduced in this model were: previous pregnancy; any sexually transmitted disease (STD) in the last year; and hepatitis B during the past year.

Each group of variables was entered in a stepwise logistic regression. For each step, the most parsimonious model was chosen through a process of backward elimination with exclusion criteria of $p > 0.05$. The regression models were compared using improvement in the -2loglikelihood measure with chi-square.

Results

Almost one out of three IDUs (32.3%) reported past prisons stays. Table 1 shows the results of the bivariate analysis of socio-economic variables, injecting practices and sexual habits associated with imprisonment. Age is clearly associated with imprisonment, with older IDUs having a higher probability of having been in prison. The extreme marginalization of IDUs who have been incarcerated is evident when examining place of residence and source of income. Forty-nine per cent of female IDUs with no fixed address had been in prison, compared to 27.2% of those with a fixed abode ($p < 0.001$). Furthermore, 42.3% of the women whose primary source of income was acquired through illegal means or prostitution had been incarcerated, compared to only 24.0% of those who had a legal source of income ($p < 0.001$).

Age at school leaving was not significant by the linear trend test. Age at initiation of drug injection was strongly associated with a history of previous incarceration. Those who were 16 years or less when they began injecting were more than twice as likely to have been in prison than those who began injecting at age 20 or later ($p < 0.001$). There is a linear significant trend.

Those who had ever borrowed or loaned used injection materials were more likely to have been incarcerated. However no significant association was found between a recent history of having shared injection materials in the last six months and having been in prison. No significant associations were found between the current use of any specific drugs and imprisonment. Of the 89 women who reported having been in prison, 34.8 reported injecting whilst incarcerated.

Almost all of the women reported having had a steady partner and, in the great majority of cases (85%), this partner was also an IDU. No significant associations were found between having ever had a steady sexual partner and having been in prison, even when the partner was an IDU. However, women who had a steady sexual partner who was HIV-positive were twice as likely to have been imprisoned (OR = 2.1; 95%CI: 1.2–3.4) than those who had not. Although no association was found between having had casual partners and prison, having had a partner who was HIV-positive (OR = 2.7; 95%CI: 1.4–5.1) or an IDU (OR = 2.1, (95% CI = 1.2–3.4)) was significantly associated with incarceration. A link between a history of sex work was seen, with women who had practised prostitution having nearly double the odds compared to those who had never engaged in sex work.

No significant associations were found between incarceration and current use of condoms with regular partners, casual partners or clients.

A significant association was found between having regular menstrual periods and imprisonment, with 21.2% of those with regular menstrual periods having been in prison compared to 37.6% of those with irregular periods (OR = 0.4; 95% CI: 0.3–0.8).

No associations with imprisonment were found for either various types of contraception used in the past five years or current use of contraception. We found a strong relationship between having ever been pregnant and the dependent variable. Those reporting a previous pregnancy were three times more likely to have been imprisoned compared to those who had never been pregnant ($p = 0.001$). Having had any type of STD in the last five years nearly tripled the odds of previous imprisonment ($p = 0.001$), while having an STD in the last year was also associated with a history of incarceration ($p = 0.05$).

Table 2 shows the results of the multivariate analysis of determinants of imprisonment. In addition to the strong association between age and incarceration, it is noteworthy that the probability of imprisonment is increased with indicators of poverty and marginalization such as having no fixed abode, having illegal sources of income, and being a school dropout (leaving school before completing primary education or before completing secondary education). The only drug behaviour variable which retained significance was age at initiation of

Table 1. *Imprisonment by selected variables in Spanish female IDUs, 1995*

Variable	Total	Imprisonment	OR(CI.95%)	*p*
Sociodemographics				
Age				
24 or less	73	17.8	1(reference)	**[a]
25–29	110	33.6	2.3(1.1;5.1)	
30–34	72	41.7	3.3(1.5;7.6)	
35 or more	49	36.7	2.7(1.1;6.7)	
Age left full-time education				
13 or less	88	43.2	1.4(0.7;2.7)	NS
14–15	82	28.0	0.7(0.3;1.5)	
16 or more	73	35.6	1(reference)	
Abode				
No fixed address	69	49.3	2.6(1.5;4.5)	***
Fixed address	235	27.2		
Income				
Illegal + sex work	137	42.3	2.3(1.4;3.9)	NS
Legal	167	24.0		
Drug-using habits				
Age began injecting drugs				
16 or less	81	48.1	3.3(1.8;6.2)	***[a]
17–19	81	33.3	1.8(0.9;3.4)	
20 or more	141	22.0	1(reference)	
Ever shared needles/syringes				
Yes	217	36.9	2.2(1.2;4.0)	***
No	86	20.9		
Ever shared needles/syringes in last six months				
Yes	104	40.4	1.3(0.8;2.3)	NS
No	114	33.3		
Sexual habits				
Ever had a regular sexual partner				
Yes	293	32.1	0.8(0.2;2.9)	NS
No	11	36.4		
Ever had a regular sexual IDU partner				
Yes	257	32.7	1.1(0.6;2.6)	NS
No	47	29.8		
Ever had a regular sexual HIV-positive partner				
Yes	138	39.1	2.1(1.2;3.4)	**
No	152	23.7		
Frequency of condom use with regular sexual partner				
Vaginal intercourse:				
Never/sometimes	122	25.4	1.0(0.4;2.3)	NS
Always	35	25.7		
Ever had a casual sexual partner				
Yes	241	32.8	1.1(0.6;2.0)	NS
No	62	30.6		
Ever had a casual sexual IDU partner				
Yes	156	39.7	2.1(1.3;3.4)	**
No	141	24.1		
Ever had a casual sexual HIV-positive partner				
Yes	53	45.3	2.7(1.4;5.1)	**
No	186	23.7		
Frequency of condom use with casual sexual partner				
Vaginal intercourse:				
Never/sometimes	48	29.2	0.7(0.3–1.6)	NS
Always	50	38.0		

continued:

Table 1. *Continued*

Variable	Total	Imprisonment	OR(CI.95%)	*p*
Ever had a client				
Yes	140	39.3	1.8(1.1;3.0)	*
No	164	26.2		
Frequency of condom use with client				
Vaginal intercourse:				
Never/sometimes	26	38.5	0.8(0.3;2.2)	NS
Always	52	42.3		
Reproductive health				
Regular periods				
Yes	99	21.2	0.4(0.3–0.8)	**
No	205	37.6		
Age at first pregnancy				
<.18	74	44.6	1.6(0.9–2.8)	NS
18 or more	150	34.0		
Contraception currently				
Yes	159	30.2	0.8(0.5–1.3)	NS
No	140	34.3		
Intrauterine device used in last five years				
Yes	21	14.3	0.3(0.1–1.1)	NS
No	283	33.6		
Condom used in last five years				
Yes	247	33.2	1.3(0.7–2.4)	NS
No	57	28.1		
Spermicide used in last five years				
Yes	45	42.2	1.7(0.9–3.2)	NS
No	259	30.5		
Contraceptive pill used in last five years				
Yes	91	28.6	0.8(0.5–1.3)	NS
No	213	33.8		
Ever been pregnant				
Yes	230	37.4	3.1(1.6–6.1)	***
No	74	16.2		
Regular smear test				
Yes	134	30.6	0.9(0.5–1.4)	NS
No	168	33.9		
STD in last five years				
Yes	77	49.4	2.9(1.6–5.1)	***
No	196	25.5		
STD in last year				
Yes	148	36.5	1.7(1.0–2.8)	*
No	154	25.7		

*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.

injection. Those who started injecting before age 16 years had a higher probability of having been incarcerated (OR = 3.3;95%CI: 1.7–6.4). None of the risk behaviour variables related to unsafe injection or to unsafe sex practices in the previous six months were retained in the model, suggesting that the experience of having been incarcerated does not appear to influence current risk-taking behaviour. Those who had ever been pregnant were more likely than those who had never been pregnant to have been to prison. Women who reported having an STD in the last year were also more likely to have been imprisoned compared to those who had not ($p = 0.05$).

Table 2. *Hierarchical logistic regression estimation of odds ratios relating imprisonment and risk factors*

	Model A: Age OR (95% CI)	Model B: socioeconomic status OR (95% CI)	Model C: risk behaviour OR (95% CI)	Model D: reproductive health OR (95% CI)
Age				
24 or less	1.0	1.0	1.0	1.0
25–29	2.3(1.1;4.8)	3.2(1.5;6.9)	3.5(1.6;7.8)	2.9(1.3;6.6)
30–34	3.3(1.5;7.1)	5.4(2.3;12.3)	5.8(2.4;13.7)	4.5(1.9;10.9)
35 +	2.7(1.2;6.2)	4.4(1.8;11.1)	6.4(2.4;17.2)	4.9(1.8;13.4)
Age leaving education				
13 or less		3.8(1.6;9.0)	2.7(1.1;6.5)	2.4(1.0;6.0)
14–15		2.0(0.8;4.9)	1.6(0.6;4.1)	1.3(0.5;3.4)
16–18		3.1(1.3;7.4)	2.5(1.0;6.2)	2.2(0.9;5.5)
19 +		1.0	1.0	1.0
Abode				
No fixed address versus fixed address		1.8(1.0;3.4)	1.7(0.9;3.2)	1.6(0.8;3.1)
Source of income				
Illegal versus legal		2.3(1.3;4.1)	2.3(1.3;4.2)	2.2(1.2;4.0)
Age injecting drugs				
16 or less			1.0	1.0
17–19			3.3(1.7;6.4)	2.2(1.0;4.8)
20 +			1.7(0.8;3.4)	1.9(1.1;3.6)
Previous pregnancy				
Yes versus no				2.2(1.0;4.8)
STD in past year				1.9(1.1;3.6)
Yes versus no				

For models B to C, the following variables were excluded from the equation: in model B, regular sexual partner IDU and prostitution; in model C, regular partner HIV-positive, condom use, cocaine injection, speedball injection and ever sharing needles.

Discussion

We have shown that although injecting drug using women who have been in prison are identified by the marginality of their lives, they do not differ significantly from those who have never been incarcerated in their use of condoms or in their injection equipment-sharing patterns. This implies that being in prison does not result in demonstrated improvements in risk behaviour following release from prison. Although most prisons worldwide are not currently acting as centres for health promotion and risk reduction, intervention trials could demonstrate whether they have the potential to assist inmates in establishing safer injecting and sexual practices which can be maintained following release from prison.

Age at school leaving has a nonlinear association with imprisonment, a finding which may be explained by the nature of education cycles in Spain. Those who have not finished primary school (leaving school before 14 years) are at highest risk of imprisonment, followed by high school dropouts who leave school at 16 or 17 years. The group of women in between who quit school at 14 or 15 years may have simply finished primary school without pursuing further education. Risk of imprisonment seems associated with being a school dropout, either from primary or from secondary education.

Two indicators of social exclusion are indirectly related to imprisonment—reporting one's source of income as illegal and not having a fixed abode. In a study of AIDS patients, socio-economic status, as determined by currently living in a poor district of Barcelona, was

also identified as having a direct relationship with previous imprisonment amongst IDUs (Cayla *et al.*, 1995). Current age and age at initiation of drug injecting both have direct and strong relationships with imprisonment, in all likelihood reflecting associations between years of injection and petty crime or drug dealing. The longer women IDUs have been injecting, the more likely they are to be involved in drug dealing to support their own habit. Early age at first injection may also be viewed as an indicator of marginality. Age by itself may be a risk indicator, since older women IDUs are likely to have family responsibilities and more financial needs to provide for their children and to sustain their drug habits (Boyd, 1999; Boyd & Faith, 1999).

It has been shown repeatedly in other studies, as in our study, that a history of incarceration is an independent risk factor for HIV. Imprisonment increases the chances of being HIV-positive as a result of unsafe sex, unsafe drug injection or tattooing during incarceration. The efficacy of transmission by these three modes is heightened by the high background prevalence of infection, estimated to be 60% among street recruited IDUs in Madrid (Zunzunegui *et al.*, 1993), which is consistent with the 62% prevalence found in this survey (Estébanez *et al.*, 2000). In many prisons, condoms are not easily available and even when visits of male sexual partners are allowed, safer sex practices are not encouraged. Sex between females has been shown to be a possible but unlikely mode of transmission. With the exception of a few prisons, sterile injection equipment is not available and syringes may be shared repeatedly by many inmates (Dolan *et al.*, 1998; Edwards *et al.*, 1999). Tattooing is very common in prison and sterile equipment is rarely available (Estébanez *et al.*, 1990; Martin *et al.*, 2000; Dolan *et al.*, 1998).

Risky drug injection practices are likely to be stronger contributors to HIV spread in female prison populations than unsafe sex. Countries with lower documented HIV prevalence among IDUs than Spain, such as England (Edwards *et al.*, 1999), Scotland (Goldberg *et al.*, 1998), Australia (Dolan & Wodak, 1999), Germany (Stark *et al.*, 1997) have reported associations between injecting practices and HIV prevalence in correctional institutions for men. A study of male street IDUs in Grenada revealed that 33% reported injecting in prison and 89% of these men had shared syringes (Palacio Llanos, 1999). Incarceration was associated with less frequent condom use among IDUs who had been repeatedly imprisoned, had shared syringes while in prison and had not received counselling after HIV testing (Romero *et al.*, 1999). In a previously published paper on our sample of female IDUs, HIV seropositivity was confirmed for 62% of the 262 women with known HIV status. In this high prevalence context it is not surprising that history of imprisonment was an independent risk factor for HIV seropositivity (OR = 2.3; 95% CI:1.1–4.9), controlling for age, poverty and marginalization, HIV risk sexual and drug behaviours (Estébanez *et al.*, 2000). A few calculations serve to illustrate how HIV transmission may occur in the closed environment with high HIV prevalence that constitutes a Spanish prison. Jacquez *et al.* (1994) reported that infectivity is very high in the first six to eight weeks following infection, then stays low during the asymptomatic stage until it rises again when HIV-related disease symptoms become manifest. Several authors have modelled HIV transmission based on estimates of a mean infectivity of 0.01 per contact with a contaminated syringe (Kaplan & Heimer, 1992; Kretzschmar & Wiessing, 1998). Therefore, assuming that the probability of transmission via one injection with a contaminated syringe is 0.01, the probability of becoming infected by sharing equipment 12 times in a prison where 60% of the IDUs inmates are infected is: $1 - (1 - 0.01.\ 0.60)^{12} = 1 - 0.93 = 0.07$. Therefore, seven out of 100 HIV-negative women injecting once a day would become infected after only 12 days of incarceration.

The study reported here has a number of limitations. Potential bias from self-reporting, particularly concerning sexual and injecting behaviours, may threaten validity, however the

nature and frequency of risk behaviours for HIV acquisition reported by our study subjects are similar to that reported in comparable studies conducted in Spain. Women interviewed in this study are not likely to be representative of the population of female IDUs in Madrid since 60% of them have been recruited at drug treatment centres (60%) and the remaining 40% at a needle exchange programme.

HIV prevention education for incarcerated individuals is critical not only because the audience is captive and difficult to access otherwise, but also because prisoners have a high risk of HIV acquisition and transmission while incarcerated and after discharge. Prison populations continue to grow as a consequence of the 'war of drugs', with correctional institutions acting as a revolving door for many users of street drugs. Harm reduction interventions, such as needle exchange programmes and condom provision have been advocated and implemented by pioneering health professionals (Nelles & Harding, 1995). However, the lack of independence of prison medical services within correctional institutions and systems has curtailed these efforts in most countries. In response to the severity and urgency of HIV and AIDS in prisons, the World Health Organization (WHO) has recommended sweeping reforms, including increased availability of condoms, introduction of needle exchange programmes and the provision of bleach to clean injecting equipment, on a par with services provided for the community at large (WHO, 1993). By linking the recommendations for prison settings to those provided for the general population, the WHO affirmed the principle of equality, namely the same prevention and control strategies should be applied in prisons as are in effect in other parts of society (Tomasevski, 1991; Trace, 1998). A similar approach has been recommended by other international organizations including the Council of Europe. Most drug control programmes in prison concentrate on reducing the supply of drugs instead of reducing the demand. Future advances may include the extension of methadone, which has already occurred in all prisons of Catalonia, and heroin maintenance treatments for inmates, which are being piloted in Switzerland. Offering detoxification and maintenance programmes with incentives to participate may be more effective in preventing blood-borne disease transmission than punishment for continuing drug consumption under dangerous conditions (Seddon, 1996; Trace, 1998). Despite a consensus on the critical importance of prevention strategies by and for IDUs in the response to the HIV epidemic, differences persist between provision of preventive programmes in the wider society versus that for prisoners, in particular for women IDUs (Martin, 1998).

Female IDUs who have been imprisoned have substantially increased frequencies of reproductive conditions such as pregnancy, irregular periods and sexually transmitted diseases compared with women IDUs who have not been in prison. As women in prison have different health needs and social problems than incarcerated men, gender-specific programmes are needed (Zaitzow, 1999). Involvement of women IDUs in the design, implementation and evaluation of interventions can be empowering for participants while increasing the probability of significant and lasting behaviour change to prevent HIV acquisition and transmission.

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