

Syringe Confiscation as an HIV Risk Factor: The Public Health Implications of Arbitrary Policing in Tijuana and Ciudad Juarez, Mexico

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ABSTRACT *Female sex workers who inject drugs (FSW-IDUs) face elevated risk for HIV/STIs and constitute a key population for public health prevention. Through direct and indirect pathways including human rights violations, policing practices like syringe confiscation can compound FSW-IDU health risk and facilitate the spread of disease. We studied correlates of experiencing syringe confiscation among FSW-IDUs in northern Mexico, where formal policy allows for syringes to be available over the counter without a prescription, but police practices are often at odds with the law. FSW-IDUs reporting recent syringe sharing and unprotected sex with clients in Tijuana and Ciudad Juarez were administered surveys and HIV/STI testing. Logistic regression was used to identify correlates of syringe confiscation. Among 624 respondent FSW-IDUs, prevalence of syringe confiscation in the last 6 months was 48 %. The following factors were positively associated with syringe confiscation: testing positive for HIV (adjusted odds ratio [aOR]=2.54, 95 % confidence interval [CI]=1.11–5.80), reporting sexual abuse by police (aOR=12.76, 95 % CI=6.58–24.72), engaging in groin injection (aOR=1.84, 95 % CI=1.15–2.93), injecting in public (aOR=1.64; 95 % CI=1.14–2.36), and obtaining syringes from pharmacies (aOR=1.54; 95 % CI=1.06–2.23). Higher education level was negatively associated with syringe confiscation (aOR=0.92, 95 % CI=0.87–0.98) as was frequent injection with clients within the last month (aOR=0.64, 95 % CI=0.44–0.94). This analysis adds to the body of evidence linking unauthorized law enforcement actions targeting high-risk groups with HIV and other adverse health outcomes. Using a public health lens to conceptualize abuse as a structural risk factor, we advocate for multi-prong prevention, systematic monitoring, and evidence-based intervention response to deleterious police practices.*

KEYWORDS *Injection drug use, Sex work, Police, HIV risk factors, Risk environment*

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BACKGROUND

In Mexico, the increasing prevalence of drug use has resulted from “spillover” along US-bound drug trafficking routes,¹ acutely affecting the northern border states. In major gateways like Tijuana and Ciudad (Cd.) Juarez where drug trafficking and migration channels converge, rates of injection drug use are estimated to be many times the national average.^{1,2} As destinations for sex tourism, these two cities also have sizable populations of female sex workers (FSWs).³ High prevalence of HIV and other injection- and sexually transmitted infections (STIs) has been observed along the US border, with especially elevated levels among female sex workers who also inject drugs (FSW-IDUs).³

These epidemiological paradigms have emerged in the context of increased violence caused by the armed struggle against drug cartels. With substantial financial support from the US Merida Initiative, Mexico’s central government has trained and deployed large numbers of heavily armed federal military and police to help maintain security and combat organized crime in Tijuana, Cd. Juarez, and elsewhere in the embattled Northern Border Region. Adding to the already heavy presence of municipal and state police, the “militarization” of policing by the federal authorities has been criticized for sharply increasing human and civil rights abuses by law enforcement in the affected areas.⁴⁻⁶

A growing body of research explores the synergistic impact of health and human rights challenges facing vulnerable groups, including FSW-IDUs.⁷⁻¹⁷ From an epidemiological perspective, FSW-IDUs command special focus because they can acquire communicable infections through both the sexual and injection routes, making them critical to community-level HIV and STI prevention.¹⁸⁻²⁰ From a human rights perspective, this population is doubly marginalized by policies criminalizing drug use and prostitution. By pushing their activities underground and restricting access to formal support frameworks, laws can limit these individuals’ ability to negotiate safer practices and avoid psychological and physical victimization, including sexual assault, at the hands of clients, pimps, and intimate partners.^{10,11,13,16} Police practices rooted in such laws can further facilitate individuals’ risky behavior (including receptive syringe sharing and unprotected sex)^{18,21} and interfere with public health efforts targeting high-risk populations.^{9,22-24} Formal policies and their enforcement are increasingly seen as critical structural factors that shape the “risk environment” for the production of health and disease among vulnerable groups and society at large, including vulnerability to HIV infection.^{22,24-27} This framework posits that health outcomes result from an interplay of multi-level influences originating from environmental and structural processes rather than a product of merely individual-level characteristics or behaviors.²⁵

Mexico represents a rare example of a jurisdiction where the formal policy environment is favorable to public health prevention among high-risk groups such as FSW-IDUs. Syringe purchase and possession are unrestricted by law, theoretically facilitating syringe access including pharmacy-based and syringe exchange programs (SEPs). Regulation of commercial sex activity is left to local discretion; both Tijuana and Cd. Juarez permit prostitution.²

Even in this setting, however, unauthorized (or “extra-judicial”) police practices such as extortion of money and sexual services, syringe confiscation, and abuse of FSWs, IDUs, and FSW-IDUs are widespread. Paralleling broader research on police professionalism and management,²⁸ our previous findings suggest that most IDUs in

the Northern Border Region report having been recently arrested for syringe possession.^{2,29} We found that such arrest was independently associated with more than threefold increase in the odds of receptive syringe sharing.²⁹ We also previously reported that being arrested for having track marks (a visible marker of drug use) and experiencing syringe confiscation was independently associated with HIV infection.^{18,30}

Police confiscation of syringes from IDUs carries an especially onerous potential to generate population health detriment. Removal of injection equipment directly reduces drug user access to sterile syringes. Although police officers may perceive syringe confiscation as deterring drug use and furthering occupational safety,³¹ evidence suggests that it instead triggers HIV risk behaviors: IDUs may react to confiscation by sharing syringes with others, rushing injection and injecting in public places most proximate to drug acquisition points, and using services of hit doctors or shooting galleries.^{23,24,32,33} Syringe confiscation may also deter IDUs from carrying syringes to avoid detection, extortion, and abuse, meanwhile encouraging dangerous injection behaviors designed to conceal track marks, including groin injection.^{5,29,33} More broadly, extra-judicial police practices undermine IDU trust in the laws authorizing syringe possession and erode the credibility of community health providers who promote syringe access.²²

On a systems level, syringe confiscation runs counter to HIV prevention initiatives, such as SEPs, pharmacy-based distribution, and related syringe access services.²² Police surveillance of the service points and confiscation of legally obtained syringes in or around these programs may directly interfere in their functioning and reduce their public health impact.^{22,34,35} In aggregate, the real and perceived barriers to safer practices and service access help explain the observed associations between report of syringe confiscation and risk behavior among IDUs.^{23,24,29,36} Expanding on the findings from a broader initiative to understand the risk environment of FSW-IDUs along Mexico's Northern Border,^{16,18} this analysis focuses on identifying behavioral and health status correlates of syringe confiscation. Based on existing empirical and theoretical literature, we hypothesized that exposure to syringe confiscation may be associated with respondent risk behavior (e.g., receptive syringe sharing, unprotected sex) and increase the odds of positive STI/HIV diagnoses.

METHODS

This study's methods were covered in detail elsewhere.¹⁸ In short, in 2008–2009, we recruited females in venues frequented by sex workers as part of an intervention study on risky sex and injection behavior. Eligibility criteria included: being at least 18, reporting recent unprotected sex with a male client and sharing injection paraphernalia within the last month, and agreeing to undergo STI treatment. Computer-assisted interviews and testing for HIV and STIs (syphilis, gonorrhea, chlamydia, and trichomonas) were administered. Institutional review boards at UCSD School of Medicine, Tijuana General Hospital, and Universidad Autonoma de Ciudad Juarez approved the study.

Measures

We collected data on sociodemographics (age, sex, migration history), sexual and drug use risk behaviors (receptive syringe sharing, unprotected sex), and aspects of the physical, social, and economic risk environment understood to influence disease

risk (hours/day spent on the streets, income from sex, age of drug use initiation).³⁷ Surveys also assessed experiences with police, including ever being arrested as well as recent (last 6 months) experience of syringe confiscation, extortion of money or sexual services, and sexual abuse. Depression symptomology was assessed using the Center for Epidemiological Studies (CES—D) ten-item depression score^{38,39} and self-esteem using the Rosenberg inventory.⁴⁰

Laboratory Testing

As previously described, we determined infection prevalence through a battery of rapid and laboratory tests.¹⁸ To ascertain HIV status, the “Determine”[®] rapid antibody test was administered (Abbott Pharmaceuticals, Boston, MA, USA). Syphilis serology used the rapid plasma reagin test (Determine[™] Syphilis TP; Abbott Pharmaceuticals, Boston, MA, USA). Positive samples were subjected to confirmatory testing.

Testing for gonorrhea and chlamydia was conducted using a rapid test kit (BioStar[®] OIA[®] GC and CHLAMYDIA) and later replaced by the Genprobe Transcription-Mediated Amplification assay (San Diego, CA, USA). Trichomonas was detected using the OSOM[®] Trichomonas Rapid Test and bacterial vaginosis using the OSOM[®] BVBlue[®] Test (Genzyme diagnostics, San Diego, CA, USA).

Data Analysis

To compare sociodemographic, behavioral, economic, policing, and disease characteristics by syringe confiscation, we used Wilcoxon’s rank sum tests for continuous outcomes and Pearson’s chi-square or Fisher’s exact tests for binary outcomes. Univariate and multivariate logistic regressions through generalized estimating equations (GEE) were used to identify factors associated with experience of syringe confiscation based on the risk environment framework.²⁵ The GEE procedure was used to produce robust variance estimators to correct for over-dispersion. Multivariate models were developed using a manual procedure whereby variables with a significance level of less than 10 % in univariate regressions were considered for inclusion in multivariate models. Even though we did not hypothesize any significant interactions, all third- and second-order interactions between the variables included in the model were assessed. The presence of multicollinearity between the predictor variables in the final model was ruled out by appropriate values of the largest condition index and of the variance inflation factors.

RESULTS

Sample Characteristics

A total of 624 FSW-IDUs were recruited. By design, respondents were evenly split between the two study sites (312 from Tijuana and 312 from Cd. Juarez). As seen in Table 1, median age was 33 (interquartile range [IQR], 27–40); 38 % were married and 42 % had children dependents. Most (80 %) engaged in street-based sex work, with a median of 10 h spent on the street daily (IQR, 7–15). Almost half of the respondents (48 %) reported having syringes confiscated in the last 6 months. The only sociodemographic characteristic that distinguished women reporting syringe confiscation from those who did not was the number of years of education (6 vs. 7 years, $p < .001$).

TABLE 1 Descriptive statistics by syringe confiscation by police (during the previous 6 months) (N = 624)

Variable	Had syringe confiscated by police (n=301)	Did not have syringe confiscated by police (n=323)	Total (n=624)	P
Interview location				
Tijuana	118 (39.2 %)	194 (60.1 %)	312 (50.0 %)	<.001
Ciudad Juárez	183 (60.8 %)	129 (39.9 %)	312 (50.0 %)	
Sociodemographics				
Age, median (IQR)	32 (27–39)	34 (28–41)	33 (27–40)	.18
Lived in the city of interview for the entire life	142 (47.2 %)	131 (40.6 %)	273 (43.8 %)	.11
Married	119 (39.5 %)	117 (36.2 %)	236 (37.8 %)	.41
Number of years of education completed, median (IQR)	6 (4–8)	7 (5–9)	6 (5–9)	<.001
Speaks English	71 (23.6 %)	94 (29.1 %)	165 (26.4 %)	.12
Financially responsible for children	129 (42.9 %)	133 (41.2 %)	262 (42.0 %)	.67
Injection and sexual risk behavior				
Age when first injected drugs, median (IQR)	19 (16–24)	20 (17–27)	20 (17–25)	<.001
Age when first traded sex for money, median (IQR)	18 (15–20.5)	19.5 (16–25)	19 (15–23)	<.001
First drug used: meth	5 (1.9 %)	25 (9.0 %)	30 (5.6 %)	<.001
Receptive syringe sharing (half of the time or more) ^a	171 (57.0 %)	190 (58.8 %)	361 (57.9 %)	.68
Normally injected drugs in public places ^a	201 (66.8 %)	173 (53.6 %)	374 (59.9 %)	<.001
Duration (years) of injection, median (IQR)	12 (5–18)	11 (4–18)	11 (5–18)	.09
Groin injection ^a	65 (21.6 %)	40 (12.4 %)	105 (16.9 %)	.003
Sought the help of a hit doctor ^a	123 (40.9 %)	121 (37.5 %)	244 (39.1 %)	.41
Number of people usually injected with, median (IQR) ^a	4 (2–7)	2 (1–5)	3 (1–5)	<.001
Number of male clients, median (IQR) ^a	40 (15–90)	24 (10–56)	30 (10–80)	<.001
Ratio of unprotected/total number of sex acts with clients, median (IQR) ^a	0.34 (0.00–0.68)	0.00 (0.00–0.45)	0.15 (0.00–0.56)	<.001

TABLE 1 (Continued)

Variable	Had syringe confiscated by police (n=301)	Did not have syringe confiscated by police (n=323)	Total (n=624)	P
Total number of unprotected vaginal and/or anal sex acts, median (IQR) ^a	23 (2–62)	6 (0–32)	13.5 (0–45)	<.001
Health and psychological assessment				
HIV infection, based on confirmatory positive test result	22 (7.3 %)	12 (3.7 %)	34 (5.5 %)	.05
Syphilis infection (based on titer >=1:8)	29 (9.8 %)	35 (11 %)	64 (10.4 %)	.69
Any STI, based on confirmatory test results (excluding BV)	186 (61.8 %)	175 (54.2 %)	361 (57.9 %)	.06
Self-esteem (Rosenberg Score), median (IQR)	2.38 (2.13–2.50)	2.5 (2.25–2.5)	2.46 (2.25–2.5)	.60
Depression (CES-D score of 10=depression), median (IQR)	12 (6–17)	12 (7–18)	12 (7–18)	.14
Physical, social, and economic risk environment				
Number of hours spent on the streets, on typical day, median (IQR) ^b	11.5 (8–16)	10 (7–15)	10 (7–15)	.07
Spouse/steady partner ever injected illegal drugs, among those with spouse	89 (69.5 %)	74 (63.2 %)	163 (66.5 %)	.34
Income (in US dollars) earned from sex, median (IQR) ^a	1,056.5 (405–1,915)	820 (380–1,525)	935 (400–1,800)	.02
Often/always injected drugs with a client around ^a	88 (29.2 %)	120 (37.2 %)	208 (33.3 %)	.04
Worked as a prostitute in the street ^a	244 (81.3 %)	256 (79.5 %)	500 (80.4 %)	.61
Worked as a prostitute in hotel or motel ^a	68 (22.7 %)	75 (23.3 %)	143 (23.0 %)	.92
Service utilization				
Ever had an HIV test	171 (57.0 %)	152 (47.1 %)	323 (51.8 %)	.02
Ever had a gynecological checkup	58 (19.3 %)	61 (19.1 %)	119 (19.2 %)	1.0

TABLE 1 (Continued)

Variable	Had syringe confiscated by police (<i>n</i> =301)	Did not have syringe confiscated by police (<i>n</i> =323)	Total (<i>n</i> =624)	P
Ever received methadone or buprenorphine treatment (among heroin users)	61 (20.5 %)	63 (20.1 %)	124 (20.3 %)	.92
Obtained syringes from pharmacy ^a	197 (65.7 %)	182 (56.3 %)	379 (60.8 %)	.02
Obtained syringes from syringe exchange program ^a	39 (13.0 %)	28 (8.7 %)	67 (10.8 %)	.09
Experiences with police				
Ever been arrested	284 (94.4 %)	186 (57.6 %)	470 (75.3 %)	<.001
Police officer has asked you for sexual favors ^b	154 (51.2 %)	49 (15.2 %)	203 (32.5 %)	<.001
Sexually abused by a police officer ^b	94 (31.2 %)	12 (3.7 %)	106 (17.0 %)	<.001
Police officer has asked you for money ^b	273 (90.7 %)	111 (34.4 %)	384 (61.5 %)	<.001
Police officer has forcibly taken your money ^b	213 (70.8 %)	55 (17.0 %)	268 (42.9 %)	<.001

^aLast month^bPast 6 months

Those reporting syringe confiscation differed markedly from those not reporting it in terms of the physical, economic, and social factors that are understood to act as the components of the risk environment.²⁵ This group reported being significantly younger when initiating IDU and sex work relative to the other FSW-IDUs (19 vs. 20 years, $p<.001$, and 18 vs. 20 years, $p<.001$, respectively). They also reported injecting with clients less frequently (29 vs. 37 % in the last month, $p=.04$) and reported greater monthly income from their commercial sex activities than those not reporting syringe confiscation (\$1,057 vs. \$820, $p=.02$).

Health Risk, STI/HIV Status, and Service Utilization

With the exception of receptive syringe sharing and utilization of hit doctors, women reporting syringe confiscation reported engaging in sexual and injection behaviors more frequently. In the IDU realm, this included last month groin injection (21.6 vs. 12.4 %, $p=.003$) and public injection (69 vs. 54 %, $p<.001$). Compared to the non-confiscation group, those experiencing syringe confiscation were also more likely to report STI risk factors, including the number of sexual clients in the last month (40 vs. 24, $p<.001$) and number of unprotected sex acts in the last month (23 vs. 6, $p<.001$). Without significant differences between the syringe confiscation exposure groups, frequent receptive syringe sharing was reported by a substantial majority of the overall sample (58 %) and use of “hit

doctors” by 39 % in the last month. Across the groups, 94 % of women reported daily injecting, with an overall 92 % injecting heroin at least once a day (data not shown). Respondents reported injecting with a median of three others, while only 5 % reported injecting alone in the last month (data not shown); there were no significant differences in these variables based on experience of syringe confiscation.

While a large majority of the sample (58 %) had a confirmed STI diagnosis, respondents reporting syringe confiscation were significantly more likely to test HIV-positive than those not reporting confiscation (62 vs. 54 %, $p=.02$, and 7 vs. 4 %, $p=.05$, respectively), confirming earlier findings.¹⁸ Across the sample, women reported elevated levels of depression and low general Rosenberg self-efficacy scores.

A significantly higher proportion of the respondents reporting syringe confiscation also reported undergoing HIV testing (57 vs. 47 %, $p=.02$). Those obtaining syringes from pharmacies were more likely to experience syringe confiscation (66 vs. 56 %, $p=.02$). There were no significant differences between those reporting and those not reporting recent syringe confiscation in ever having a gynecological checkup (19 % overall), receiving opioid substitution therapy (20 % overall), and using SEP services (11 % overall).

Frequency of Police Encounters

Parallel to syringe confiscation, experience of police encounters was widespread (see Table 2). Almost all of those reporting recent syringe confiscation reported having been ever arrested as compared to just over half of those not reporting confiscation (95 vs. 58 %, $p<.001$). Those reporting confiscation were also more likely to experience financial extortion (91 vs. 34 %, $p<.001$) as well as robbery by law enforcement personnel in the last 6 months (71 vs. 17 %, $p<.001$).

About one in three women in our sample experienced extortion of sexual services in the last 6 months, with a substantially higher proportion among those reporting syringe confiscation (51 vs. 15 %, $p<.001$). In this timeframe, experience of police sexual abuse was reported by about one in six respondents overall (31 % in the syringe confiscation group vs. 4 % others, $p<.001$). Almost all FSW-IDUs (95 %) who reported such abuse characterized this as something they endured to avoid arrest (data not shown).

Factors Associated with Syringe Confiscation

In logistic regression analyses, syringe confiscation was significantly associated with police extortion (odds ratio [OR]=18.62, 95 % confidence interval [95 % CI]=11.85–29.25), arrest (OR=12.31, 95 % CI=7.19–21.05), and physical (OR=11.79, 95 % CI=8.05–17.28) and sexual abuse (OR=11.77, 95 % CI=6.29–22.01). Association was also observed between syringe confiscation, testing positive for HIV (OR=2.35, 95 % CI=1.09–5.07), and groin injection (OR=1.94, 95 % CI=1.26–2.99). Environmental factors linked to report of syringe confiscation included number of hours spent on the street on a typical day (OR=1.02 per hour, 95 % CI=0.99–1.05) and income earned from sex. Factors that were protective against syringe confiscation were level of education (OR=0.90, 95 % CI=0.86–0.95) and older age of IDU initiation (OR=0.96 per year, 95 % CI=0.94–0.99).

Factors Independently Associated with Syringe Confiscation

We found that those reporting having been sexually abused by police were significantly more likely to also report syringe confiscation (adjusted odds ratio [aOR]=12.76, 95 % CI=6.58–24.72) (see Table 3). Syringe confiscation was also

TABLE 2 Univariate regression analysis of factors associated with syringe confiscation among FSW-IDUs in Tijuana and Ciudad Juarez (N=624)

Variable	Unadjusted odds ratio	Lower 95 % confidence limit	Upper 95 % confidence limit
Sociodemographics			
Number of years of education completed, median (IQR)	0.90	0.86	0.95
Injection and sexual risk behavior			
Age when first injected drugs, median (IQR)	0.96	0.94	0.99
Age when first traded sex for money, median (IQR)	0.94	0.92	0.97
First drug used: meth	0.20	0.08	0.54
Normally injected drugs in public places ^a	1.74	1.26	2.41
Groin injection ^a	1.94	1.26	2.99
Number of people usually injected with, median (IQR) ^a	1.08	1.03	1.13
Number of male clients, median (IQR) ^a	1.01	1.01	1.01
Total number of unprotected vaginal and/or anal sex acts, median (IQR) ^a	1.01	1.01	1.02
Health and psychological assessment			
HIV infection, based on confirmatory positive test result	2.35	1.09	5.07
Syphilis infection (based on titer \geq 1:8)	1.54	1.07	2.20
Any STI, based on confirmatory test results (excluding BV)	1.37	0.99	1.88
Physical, social, and economic risk environment			
Number of hours spent on the streets, on typical day, median (IQR) ^b	1.02	0.99	1.05
Income (in US dollars) earned from sex, median (IQR)	1.00	1.00	1.00
Often/always injected drugs with a client around ^a	0.70	0.50	0.98
Service utilization			
Ever had an HIV test	1.49	1.09	2.05
Obtained syringes from pharmacy ^a	1.48	1.07	2.05
Obtained syringes from syringe exchange program ^a	1.57	0.94	2.63
Experiences with police			
Ever been arrested	12.31	7.19	21.05
Police officer has asked you for sexual favors ^b	5.86	4.01	8.56
Sexually abused by a police officer ^b	11.77	6.29	22.01
Police officer has asked you for money ^b	18.62	11.85	29.25
Police officer has forcibly taken your money ^b	11.79	8.05	17.28

^aPast month^bPast 6 months

positively associated with groin injection (aOR)=1.84, 95 % CI=1.15–2.93), injecting in public (aOR=1.64; 95 % CI=1.14–2.36), and obtaining syringes from pharmacies (aOR=1.54; 95 % CI=1.06–2.23). Women testing positive for HIV were also 2.54 times more likely to report syringe confiscation (95 % CI=1.11–

5.80). Controlling for other variables, syringe confiscation remained negatively associated with higher levels of education (aOR=0.92, 95 % CI=0.87–0.98). A negative association was also observed between syringe confiscation and injecting with clients within the last month (aOR=0.64, 95 % CI=0.44–0.94).

DISCUSSION

In the context of widespread reports of police abuse of vulnerable groups in many countries around the globe,^{32,41–47} a body of empirical and theoretical literature has advanced the understanding of links between police practices and sexual or injection risk behavior among IDUs and FSWs.^{7–14,23,26,46,48,49} Previous studies along Mexico’s North Border have contributed to this international consensus by identifying a panoply of associations between criminal justice experiences and behavioral risk factors, including syringe sharing.^{29,50,51} We have also observed independent associations between arrest and HIV status.³⁰ This study extends previous research on the links between experiencing extra-judicial police practices with HIV infection¹⁸ by demonstrating a full range of behavioral and health factors associated with syringe confiscation and thus strengthening the evidence base on the health–human rights nexus.

Given the multiple pathways by which syringe confiscation can translate to risky behavior among FSW-IDUs, the framing of syringe confiscation as an “exposure” to epidemiologic harm is consistent with theoretical and empirical understanding of the “risk environment.”²⁵ Consistent with this framework, we observed that syringe confiscation was significantly and independently associated with risky behaviors such as groin and public injection as well as with pharmacy utilization. This parallels previous research in this region, highlighting the role of actual and perceived police practices as facilitators of risk behaviors and barriers to protective behaviors, including pharmacy-based syringe access.^{18,29,33,36,50,52,53}

Women in this sample may encounter additional risks stemming from syringe confiscation in the realm of sexual transmission. Literature suggests that police officers often use drug and syringe possession and commercial sex activity to extort sexual services,^{2,5,16,18,51,54} a paradigm clearly accentuated by our finding that syringe confiscation was independently associated with police sexual abuse. In this

TABLE 3 Multivariate analysis of factors associated with syringe confiscation among FSW-IDUs in Tijuana and Ciudad Juarez (N=621)

Predictor	Adjusted odds ratio estimate	Lower 95 % confidence limit	Upper 95 % confidence limit
Sexually abused by a police officer ^a	12.76	6.58	24.72
HIV infection, based on confirmatory positive test result	2.54	1.11	5.80
Groin injection ^b	1.84	1.15	2.93
Normally injected in public spaces ^b	1.64	1.14	2.36
Obtained syringes from pharmacy ^b	1.54	1.06	2.23
Years of education completed (per year)	0.92	0.87	0.98
Often/always injected drugs with a client around ^b	0.64	0.44	0.94

^aPast 6 months

^bPast month

context, victims are no more likely to be able to control the circumstances or these sexual encounters than are the perpetrators likely to practice safe sex, leading to elevated risk of infection to both parties. Additional research is needed to assess the role of law enforcement in spreading STIs among SWs, as well as bridging infections into the broader community.

It is notable that consistently injecting in the presence of clients was protective against syringe confiscation. This may reflect structural protection of commercial sex venues against police abuse or encourage FSW-IDU to rely on clients' injection equipment. Consumption of drugs and alcohol in the context of a transactional sex encounter is known to be associated with unprotected sex, violence, and disease acquisition.^{18,54,55} To the extent that police abuse facilitates this practice, this may represent another pathway for compounding sexual and risk behavior and health risk.

This analysis has several limitations. Given the high-risk nature of the sample and the study's geographical setting, findings may not be generalizable to other IDU and FSW populations. The cross-sectional and non-experimental nature of this study also limits assertions of directionality or causality between experiencing syringe confiscation, sexual and injection risk behavior, and HIV status. It is possible that some of the causal pathways may in fact be reversed or that syringe confiscation is merely a proxy for other factors like increased marginalization, which in turn raises the risk of police abuse. Although we controlled for homelessness, income, and other sociodemographic variables, our finding that level of education is protective against syringe confiscation may signal that police target the more vulnerable and least-resourced FSW-IDUs in these communities.

Even if the associations we have observed are not causal, however, it is clear that syringe confiscation is endemic among a high-risk group of FSW-IDUs. Given that our respondents frequently engage in syringe sharing and unprotected sex and have elevated rates of blood-borne infections, confiscation or destruction of injection equipment in this group almost certainly fuels the spread of HIV and other disease. Our findings also add to a growing body of evidence documenting the systematic sexual, physical, and other abuse of FSWs, IDUs, and FSW-IDUs at the hands of law enforcement officials.^{9,18,43,56,57} The layered marginalization of these women limits their options for defending themselves from extra-judicial police practices and vindicating their rights through formal channels. In conflict settings, the latter is especially difficult, given the failures of the judicial and human rights protection systems,⁴ and can aggravate mental trauma from sexual and other abuses.^{2,4,14} Future analyses should examine associations between experience of police abuse, depression symptomology, post-traumatic stress, and other mental health outcomes that may help elucidate the mechanisms underlying the health-human rights nexus.

In applying a social epidemiology lens to this "pandemic" of human rights abuses, we call for increased attention to syringe confiscation and other deleterious police practices as structural risk factors for HIV infection and other public health harms. A public health approach to curbing these activities dictates integrating effective prevention (e.g., policy reform and police training), systematic monitoring (e.g., inclusion of variables such as experience of syringe confiscation in behavioral surveillance surveys of IDUs and FSWs), and multi-level response interventions (punishment of perpetrators).⁵⁸⁻⁶¹ Consistent process evaluation and research on police knowledge, beliefs, and attitudes must accompany these efforts, with feedback used to inform program tailoring.

Our findings carry several specific policy implications. Mexico is currently undertaking wide-ranging reforms to its drug policy, judiciary, and criminal justice systems on federal, state, and municipal levels. Efforts to improve the professionalism, training, and management of law enforcement and other government servants are central to this reform effort.²⁸ This reform should be accelerated, with special emphasis on structural interventions designed to align law enforcement and public health.^{58,59} Implementation of these policy reforms may be limited by resource constraints, lack of political will, and governance failures.^{4,6,26,28,31,62} Auxiliary mechanisms such as making federal grants contingent on specific implementation targets may improve policy implementation.⁶³ By adding a public health dimension to the societal costs of civil and human rights violations, our analysis magnifies the imperative to use a range of tools to curb extra-judicial police practices like syringe confiscation while also amplifying the broader calls to strengthen the rule of law in Mexico.¹⁶

On the international arena, the US government has vitally facilitated the expansion and militarization of policing along Mexico's Northern Border in an effort to re-establish security and curb the flow of illegal drugs. This includes Merida Initiative's substantial investment in equipping and training Mexican law enforcement agents deployed in the region. Critics have implicated this and other aids to Mexican law enforcement programs for failing to adequately institutionalize professionalism, accountability, and effective management among Mexican police.⁴ As the evidence of collateral human and public health costs exacted by law enforcement abuse and corruption on border communities continues to mount, it is time to shift funding priorities to mitigating these harms through training, monitoring, and accountability programs.

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REFERENCES

1. Bucardo J, Brouwer K, Magis-Rodriguez C, et al. Historical trends in the production and consumption of illicit drugs in Mexico: implications for the prevention of blood borne infections. *Drug Alcohol Depend.* 2005;79(3):281-293.
2. Ramos R, Ferreira-Pinto J, Brouwer K, et al. A tale of two cities: social and environmental influences shaping risk factors and protective behaviors in two Mexico-US border cities. *Health Place.* 2009;15(4):999-1005.
3. Strathdee S, Magis-Rodriguez C. Mexico's evolving HIV epidemic. *JAMA.* 2008;300(5):571-573.
4. Meyer M. *Abused and afraid in Ciudad Juarez: an analysis of human rights violations by the military in Mexico.* Ciudad Juarez, Mexico: Centro de Derechos Humanos; 2010.

5. Miller CL, Firestone M, Ramos R, et al. Injecting drug users' experiences of policing practices in two Mexican–U.S. border cities: public health perspectives. *Int J Drug Policy*. 2008;19(4):324-331.
6. Beittel JS. *Mexico's drug-related violence*. Washington, DC: Congressional Research Service; 2009. May 15.
7. Biradavolu MR, Burris S, George A, Jena A, Blakenship K. Can sex workers regulate police? Learning from an HIV prevention project for sex workers in Southern India. *Soc Sci Med*. 2009;68(8):1541-1547.
8. Basu I, Jana S, Rotheram-Borus MJ, et al. HIV prevention among sex workers in India. *J Acquir Immune Defic Syndr*. 2004;36(3):845-852.
9. Blankenship K, Koester S. Criminal law, policing policy, and HIV risk in female street sex workers and injection drug users. *J Law Med Ethics*. 2002;30:548-559.
10. Harcourt C, Egger S, Donovan B. Sex work and the law. *Sex Heal*. 2005;2:121-128.
11. Law SA. Commercial sex: beyond decriminalization. *Calif Law Rev*. 2000;73:523-608.
12. Mayhew S, Collumbien M, Qureshi A, et al. Protecting the unprotected: mixed-method research on drug use, sex work and rights in Pakistan's fight against HIV/AIDS. *Sex Transm Infect*. 2009;85(Suppl 2):ii31-ii36.
13. Decker MR, McCauley HL, Phuengsamran D, Janyam S, Seage G, Silverman J. Violence victimisation, sexual risk and sexually transmitted infection symptoms among female sex workers in Thailand. *Sex Transm Infect*. 2010;86(3):236-240.
14. Raj A, Gupta J. Women, Migration, conflict and risk for HIV. In: Martin SF, Tirman J, eds. *Women, migration, and conflict: breaking a deadly cycle*. Washington, DC: Springer; 2009:107.
15. Sarang A, Rhodes T, Sheon N, Page K. Policing drug users in Russia: risk, fear, and structural violence. *Subst Use Misuse*. 2010;45(6):813-864.
16. Beletsky L, Martinez G, Gaines T, et al. Mexico's Northern Border conflict: collateral damage to health and human rights of vulnerable groups. *Pan Am J Public Health*. 2012; in press.
17. Mann J, Gruskin S, Grodin MA, eds. *Health and human rights: a reader*. New York: Routledge; 1999.
18. Strathdee SA, Lozada R, Martinez G, et al. Social and structural factors associated with HIV infection among female sex workers who inject drugs in the Mexico–US Border Region. *PLoS ONE*. 2011;6(4).
19. Hamers FF, Downs AM. HIV in central and eastern Europe. *Lancet*. 2003;361(9362):1035-1044.
20. Liu H, Grusky O, Li X, Ma E. Drug users: a potentially important bridge population in the transmission of sexually transmitted diseases, including AIDS, in China. *Sex Transm Dis*. 2006;33(2):111-117.
21. Rich JD, Dickenson BP, Lie K-L, Case P. Strict syringe laws in Rhode Island are associated with high rates of reusing syringes and HIV risks among injection drug users (letter). *J Acquir Immune Defic Syndr*. 1998;18(Suppl 1):S140.
22. Beletsky L, Grau LE, White E, Bowman S, Heimer R. The roles of law, client race, and program visibility in shaping police interference with the operation of US syringe exchange programs. *Addiction*. 2011;106(2):357-365.
23. Rhodes T, Platt L, Sarang A, Vlasov A, Mikhailova L, Monaghan G. Street policing, injecting drug use and harm reduction in a Russian city: a qualitative study of police perspectives. *J Urban Health*. 2006;83(5):911-925.
24. Werb D, Wood E, Small W, et al. Effects of police confiscation of illicit drugs and syringes among injection drug users in Vancouver. *Int J Drug Policy*. 2008;19(4):332-338.
25. Rhodes T. The 'risk environment': a framework for understanding and reducing drug-related harm. *Int J Drug Policy*. 2002;13(2):85-94.
26. Burris S, Blankenship KM, Donoghoe M, et al. Addressing the "risk environment" for injection drug users: the mysterious case of the missing cop. *Milbank Q*. 2004;82(1):125-126.

27. Wood E, Spittal P, Small W, et al. Displacement of Canada's largest public illicit drug market in response to a police crackdown. *Can Med Assoc J.* 2004;170:1551-1556.
28. Tello N. Police reforms: the voice of police and residents in Mexico City. *Polic Soc Int J Res Policy.* 2011;22(1):14-27.
29. Pollini RA, Brouwer KC, Lozada RM, et al. Syringe possession arrests are associated with receptive syringe sharing in two Mexico-US border cities. *Addiction.* 2008;103(1):101-108.
30. Strathdee SA, Fraga WD, Case P, et al. "Vivo para consumirla y la consumo para vivir" ["I live to inject and inject to live"]: high-risk injection behaviors in Tijuana, Mexico. *J Urban Health.* 2005;82(3 Suppl 4):iv58-iv73.
31. Beletsky L, Macalino G, Burris S. Attitudes of police officers towards syringe access, occupational needle-sticks, and drug use: a qualitative study of one city police department in the United States. *Int J Drug Policy.* 2005;16:267-274.
32. Human Rights Watch. *Abusing the user: police misconduct, harm reduction and HIV/AIDS in Vancouver.* New York: Human Rights Watch; 2003:Vol 15, No. 2(B).
33. Philbin M, Pollini R, Ramos R, et al. Shooting gallery attendance among IDUs in Tijuana and Ciudad Juarez, Mexico: correlates, prevention opportunities, and the role of the environment. *AIDS Behav.* 2008;12(4):552-560.
34. Cooper H, Moore L, Gruskin S, Krieger N. The impact of a police drug crackdown on drug injectors' ability to practice harm reduction: a qualitative study. *Soc Sci Med.* 2005;61:673-684.
35. Davis C, Burris S, Metzger D, Becher J, Lynch K. Effects of an intensive street-level police intervention on syringe exchange program utilization: Philadelphia, Pennsylvania. *Am J Public Health.* 2005;95:233-236.
36. Strathdee SA, Lozada R, Pollini RA, et al. Individual, social, and environmental influences associated with HIV infection among injection drug users in Tijuana, Mexico. *JAIDS.* 2008;47(3):369-376.
37. Rhodes T, Simic M. Transition and the HIV risk environment. *Br Med J.* 2005;331:220-223.
38. Springer S, Chen S, Altice F. Depression and symptomatic response among HIV-infected drug users enrolled in a randomized controlled trial of directly administered antiretroviral therapy. *AIDS Care.* 2009;21(8):976-983.
39. Santor DA, Coyne JC. Shortening the CES-D to improve its ability to detect cases of depression. *Psychol Assess.* 1997;9(3):233-243.
40. Rosenberg M. *Society and the adolescent self image.* Princeton (NJ): Princeton University Press; 1965.
41. Human Rights Watch. *Locked doors: the human rights of people living with HIV/AIDS in China.* New York: Human Rights Watch; 2003:Vol. 14, No. 7(C).
42. Human Rights Watch. *Injecting reason: human rights and HIV prevention for injection drug users.* New York: Human Rights Watch; 2003:Vol 15, No. 2(G).
43. Human Rights Watch. *Fanning the flames: how human rights abuses are fueling the AIDS epidemic in Kazakhstan.* New York: Human Rights Watch; 2003:Vol. 15, No. 3(D).
44. Human Rights Watch. *Lessons not learned: human rights abuses and HIV/AIDS in the Russian Federation.* New York: Human Rights Watch; 2004:April 2004, Vol. 16, No. 5 (D).
45. Human Rights Watch. *Not enough graves: the war on drugs, HIV/AIDS and violations of human rights.* New York: Human Rights Watch; 2004:Vol.16, No. 8(C).
46. Beyrer C, Jittiwutikarn J, Teokul W, et al. Drug use, increasing incarceration rates, and prison-associated HIV risks in Thailand. *AIDS Behav.* 2003;7(2):153-161.
47. Vongchak T, Kawichai S, Sherman S, et al. The influence of Thailand's 2003 'war on drugs' policy on self-reported drug use among injection drug users in Chiang Mai, Thailand. *Int J Drug Policy.* 2005;16(2):115.
48. Rhodes T, Singer M, Bourgois P, Friedman SR, Strathdee SA. The social structural production of HIV risk among injecting drug users. *Soc Sci Med.* 2005;61(5):1026-1044.

49. Lazzarini Z, Klitzman R. HIV and the law: integrating law, policy, and social epidemiology. *J Law Med Ethics*. 2002;30(4):533-547.
50. Pollini R, Gallardo M, Hasan S, et al. High prevalence of abscesses and self-treatment among injection drug users in Tijuana, Mexico. *Int J Infect Dis*. 2010;14(Suppl 3):117-122.
51. Volkman T, Lozada R, Anderson CM, Patterson TL, Vera A, Strathdee SA. Factors associated with drug-related harms related to policing in Tijuana, Mexico. *Harm Reduct J*. 2011;8(7).
52. Pollini R, Lozada R, Gallardo M, et al. Barriers to pharmacy-based syringe purchase among injection drug users in Tijuana, Mexico: a mixed methods study. *AIDS Behav*. 2010;14(3):679-687.
53. Strathdee SA, Lozada R, Ojeda VD, et al. Differential effects of migration and deportation on HIV infection among male and female injection drug users in Tijuana, Mexico. *PLoS One*. 2008;3(7):e2690.
54. Shannon K, Kerr T, Strathdee SA, Shoveller J, Montaner J, Tyndall M. Prevalence and structural correlates of gender based violence among a prospective cohort of female sex workers. *BMJ*. 2009;339.
55. Strathdee SA, Hallett TB, Bobrova N, et al. HIV and the risk environment among people who inject drugs: past, present, and projections for the future. *Lancet*. 2010;376(9737):268-284.
56. Pirkle C, Soundardjee R, Stella A. Female sex workers in China: vectors of disease? *Sex Transm Dis*. 2007;34(5).
57. El-Bassel N, Terlikbaeva A, Pinkham S. HIV and women who use drugs: double neglect, double risk. *Lancet*. 2010;376(9738):312-314.
58. Beletsky L, Silverman B, Davis C, Graff J. Harmonizing harm reduction and law enforcement: strategies for prevention, monitoring, and response. *American Civil Liberties Union of Delaware*. Available at: <http://aclu-de.comcastbiz.net/phc/PDF/final.pdf>.
59. Beletsky L, Agrawal A, Moreau B, Kumar P, Weiss-Laxer N, Heimer R. Police training to align law enforcement and HIV prevention: preliminary evidence from the field. *Am J Public Health*. 2011;101(11):2012-2015.
60. Beletsky L, Grau LE, White E, Bowman S, Heimer R. Content, correlates and predictors of police training initiatives by syringe exchange programs. *Drug Alcohol Depend*. 2011;19(1-2):145-149.
61. Davis C, Beletsky L. Bundling occupational safety with harm reduction information as a feasible method for improving police receptiveness to syringe access programs: evidence from three U.S. cities. *Harm Reduct J*. 2009;6(16):1-18.
62. Green TC, Martin EG, Bowman SE, Mann MR, Beletsky L. Life after the ban: an assessment of US syringe exchange programs' attitudes about and early experiences with federal funding. *Am J Public Health*. In Press.
63. Auditoría Superior de la F. *Informe del Resultado de la Revisión y Fiscalización Superior de la Cuenta Pública*. Mexico, DF; 2007.