Journal of Urban Health: Bulletin of the New York Academy of Medicine, Vol. 91, No. 4
doi:10.1007/s11524-013-9855-2

Prevalence and Correlates of HIV and Sexually Transmitted Infections among Female Sex Workers and Their Non-commercial Male Partners in Two Mexico-USA Border Cities

Angela M. Robertson, Jennifer L. Syvertsen, Monica D. Ulibarri, M. Gudelia Rangel, Gustavo Martinez, and Steffanie A. Strathdee

ABSTRACT *Female sex workers (FSWs) acquire HIV and other sexually transmitted infections (STIs) through unprotected sex with commercial and non-commercial (intimate) male partners. Little research has focused on FSWs' intimate relationships, within which condom use is rare. We sought to determine the prevalence and correlates of HIV/STIs within FSWs' intimate relationships in Northern Mexico. From 2010 to 2011, we conducted a cross-sectional survey of FSWs and their non-commercial male partners in Tijuana and Ciudad Juárez, Mexico. Eligible FSWs and their verified male partners were aged ≥18 years; FSWs reported lifetime use of heroin, cocaine, crack, or methamphetamine and recently exchanged sex (past month). Participants completed baseline questionnaires and testing for HIV, chlamydia, gonorrhea, and syphilis. We determined the prevalence and correlates of individuals' HIV/STI positivity using bivariate probit regression. Among 212 couples (n=424), prevalence of HIV was 2.6 % (n=11). Forty-two (9.9 %) tested positive for any HIV/STIs, which was more prevalent among women than men (12.7 % vs. 7.1 %, p<0.05). FSWs with regular sex work clients were less likely to test positive for HIV/STIs than those without regular clients. Similarly, male partners of FSWs who had regular clients were 9 % less likely to have HIV/STIs. Higher sexual decision-making power was protective against HIV/STIs for women. Men who recently used methamphetamine or reported perpetrating any conflict within steady relationships were more likely to test positive for HIV/STIs. Within FSWs' intimate relationships in two Mexican-US border cities, nearly one in ten partners tested positive for HIV/STIs. Couple-based prevention interventions should recognize how intimate relationship factors and social contexts influence HIV/STI vulnerability.*

KEYWORDS *Female sex workers, HIV, Sexually transmitted infections, Intimate relationships, Couple-based research, Mexico*

Robertson is with the Department of Epidemiology, Harvard School of Public Health, 677 Huntington Avenue, Boston, MA 02115, USA; Robertson is with the The Fenway Institute, Fenway Health, 1340 Boylston Street, 8th Floor, Boston, MA 02215, USA; Syvertsen is with the Department of Anthropology, The Ohio State University, 4046 Smith Laboratory, 174 W. 18th Avenue, Columbus, OH 43210, USA; Ulibarri is with the Department of Psychiatry, University of California at San Diego, 9500 Gilman Drive, Mail Code 0603, La Jolla, CA 92093-0603, USA; Rangel is with the Department of Population Studies, El Colegio de La Frontera Norte, Carretera Escénica Tijuana-Ensenada, Km 18.5, San Antonio del Mar, 22560, Tijuana, Baja California, Mexico; Martinez is with the Federación Mexicana de Asociaciones Privadas (FEMAP), Ave. Malecón No. 788 Col. Centro C.P., 32000, Ciudad Juárez, Chihuahua, Mexico; Strathdee is with the Division of Global Public Health, School of Medicine, University of California at San Diego, 9500 Gilman Drive, Mail Code 0507, La Jolla, CA 92093-0507, USA.

Correspondence: Steffanie A. Strathdee, Division of Global Public Health, School of Medicine, University of California at San Diego, 9500 Gilman Drive, Mail Code 0507, La Jolla, CA 92093-0507, USA. (E-mail: sstrathdee@ucsd.edu)

INTRODUCTION

Female sex workers (FSWs) experience a disproportionate burden of sexually transmitted infections (STIs) including HIV.[1] Although behavioral interventions have improved FSWs' condom use with male clients,[2–6] research from diverse settings suggests that 25–95 % of FSWs have non-commercial male partners with whom they are two to five times more likely to have unprotected sex compared with clients.[7–17] As in other intimate relationship contexts, unprotected sex is a normative part of FSWs' relationships despite FSWs' knowledge of their intimate male partners' sexual and drug-related risk behaviors for HIV/STIs.[18–22] However, there remains insufficient research to date on the prevalence and correlates of HIV/STIs risks within FSWs' non-commercial relationships.

In cities along Mexico's Northern border with the USA, widespread sex work, drug use, poverty, and economic inequality have promoted HIV/STI epidemics among subpopulations including FSWs.[23] Sex work is unregulated in Ciudad Juárez, Chihuahua (adjacent to El Paso, Texas), and is quasi-legal in Tijuana, Baja California (adjacent to San Diego, California), yet research by our group suggests that the current sex work registration system excludes some of the most vulnerable women who have lower socioeconomic status and reduced access to the required permits, regular health checks, and employment in indoor venues.[24,25] In these cities, the prevalence of HIV among FSWs increased from <1 % in the 1990s to ~6 % in 2006.[23] Our research among mostly street-based FSWs in these cities has also revealed high prevalence of STIs: in 2006, 6 % tested positive for gonorrhea, 13 % for Chlamydia, and 14 % for active syphilis (titers $\geq$ 1:8).[26]

Drug use, including injection drug use, which are increasingly common in this region due to "spillover" from trafficking routes,[27] further promote HIV/STI transmission by compromising FSWs' abilities to negotiate consistent condom use.[28] In these cities, FSWs' HIV positivity was associated with smoking, snorting, or inhaling methamphetamine and injecting cocaine,[26] and among FSWs who injected drugs, 72 % tested positive for at least one STI including HIV.[29]

Our binational research team has estimated that more than one third of FSWs in the Mexico-USA border region have steady non-commercial partners,[30] and unprotected sex within these intimate relationships is twice as likely compared to commercial sex contexts.[31] Although a behavioral intervention for FSWs in Tijuana and Ciudad Juarez successfully increased condom use with FSWs' male clients and reduced cumulative STI incidence by 40 % in the intervention group,[3] it did not target condom use within FSWs' non-commercial relationships.[32] Additional analyses revealed that, among FSWs with non-commercial partners, the majority (74 %) reported having unprotected vaginal sex with their partners even though half believed that their partners had outside sexual partners.[30] FSWs with steady partners were more likely to have syphilis titers consistent with active infection,[31] and one third (35 %) reported recently experiencing interpersonal violence (IPV).[33] Taken together, these findings suggest that HIV/STI transmission within non-commercial relationships could pose an important risk for HIV/STI acquisition in this region.[32]

Despite extensive research on the health of FSWs in Tijuana and Ciudad Juárez,[34] no studies to date have investigated the epidemiology of HIV/STIs within FSWs' intimate relationships in these resource-poor cities. The objective of this analysis was to determine the prevalence and correlates of HIV/STIs among socially marginalized couples in the border setting. We hypothesized that HIV/STI infection would be

associated with sexual and drug-related risk behaviors within and outside of relationships (e.g., unprotected sex with clients, stimulant drug abuse).

METHODS

Study Design and Population

Proyecto Parejas is a study of the social epidemiology of HIV/STIs within FSWs' intimate relationships in Tijuana and Ciudad Juárez. As previously described,[35] we recruited women first in areas where sex work and drug use were known to occur using targeted and snowball sampling. Eligible women were ≥18 years of age; involved in non-commercial heterosexual relationships for ≥6 months; reported sex with their non-commercial partners and exchanged sex with clients in the past month; and ever used heroin, cocaine, crack, or methamphetamine. Women were excluded if they planned to break up with their partner or feared severe IPV as a result of participating. Eligible FSWs were then invited to bring their primary non-commercial partners to study offices to check men's eligibility and verify relationship status through additional screening.[35] Male partners were eligible if they were ≥18 years old, regardless of drug use history. Subjects provided written informed consent for all study protocols, which were approved by institutional review boards of the University of California, San Diego, Tijuana's Hospital General, El Colegio de la Frontera Norte, and the Universidad Autónoma de Ciudad Juárez.

Data Collection

From 2010 to 2011, participants were reimbursed US$20 for completing interviewer-administered questionnaires programmed into laptop computers. Socio-demographics and personal factors included age and educational attainment in years, birthplace, history of arrest and US deportation, and monthly income. Relationship measures included relationship duration, trust,[36] satisfaction,[37] sexual satisfaction, sexual relationship power,[38] and conflict (psychological aggression, physical assault, injury, and sexual assault).[39] Relationship variables that theoretically should not vary within couples (e.g., relationship duration, age difference between partners) were averaged within dyads using both partners' responses.[40] Sexual risk behaviors included unprotected sex within study relationships, concurrent sexual partners,[41] sex work factors among women (e.g., numbers/types of male clients, unprotected sex), and sex trading behaviors among men. Drug abuse behaviors included lifetime and recent (past 6 months) consumption and injection of illicit drugs, drug use before sex within and outside of study relationships, and specific injection practices (e.g., receptive syringe sharing, sharing of injection paraphernalia).

Biological samples were collected for HIV/STI testing. To ascertain HIV status, Advance Quality HIV rapid tests (InTec Products, Inc) were used. Reactive samples were tested using an HIV-1 enzyme immunoassay and immunofluorescence assay. Syphilis serology used the rapid plasma reagin (RPR) qualitative test. Positive samples were confirmed by *Treponema pallidum* particle agglutination assay (TPPA) (Fujirebio, Wilmington, DE, USA). Urine samples were self-collected for *Neisseria gonorrhoeae* and *Chlamydia trachomatis* testing with transcription-mediated amplification assays (Genprobe, San Diego, CA). Results of rapid HIV and syphilis tests were provided to participants immediately. Chlamydia, gonorrhea, and confirmatory HIV and syphilis test results (conducted by the San Diego County Health Department) were delivered to participants within 1 month. All confirmed

HIV cases were referred to municipal clinics for free treatment and follow-up care. Free STI treatment was provided based on US and Mexican guidelines.

Data Analysis

Due to the small numbers of positive cases, our binary dependent variable was combined HIV/STI status (i.e., any STIs including HIV). Two couples ($n=4$) with incomplete biological test results were excluded. Descriptive statistics compared overall sample characteristics of women and men with and without HIV/STIs. To identify factors associated with HIV/STI positivity, we used bivariate probit regression with robust standard errors, a maximum-likelihood approach to modeling FSWs' and male partners' HIV/STIs separately but simultaneously (i.e., two separate probit equations allowing correlation within couples, as assessed by the rho statistic). We first examined associations between independent variables and HIV/STI status (i.e., bivariable analyses). To build our final, multivariable model, we used a hierarchical block approach, entering variables attaining significance levels of 20 % for either women or men in bivariable analyses as well as variables that we considered theoretically relevant. We assessed plausible interactions, multicolinearity (via variance inflation factors), confounding (via $\geq$10 % changes in other estimates),[42] and the fit of nested models (via AIC).[43] We calculated marginal effects to help interpret regression coefficients as predicted probabilities of FSWs' and their male partners' HIV/STI positivity. We conducted sensitivity analyses with the binary dependent variable of STI positivity (i.e., testing positive for any STI excluding HIV) following a similar analytic plan. Results were qualitatively similar; thus, we present results from our primary analysis of combined HIV/STI positivity.

RESULTS

Sociodemographics

Among 212 couples ($n=424$), men were slightly older than women (median age 37 vs. 33 years, $p<0.01$; Table 1). Participants completed a median of 7 years of education (interquartile range [IQR]: 6–9 years). Overall, 43 % reported having monthly income less than US$200 and 29 % of male partners reported relying financially on their FSW-partners for at least some household expenses. Median relationship duration was 3.0 years (IQR: 1.6–5.4 years), and most couples reported always having unprotected sex together (median 100 % of past-month vaginal sex acts within relationships were reportedly unprotected; IQR: 80–100 %). Trust between partners was high (median ranking 9 out of 10 points; IQR: 7–10), as was relationship satisfaction (median score 15 out of 20 points; IQR: 14–15). Ninety percent reported high sexual satisfaction within their intimate relationship.

At the same time, conflict was common, with 66 % of couples reporting psychological aggression during the past year, 44 % reporting physical assault, 21 % reporting sexual coercion, and 29 % reporting physical injuries resulting from conflict (data not shown). When asked about the direction of this conflict within their relationships, 49 % reported perpetrating any form of conflict (no significant difference between women and men), and more men than women reported being the victim of any form of conflict (54 vs. 41 %, $p<0.05$). Similarly, although there were no differences between women's and men's decision-making dominance scores, women had higher relationship control scores than men (median 35 vs. 27 points out of 48 possible, $p<0.01$). Recent drug abuse was common, with 63 % of

TABLE 1 Characteristics of 212 female sex workers and their 212 non-commercial male partners in two Mexico-USA border cities ($N=424$)

Variable	Women ($n=212$)	Men ($n=212$)	Overall ($n=424$)
Sociodemographics			
Lives in Tijuana (vs. Ciudad Juarez)	104 (49 %)	104 (49 %)	208 (49 %)
Median age in years (interquartile range; IQR)	33 (26–39)	37 (31–43)	34 (29–41)***
Median educational attainment in years (IQR)	6 (6–9)	7 (6–9)	7 (6–9)***
Born in study site (vs. someplace else)	105 (50 %)	94 (44 %)	199 (47 %)
Income <2,500 pesos per month (<$200 USD)	81 (38 %)	103 (49 %)	184 (43 %)**
Ever been arrested (lifetime)	116 (55 %)	140 (66 %)	256 (60 %)***
Relationship factors			
Median relationship duration in years (IQR) [a]	–	–	3.0 (1.6–5.4)
Median % vaginal sex acts were unprotected in past month (IQR) [a]	–	–	100 (82–100)
Median trust of partner on 10-point scale (IQR)	9 (7–10)	9 (8–10)	9 (7–10)**
Median relationship satisfaction, 20-point scale (IQR)	15 (13–15)	15 (14, 15)	15 (14, 15)*
Male financial dependence on FSW's income [a]	–	62 (29 %)	–
Median relationship control, 48-point scale (IQR) [b]	35 (31–36)	27 (24–30)	30 (26–36)***
Median decision-making dominance, 24-point scale (IQR)[b]	16 (16, 17)	16 (16, 17)	16 (16, 17)
Perpetrated/caused any conflict within steady relationship, past year [c]	98 (46 %)	108 (51 %)	206 (49 %)
Victim of any conflict within steady relationship, past year [c]	87 (41 %)	115 (54 %)	202 (48 %)**
Sexual behaviors			
Sexually satisfied with steady partner (vs. not satisfied)	185 (87 %)	198 (93 %)	383 (90 %)**
Self-identified as bisexual (vs. heterosexual)	4 (2 %)	10 (5 %)	14 (3 %)
Male partner ever exchanged sex for money, drugs, other material goods (among men only, $n=212$)	–	73 (34 %)	–
Male partner had any outside sex partners, past 6 months (among men only, $n=212$)	–	65 (31 %)	–
Had any "steady" concurrent sex partners (including regular clients), past year	54 (25 %)	13 (6 %)	67 (16 %)***
FSW had any regular clients, past month (among FSWs only, $n=212$)	186 (88 %)	–	–
FSW often/always uses condoms with clients vs. rarely/never, past month (among FSWs only, $n=212$)	118 (56 %)	–	–
Drug abuse (past 6 months)			
Used heroin	136 (64 %)	130 (61 %)	266 (63 %)
Used methamphetamine	69 (33 %)	62 (29 %)	131 (31 %)
Used cocaine use	45 (21 %)	40 (19 %)	85 (20 %)
Used crack	36 (17 %)	23 (11 %)	59 (14 %)**
Used inhalants	20 (9 %)	14 (7 %)	34 (8 %)
Injected any drugs	132 (62 %)	123 (58 %)	255 (60 %)
FSW used drugs before sex with male clients (among FSWs only, $n=212$)	63 (30 %)	–	–
"High" on drugs before/during sex with steady partner	–	–	234 (55 %)

TABLE 1 (continued)

Variable	Women ($n=212$)	Men ($n=212$)	Overall ($n=424$)
Drunk before/during sex with steady partner	–	–	132 (31 %)
HIV and Sexually Transmitted Infections			
HIV test result positive	8 (3.8 %)	3 (1.4 %)	11 (2.6 %)
Chlamydia test result positive	16 (7.5 %)	9 (4.3 %)	25 (5.9 %)*
Gonorrhea test result positive	2 (0.9 %)	3 (1.4 %)	5 (1.2 %)
Syphilis test result positive	3 (1.4 %)	3 (1.4 %)	6 (1.4 %)
STI/HIV-positive (any STI including HIV)	27 (12.7 %)	15 (7.1 %)	42 (9.9 %) **

*$p<0.10$, **$p<0.05$, ***$p<0.01$ (from logistic regression with clustered standard errors within couples)

[a]Dyad average (uses information from both partners' responses within a given couple)

[b]Sexual relationship power subscales

[c]Conflict subscales (combined) for perpetrating or being the victim of psychological aggression, physical assault, injury, and sexual coercion within relationships

participants using heroin, 31 % using methamphetamine, 20 % using cocaine, 14 % using crack, and 60 % injecting any drugs in the past 6 months.

Prevalence of HIV/STIs

Eleven participants (2.6 %) tested HIV-positive, 25 (5.9 %) tested positive for Chlamydia, five (1.2 %) tested positive for gonorrhoeae, and six (1.4 %) had syphilis titers consistent with active infection (≥1:8; Table 2). Combined HIV/STI prevalence was 9.9 % ($n=42$), which was significantly higher among FSWs than male partners (12.7 vs. 7.1 %, $p<0.05$). HIV/STI status was highly correlated within relationships ($p<0.001$; Table 2). Among seven couples (3.3 %) both partners were infected with HIV/STIs, and 28 couples (13.2 %) had discordant HIV/STI status, with one partner testing positive for HIV/STIs and the other testing negative.

Factors Associated with HIV/STIs

In bivariable comparisons controlling for couple status, men who were younger and reported perpetrating conflict within their steady relationships were more likely to test positive for HIV/STIs (both $p<0.01$; Table 3). FSWs with higher decision-making dominance scores were less likely to have HIV/STIs. Most FSWs (88 % overall) reported having regular clients in the past month, which was less common among women who tested positive for HIV/STIs (74 vs. 90 %, $p<0.05$). For all major drugs of abuse, those who used drugs in the past 6 months appeared to be more likely to test positive for HIV/STIs: among men, those who recently used

TABLE 2 HIV/STI status within 212 female sex workers' non-commercial relationships in Tijuana and Cd. Juárez, Mexico ($n=424$)

		FSWs' HIV/STI status* ($n=212$)	
		Negative	Positive
Male partners' HIV/STI status ($n=212$)	Negative	177 (83.5 %)	20 (9.4 %)
	Positive	8 (3.8 %)	7 (3.3 %)

*$p<0.001$ from chi-square test of HIV/STI status being interdependent within couples (rejects null hypothesis that HIV/STI status is independent within couples)

TABLE 3 Characteristics of 212 female sex workers and their 212 non-commercial male partners in two Mexico-USA border cities ($N=424$)

Variable	HIV/STI-positive ($n=42$; 10 %)	HIV/STI-negative ($n=382$; 90 %)	Overall ($n=424$; 100 %)	Marginal effects (robust SE)[a] for FSWs' HIV/STI positivity ($n=212$)	Marginal effects (robust SE)[a] for men's HIV/STI positivity ($n=212$)
Sociodemographics					
Lives in Tijuana (vs. Ciudad Juarez)	21 (50 %)	187 (49 %)	208 (49 %)	−0.024 (0.046)	0.030 (0.035)
Median age in years (interquartile range; IQR)	33 (27–36)	35 (29–42)	34 (29–41)	−0.001 (0.002)	−0.006 (0.002) ***
Median educational attainment in years (IQR)	8 (6–9)	7 (6–9)	7 (6–9)	0.010 (0.007)	−0.001 (0.006)
Born in study site (vs. someplace else)	19 (45 %)	180 (47 %)	199 (47 %)	0.005 (0.044)	−0.020 (0.035)
Income <2,500 pesos per month (<$200 USD)	14 (33 %)	170 (45 %)	184 (43 %)	−0.038 (0.047)	−0.0398 (0.035)
Ever been arrested (lifetime)	28 (67 %)	228 (60 %)	256 (60 %)	0.0168 (0.045)	0.048 (0.039)
Relationship factors					
Median relationship duration in years (IQR) [b]	3 (1–5)	3 (2–6)	3 (2–5)	−0.002 (0.006)	−0.006 (0.004)
Median % vaginal sex acts were unprotected in past month (IQR)[b]	100 (71–100)	100 (83–100)	100 (82–100)	−0.098 (0.073)	−0.001 (0.064)
Median trust of partner on 10-point scale (IQR)	9 (8–10)	9 (7–10)	9 (7–10)	0.008 (0.012)	0.006 (0.008)
Median relationship satisfaction, 20-point scale (IQR)	15 (14, 15)	15 (14, 15)	15 (14, 15)	0.006 (0.008)	−0.001 (0.007)
Male financial dependence on FSW's income[b]	9 (21 %)	115 (30 %)	124 (29 %)	−0.021 (0.051)	−0.064 (0.046) *
Median relationship control, 48-point scale (IQR)[c]	32 (26–36)	30 (26–36)	30 (26–36)	−0.003 (0.003)	0.002 (0.004)
Median decision-making dominance, 24-point scale (IQR)[c]	16 (15, 16)	16 (16, 17)	16 (16, 17)	−0.016 (0.006) ***	0.002 (0.007)
Perpetrated/caused any conflict within steady relationship, past year [d]	26 (62 %)	180 (47 %)	206 (49 %)	0.007 (0.045)	0.110 (0.042) ***
Victim of any conflict within steady relationship, past year[d]	26 (62 %)	176 (46 %)	202 (48 %)	0.034 (0.045)	0.110 (0.044) **
Sexual behaviors					
Sexually satisfied with steady partner (vs. not satisfied)	41 (98 %)	342 (90 %)	383 (90 %)	0.000 (0.000)	0.000 (0.000)
Self-identified as bisexual (vs. heterosexual)	3 (7 %)	11 (3 %)	14 (3 %)	0.254 (0.123) *	0.022 (0.058)
Male partner ever exchanged sex for money, drugs, other material goods (among men only, $n=212$)	9 (60 %)	64 (32 %)	73 (34 %)	−0.005 (0.046)	−0.030 (0.035)
Male partner had any outside sex partners, past	7 (47 %)	58 (29 %)	65 (31 %)	−0.042 (0.058)	−0.011 (0.045)

TABLE 3 (continued)

Variable	HIV/STI-positive ($n=42$; 10 %)	HIV/STI-negative ($n=382$; 90 %)	Overall ($n=424$; 100 %)	Marginal effects (robust SE)[a] for FSWs' HIV/STI positivity ($n=212$)	Marginal effects (robust SE)[a] for men's HIV/STI positivity ($n=212$)
6 months (among men only, $n=212$)					
Had any "steady" concurrent sex partners (including regular clients), past year	3 (7 %)	64 (17 %)	67 (16 %)	0.000 (0.000)	0.000 (0.000)
FSW had any regular clients, past month (among FSWs only, $n=212$)	20 (74 %)	166 (90 %)	186 (88 %)	−0.126 (0.059) **	−0.095 (0.043) **
FSW often/always uses condoms with clients vs. rarely/never, past month (among FSWs only, $n=212$)	15 (56 %)	103 (56 %)	118 (56 %)	0.003 (0.046)	−0.039 (0.035)
Drug abuse (past 6 months)					
Used heroin	27 (64 %)	239 (63 %)	266 (63 %)	0.046 (0.048) *	0.012 (0.036)
Used methamphetamine	17 (40 %)	114 (30 %)	131 (31 %)	0.029 (0.046)	0.056 (0.035) **
Used cocaine use	10 (24 %)	75 (20 %)	85 (20 %)	0.048 (0.053)	0.001 (0.044)
Used crack	8 (19 %)	51 (13 %)	59 (14 %)	0.040 (0.057)	0.009 (0.052)
Used inhalants	6 (14 %)	28 (7 %)	34 (8 %)	0.000 (0.000)	0.000 (0.000)
Injected any drugs	27 (64 %)	228 (60 %)	255 (60 %)	0.067 (0.048) *	0.012 (0.036)
FSW used drugs before sex with male clients (among FSWs only, $n=212$)	7 (26 %)	56 (30 %)	63 (30 %)	0.001 (0.046)	0.014 (0.035)
"High" on drugs before/during sex with steady partner	23 (55 %)	211 (55 %)	234 (55 %)	−0.017 (0.046)	0.014 (0.036)
Drunk before/during sex with steady partner	18 (43 %)	114 (30 %)	132 (31 %)	0.049 (0.048)	0.040 (0.036)

*$p<0.10$, **$p<0.05$, ***$p<0.01$

[a]Marginal effects (shown with robust standard errors) represent the change in probability of having positive test result(s) for HIV/STIs associated with a 1-unit change in each independent variable; model controls for couple-specific effects

[b]Dyad average (uses information from both partners' responses within a given couple)

[c]Sexual relationship power subscales

[d]Conflict subscales (combined) for perpetrating or being the victim of psychological aggression, physical assault, injury, and sexual coercion within relationships

methamphetamine were ~6 % more likely to have HIV/STIs ($p<0.05$), while among women, those who injected drugs were ~7 % more likely to have HIV/STIs, although this association was only marginally statistically significant ($p<0.10$).

Factors Independently Associated with HIV/STIs

In our final multivariable model controlling for couple status, we identified several individual and interpersonal factors that were independently associated with HIV/STIs (Table 4). First, women with regular sex work clients (past month) were 11 % less likely to test positive for HIV/STIs than women without regular clients. Similarly, male partners of FSWs who had regular clients were 9 % less likely to have HIV/STIs. Among women, higher sexual decision-making power remained protective against HIV/STIs (2 % decrease in the probability of HIV/STIs per point increase in decision-making power score). Among men, perpetrating any conflict within steady relationships during the past year was associated with an 11 % increase in the probability of HIV/STI positivity. Finally, men who used methamphetamine (past 6 months) were 6 % more likely to have HIV/STIs, although this association was only marginally statistically significant ($p=0.066$).

DISCUSSION

Our study is the first to date to assess the prevalence and correlates of HIV/STIs within FSWs' intimate relationships. Although the prevalence of each individual STI was low, nearly one in ten participants tested positive for any STIs including HIV, and the combined HIV/STI outcome was more common among women than men. Within couples, HIV/STI status was highly correlated, suggesting the potential for transmission within the one in eight couples who tested differently (i.e., discordantly) for HIV/STIs. Although this finding does not support earlier suggestions that FSWs' intimate male partners comprise a significant source of HIV/STI transmission into FSW-intimate partner dyads,[31,32] our analysis was limited by the low numbers of positive cases in our sample, and additional research is needed to describe the

TABLE 4 Factors independently associated with HIV/STIs among 212 female sex workers and their 212 non-commercial male partners in two Mexico-USA border cities ($N=424$)

	HIV/STI positivity: marginal effects (robust SE)[a]	
Variable	Women	Men
FSW had regular clients, past month	−0.11** (0.06)	−0.09** (0.04)
Sexual relationship decision-making power score (per point increase)[b]	−0.02** (0.01)	0.00 (0.00)
Perpetrated/caused any conflict within steady relationship, past year[c]	−0.01 (0.04)	0.11*** (0.04)
Used methamphetamine, past 6 months	0.03 (0.04)	0.06* (0.03)

*$p<0.10$, **$p<0.05$, ***$p<0.01$

[a]Marginal effects (shown with robust standard errors) represent the change in probability of having positive test result(s) for HIV/STIs associated with a 1-unit change in each independent variable; model controls for couple-specific effects

[b]Sexual relationship power subscales

[c]Conflict subscales (combined) for perpetrating or being the victim of psychological aggression, physical assault, injury, and sexual coercion within relationships

prevalence and independent correlates of HIV and specific STIs. Nevertheless, we believe that our findings carry important implications for future couple-based research and prevention efforts in this region.

The prevalence of active syphilis, which was associated with four times the odds of HIV infection in a previous study,[26] was dramatically lower among FSWs in our sample (e.g., 14 % in 2006 vs. 1 % in our sample). Although the low prevalence we identified could reflect continued HIV/STI surveillance and prevention efforts throughout the region,[44] we cannot determine from our sample whether HIV/STI prevalence is decreasing in the larger population of FSWs in these cities. Alternatively, our sample of FSWs, who are involved in relatively stable, intimate partnerships, may represent a lower risk group than the general population of drug-involved FSWs. As recently found in India, FSWs who reported having "regular" (i.e., steady) non-commercial partners engaged in fewer risk behaviors than FSWs with "non-regular" non-commercial partners.[12] Nevertheless, we believe our findings underscore the need for continued prevention efforts targeting FSWs' male clients, who were found to have higher HIV prevalence than the non-commercial male partners in our sample (e.g., 4 % in Tijuana in 2008 vs. 1 % in our study).[45]

We found that testing positive for HIV/STIs was associated with several individual and relationship factors. First, women who had regular sex work clients were less likely to test positive for HIV/STIs than women without regular clients. While our past research has documented reduced condom use among FSWs and their regular clients which would imply greater HIV/STI exposure, women in this sample have described trusting regular clients, who develop closer emotional bonds and provide women with more stable forms of financial support such as rent. These clients are perceived to be less risky because, as FSWs in this population have explained, rather than frequenting multiple FSWs, regular clients are "monogamous," in that they have only one FSW partner plus a low risk spouse.[46] In addition to this financial security,[47] FSWs with regular clients may also be able to avoid exposures to multiple, higher-risk clients. This finding implies that, rather than adopting a one-size-fits-all approach to increasing FSWs' condom use, prevention efforts should recognize FSWs' risk perceptions and occupational expertise while acknowledging the diversity of behavioral and financial norms within FSWs' commercial relationships.

Reaffirming the importance of investigating HIV/STI transmission dynamics within interpersonal relationships and other social contexts,[48] men whose female partners had regular clients were also less likely to test positive for HIV/STIs than men whose partners did not have regular clients. This lower HIV/STI positivity could be due to the lower risk profiles of regular clients described above. Alternatively, it could reflect the economic benefits that FSWs obtain from regular clients (i.e., higher, more stable income),[47] which they likely share with their non-commercial partners and families.[46] Either way, this finding highlights the importance of involving both partners in couple-based research studies which are able to better measure and assess HIV/STI transmission dynamics.[48] These effects would likely be missed in traditional epidemiologic survey research focused on individual risk behaviors and outcomes.[49] Future research is needed to assess broader social contexts (e.g., social networks).

Also related to dyadic processes within intimate relationships, FSWs with higher sexual decision-making power within their relationships were less likely to test positive for HIV/STIs than FSWs with lower power. Women's ability to negotiate safer sexual practices, including consistent condom use, has long been recognized as a fundamental component of HIV/STI prevention.[50] Recent work in India and the

Dominican Republic has shown that promoting empowerment among FSWs at the community and individual levels can greatly improve safer sex negotiation skills, contributing to improved sexual and reproductive health outcomes.[8,51,52] Although few interventions to date have specifically targeted FSWs' noncommercial relationships, some studies suggest that promoting collectivization can improve safer sex norms beyond commercial sexual encounters and can extend into women's personal relationships.[53] Our finding that FSWs with higher sexual decision-making power were less likely to have HIV/STIs provides further evidence in support of HIV/STI prevention interventions addressing relationship power.[54,55] However, it is important to note that our measurement of relationship control and decision-making power within FSWs' intimate relationships is novel. With many men in our study population reporting being financially dependent on their female partners, additional research is needed to validate the specific constructs of control and decision-making within relationships that are not exclusively characterized by the traditional, gendered divisions of labor and power.[56]

We also found that perpetrating conflict within intimate relationships was associated with HIV/STIs among male partners. Nearly half of participants in our sample reported perpetrating conflict, which was not statistically different between men and women, suggesting that aggressive behaviors are highly prevalent within these relationships and may reflect the broader context of everyday violence within which our socially marginalized participants reside.[57] In our previous research, we found that experiencing IPV among FSWs was independently associated with having lower relationship power and being involved in relationships with steady partners who had outside, concurrent sexual partners.[33] Our qualitative and ethnographic work with this population has provided some indication that the underlying reasons for conflict differ for men and women in these couples, with many couples describing difficulty in disclosing HIV/STI risks, particularly regarding sex work-related risks.[58] Taken together, these findings suggest that men who perpetrate conflict in our sample may have generally higher-risk profiles including poorer communication skills, emotional instability, and impulsivity. They may also be less supportive of their female partners, particularly given women's engagement in sex work. However, it is important to note that our eligibility criteria excluded couples in which women reported fearing extreme, life-threatening IPV. While additional research is needed to better understand the complexities of conflict within FSWs' intimate relationships in these cities, our findings suggest that couples-based prevention programs should identify and work with such potentially abusive male partners. Additional resources are also needed for women involved in abuse relationships, including referrals to domestic violence resources, before addressing relationship issues with both members of the couple together.[59–61]

Finally, although only marginally statistically significant, we found that men who used methamphetamine were more likely to test positive for HIV/STIs than men who did not. Methamphetamine is increasingly being trafficked through Northwestern Mexico where it has resulted in a high prevalence of abuse.[62] Methamphetamine abuse has been linked to risky sexual behaviors in a variety of settings,[63] and has been associated with HIV/STI positivity and inconsistent condom use among FSWs and male clients in our previous research.[26,28,45,64] Our findings imply that the association between methamphetamine abuse and HIV/STIs may also hold true for FSWs' non-commercial male partners. Effective drug treatment options, including programs that focus on stimulant abuse and co-occurring conflict within relationships, are needed in these cities in addition to more comprehensive programs that

recognize and address the co-occurrence of stimulant abuse, violence, and sexual risk among socially marginalized couples.

Our study is not without limitations. First, because our dyadic analyses were cross-sectional, our findings cannot be interpreted as causal, and we cannot distinguish the direction of associations or transmission dynamics within couples. Second, due to our recruitment and screening strategies,[35] our findings may not be generalized to other couples, FSWs who are experiencing extreme IPV, or FSWs with casual non-commercial partners. Our focus on stable (≥6 month duration), non-commercial partnerships may have also resulted in our sample being less vulnerable to HIV/STI acquisition. Future research should assess the demographic and risk behavior profiles of men in shorter-term relationships with FSWs. Similarly, other researchers may want to avoid dichotomizing partners as "commercial" or "non-commercial," as our own research with this population has revealed a continuum of partner types with a range of behavioral norms that are relevant to HIV/STI transmission.[46] We also depended on self-report of highly sensitive topics, including sexual and drug-related risk behaviors and IPV. Finally, low prevalence of HIV/STI outcomes prevented a thorough examination of the independent correlates of HIV as compared to other specific STIs; however, sensitivity analyses performed on STIs (without HIV) yielded very similar findings. Furthermore, as a first dyadic study of HIV/STIs among FSWs and their intimate partners, we believe that our findings carry important implications for future couple-based research and prevention efforts in these cities.

As in other intimate relationship contexts,[8,10,14,65] we have found FSWs' low levels of condom use with non-commercial partners to be linked to emotional bonds between partners including love and trust,[66] as well as social and gender norms that reinforce power imbalances between partners and place reproductive and sexual health responsibilities on women over men.[15,67,68] Simply promoting condom use within intimate relationships could signify mistrust and ultimately threaten relationship stability.[69–75] Our findings also highlight the importance of assessing relationship and social network dynamics in HIV/STI transmission research. Thus, additional dyadic, qualitative, and mixed methods studies are needed to understand how relationship dynamics can be leveraged by couple-based interventions to enhance risk disclosure, particularly among HIV/STI-discordant couples. HIV/STI prevention efforts for marginalized couples in this region should carefully assess both partners' behaviors as well as shared relationship characteristics when designing HIV/STI prevention programs.

ACKNOWLEDGMENTS

Funding for this study was provided by the National Institutes of Health (NIH) grants R01DA027772, R36DA032376, T32AI007384, T32DA023356, and K01DA026307; the NIH had no further role in study design; in the collection, analysis and interpretation of data; in the writing of the report; or in the decision to submit the paper for publication. We thank the project staff and participants without whom this research would not be possible.

REFERENCES

1. Baral S, Beyrer C, Muessig K, et al. Burden of HIV among female sex workers in low-income and middle-income countries: a systematic review and meta-analysis. *Lancet Infect Dis*. 2012; 12(7): 538–549.

2. Foss AM, Hossain M, Vickerman PT, Watts CH. A systematic review of published evidence on intervention impact on condom use in sub-Saharan Africa and Asia. *Sex Transm Infect*. 2007; 83(7): 510–516.
3. Patterson TL, Mausbach B, Lozada R, et al. Efficacy of a brief behavioral intervention to promote condom use among female sex workers in Tijuana and Ciudad Juarez, Mexico. *Am J Public Health*. 2008; 98(11): 2051–2057.
4. Wariki WM, Ota E, Mori R, Koyanagi A, Hori N, Shibuya K. Behavioral interventions to reduce the transmission of HIV infection among sex workers and their clients in low- and middle-income countries. *Cochrane Database Syst Rev*. 2012; 2, CD005272.
5. Leonard L, Ndiaye I, Kapadia A, et al. HIV prevention among male clients of female sex workers in Kaolack, Senegal: results of a peer education program. *AIDS Educ Prev*. 2000; 12(1): 21–37.
6. Lowndes CM, Alary M, Labbe AC, et al. Interventions among male clients of female sex workers in Benin, West Africa: an essential component of targeted HIV preventive interventions. *Sex Transm Infect*. 2007; 83(7): 577–581.
7. Deering KN, Bhattacharjee P, Bradley J, et al. Condom use within non-commercial partnerships of female sex workers in southern India. *BMC Public Health*. 2011; 11(Suppl 6): S11.
8. Kerrigan D, Ellen JM, Moreno L, et al. Environmental-structural factors significantly associated with consistent condom use among female sex workers in the Dominican Republic. *AIDS*. 2003; 17(3): 415–423.
9. Lowndes CM, Alary M, Gnintoungbe CA, et al. Management of sexually transmitted diseases and HIV prevention in men at high risk: targeting clients and non-paying sexual partners of female sex workers in Benin. *AIDS*. 2000; 14(16): 2523–2534.
10. Mills S, Benjarattanaporn P, Bennett A, et al. HIV risk behavioral surveillance in Bangkok, Thailand: sexual behavior trends among eight population groups. *AIDS*. 1997; 11(Suppl 1): S43–51.
11. Murray L, Moreno L, Rosario S, Ellen J, Sweat M, Kerrigan D. The role of relationship intimacy in consistent condom use among female sex workers and their regular paying partners in the Dominican Republic. *AIDS Behav*. 2007; 11(3): 463–470.
12. Bryant J, Brener L, Hull P, Treloar C. Needle sharing in regular sexual relationships: an examination of serodiscordance, drug using practices, and the gendered character of injecting. *Drug Alcohol Depend*. 2010; 107(2): 182–187.
13. Spina M, Tirelli U. Condom use in female sex workers in Italy. *Am J Public Health*. 1999; 89(1): 108.
14. Voeten HA, Egesah OB, Varkevisser CM, Habbema JD. Female sex workers and unsafe sex in urban and rural Nyanza, Kenya: regular partners may contribute more to HIV transmission than clients. *Trop Med Int Health*. 2007; 12(2): 174–182.
15. Walden VM, Mwangulube K, Makhumula-Nkhoma P. Measuring the impact of a behaviour change intervention for commercial sex workers and their potential clients in Malawi. *Health Educ Res*. 1999; 14(4): 545–554.
16. Wang C, Hawes SE, Gaye A, et al. HIV prevalence, previous HIV testing, and condom use with clients and regular partners among Senegalese commercial sex workers. *Sex Transm Infect*. 2007; 83(7): 534–540.
17. Wong ML, Lubek I, Dy BC, Pen S, Kros S, Chhit M. Social and behavioural factors associated with condom use among direct sex workers in Siem Reap, Cambodia. *Sex Transm Infect*. 2003; 79(2): 163–165.
18. El-Bassel N, Terlikbaeva A, Pinkham S. HIV and women who use drugs: double neglect, double risk. *Lancet*. 2010; 376(9738): 312–314.
19. El-Bassel N, Wechsberg WM. Couple-based behavioral HIV interventions: placing HIV risk-reduction responsibility and agency on the female and male dyad. *Couple Fam Psychol: Res Pract*. 2012; 1(2): 94–105.

20. El-Bassel N, Wechsberg WM, Shaw SA. Dual HIV risk and vulnerabilities among women who use or inject drugs: no single prevention strategy is the answer. *Curr Opin HIV AIDS*. 2012; 7(4): 326–331.
21. Misovich SJ, Fisher JD, Fisher WA. Close relationships and elevated HIV risk behavior: evidence and possible underlying psychological processes. *Rev Gen Psychol*. 1997; 1(1): 72–107.
22. Pequegnat W, Bray JH. HIV/STD prevention interventions for couples and families: a review and introduction to the special issue. *Couple Fam Psychol: Res Pract*. 2012; 1(2): 79–93.
23. Strathdee SA, Magis-Rodriguez C. Mexico's evolving HIV epidemic. *JAMA*. 2008; 300(5): 571–573.
24. Sirotin N, Strathdee SA, Lozada R, et al. A comparison of registered and unregistered female sex workers in Tijuana, Mexico. *Public Health Rep*. 2010; 125(Suppl 4): 101–109.
25. Sirotin N, Strathdee SA, Lozada R, et al. Effects of government registration on unprotected sex amongst female sex workers in Tijuana; Mexico. *Int J Drug Policy*. 2010; 21(6): 466–470.
26. Patterson TL, Semple SJ, Staines H, et al. Prevalence and correlates of HIV infection among female sex workers in 2 Mexico-US border cities. *J Infect Dis*. 2008; 197(5): 728–732.
27. Brouwer KC, Case P, Ramos R, et al. Trends in production, trafficking, and consumption of methamphetamine and cocaine in Mexico. *Subst Use Misuse*. 2006; 41(5): 707–727.
28. Munoz FA, Pollini RA, Zuniga ML, et al. Condom access: associations with consistent condom use among female sex workers in two northern border cities of Mexico. *AIDS Educ Prev*. 2010; 22(5): 455–465.
29. 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): e19048.
30. Ojeda VD, Strathdee SA, Lozada R, et al. Associations between migrant status and sexually transmitted infections among female sex workers in Tijuana, Mexico. *Sex Transm Infect*. 2009; 85(6): 420–426.
31. Ulibarri MD, Strathdee SA, Lozada R, et al. Condom use among female sex workers and their non-commercial partners: effects of a sexual risk intervention in two Mexican cities. *Int J STD AIDS*. 2012; 23(4): 229–234.
32. Strathdee SA, Lozada R, Staines-Orozco H, et al. No effect of a sexual risk intervention on condom use with female sex workers and their regular partners in two Mexico-US border cities [abstract presented April 19, 2009]. Annual Meeting of the International Harm Reduction Association 2009; Liverpool, United Kingdom.
33. Ulibarri MD, Strathdee SA, Lozada R, et al. Intimate partner violence among female sex workers in two Mexico-U.S. border cities: partner characteristics and HIV risk-behaviors as correlates of abuse. *Psychol Trauma*. 2010; 2(4): 318–325.
34. Ulibarri MD, Strathdee SA, Patterson TL. Sexual and drug use behaviors associated with HIV and other sexually transmitted infections among female sex workers in the Mexico-US border region. *Curr Opin Psychiatr*. 2010; 23(3): 215–220.
35. Syvertsen JL, Robertson AM, Abramovitz D, et al. Study protocol for the recruitment of female sex workers and their non-commercial partners into couple-based HIV research. *BMC Public Health*. 2012; 12(136): 1–16.
36. Sherman SG, Latkin CA. Intimate relationship characteristics associated with condom use among drug users and their sex partners: a multilevel analysis. *Drug Alcohol Depend*. 2001; 64(1): 97–104.
37. Johnson HA, Zabriskie RB, Hill B. The contribution of couple leisure involvement, leisure time, and leisure satisfaction to marital satisfaction. *Marriage Fam Rev*. 2006; 40(1): 69–91.

38. Pulerwitz J, Gortmaker SL, De Jong W. Measuring sexual relationship power in HIV/STD research. *Sex Roles*. 2000; 42(7): 637–660.
39. Straus MA, Douglas EM. A short form of the revised conflict tactics scales, and typologies for severity and mutuality. *Violence Vict*. 2004; 19(5): 507–520.
40. Kenny DA, Kashy DA, Cook WL. *Dyadic Data Analysis*. New York, NY: Gilford; 2006.
41. UNAIDS. Consensus indicators are needed for concurrency. *Lancet*. 2010; 375(9715): 621–622.
42. Greenland S. Modeling and variable selection in epidemiologic analysis. *Am J Public Health*. 1989; 79(3): 340–349.
43. Akaike H. A new look at the statistical model identification. *IEEE Trans Autom Control*. 1974; 19(6): 716.
44. Cleland CM, Des Jarlais DC, Perlis TE, Stimson G, Poznyak V. HIV risk behaviors among female IDUs in developing and transitional countries. *BMC Public Health*. 2007; 7(1): 271.
45. Patterson TL, Goldenberg S, Gallardo M, et al. Correlates of HIV, sexually transmitted infections, and associated high-risk behaviors among male clients of female sex workers in Tijuana, Mexico. *AIDS*. 2009; 23(13): 1765–1771.
46. Robertson AM, Syvertsen JL, Amaro H, et al. Can't buy my love: a typology of female sex workers' commercial relationships in the Mexico-U.S. border region. *J Sex Res*. May 9 2013.
47. Robertson AM, Syvertsen JL, Rangel MG, et al. Concurrent sexual partnerships among female sex workers and their non-commercial male partners in Tijuana and Ciudad Juarez, Mexico. *Sex Transm Infect*. 2013; 89(4): 330–332.
48. Coates TJ, Richter L, Caceres C. Behavioural strategies to reduce HIV transmission: how to make them work better. *Lancet*. 2008; 372(9639): 669–684.
49. Morris M. Barking up the wrong evidence tree. Comment on Lurie & Rosenthal, "Concurrent partnerships as a driver of the HIV epidemic in sub-Saharan Africa? The evidence is limited. *AIDS Behav*. 2010; 14(1): 31–33. discussion 34–37.
50. Amaro H. Love, sex, and power. Considering women's realities in HIV prevention. *Am Psychol*. 1995; 50(6): 437–447.
51. Jana S, Basu I, Rotheram-Borus MJ, Newman PA. The Sonagachi project: a sustainable community intervention program. *AIDS Educ Prev*. 2004; 16(5): 405–414.
52. Kerrigan D, Moreno L, Rosario S, et al. Environmental-structural interventions to reduce HIV/STI risk among female sex workers in the Dominican Republic. *Am J Public Health*. 2006; 96(1): 120–125.
53. Halli SS, Ramesh BM, O'Neil J, Moses S, Blanchard JF. The role of collectives in STI and HIV/AIDS prevention among female sex workers in Karnataka, India. *AIDS Care*. 2006; 18(7): 739–749.
54. Wingood GM, DiClemente RJ. Application of the theory of gender and power to examine HIV-related exposures, risk factors, and effective interventions for women. *Health Educ Behav*. 2000; 27(5): 539–565.
55. Pulerwitz J, Amaro H, De Jong W, Gortmaker SL, Rudd R. Relationship power, condom use and HIV risk among women in the USA. *AIDS Care*. 2002; 14(6): 789–800.
56. Connell R. Gender, health and theory: conceptualizing the issue, in local and world perspective. *Soc Sci Med*. Jun 29 2011.
57. Staudt KA. *Violence and Activism at the Border: Gender, Fear, and Everyday Life in Ciudad Juárez*. 1st ed. Austin, TX: University of Texas Press; 2008.
58. Syvertsen JL, Robertson AM, Rolon ML, et al. "Eyes that don't see, heart that doesn't feel:" coping with sex work in an intimate relationship context along the Mexico-U.S. border and the implications for HIV prevention. *Soc Sci Med*. 2014; 8:1–8.
59. Burton J, Darbes LA, Operario D. Couples-focused behavioral interventions for prevention of HIV: systematic review of the state of evidence. *AIDS Behav*. 2010; 14(1): 1–10.

60. El-Bassel N, Gilbert L, Witte S, Wu E, Hunt T, Remien RH. Couple-based HIV prevention in the United States: advantages, gaps, and future directions. *J Acquir Immune Defic Syndr*. 2010; 55(Suppl 2): S98–101.
61. El-Bassel N, Witte SS, Gilbert L, et al. HIV prevention for intimate couples: a relationship-based model. *Fam Syst Health*. 2001; 19(4): 379–395.
62. Case P, Ramos R, Brouwer KC, et al. At the borders, on the edge: use of injected methamphetamine in Tijuana and Ciudad Juarez, Mexico. *J Immigr Minor Health*. 2008; 10(1): 23–33.
63. Corsi KF, Booth RE. HIV sex risk behaviors among heterosexual methamphetamine users: literature review from 2000 to present. *Curr Drug Abuse Rev*. 2008; 1(3): 292–296.
64. Loza O, Strathdee SA, Martinez GA, et al. Risk factors associated with chlamydia and gonorrhoea infection among female sex workers in two Mexico-USA border cities. *Int J STD AIDS*. 2010; 21(7): 460–465.
65. Rosenthal D, Oanh TTK. Listening to female sex workers in Vietnam: influences on safe-sex practices with clients and partners. *Sex Health*. 2006; 3(1): 21.
66. Syvertsen JL, Robertson AM, Palinkas LA, Rangel MG, Martinez G, Strathdee SA. 'Where sex ends and emotions begin': love and HIV risk among female sex workers and their intimate, non-commercial partners along the Mexico-US border. *Cult Health Sex*. 2013; 15(5): 540–554.
67. Castaneda X, Ortiz V, Allen B, Garcia C, Hernandez-Avila M. Sex masks: the double life of female commercial sex workers in Mexico City. *Cult Med Psychiatry*. 1996; 20(2): 229–247.
68. Shannon K, Kerr T, Allinott S, Chettiar J, Shoveller J, Tyndall MW. Social and structural violence and power relations in mitigating HIV risk of drug-using women in survival sex work. *Soc Sci Med*. 2008; 66(4): 911–921.
69. Pivnick A. HIV infection and the meaning of condoms. *Cult Med Psychiatry*. 1993; 17(4): 431–453.
70. Sobo EJ. Inner-city women and AIDS: the psycho-social benefits of unsafe sex. *Cult Med Psychiatry*. 1993; 17(4): 455–485.
71. Cusick L, Rhodes T. Sustaining sexual safety in relationships: HIV positive people and their sexual partners. *Cult Health Sex*. 2000; 2(4): 473–487.
72. Warr DJ, Pyett PM. Difficult relations: sex work, love and intimacy. *Sociol Health Illn*. 1999; 21(3): 290–309.
73. Rhodes T, Cusick L. Love and intimacy in relationship risk management: HIV positive people and their sexual partners. *Sociol Health Illn*. 2000; 22(1): 1–26.
74. Rhodes T, Cusick L. Accounting for unprotected sex: stories of agency and acceptability. *Soc Sci Med*. 2002; 55(2): 211–226.
75. Rhodes T, Quirk A. Drug users' sexual relationships and the social organisation of risk: the sexual relationship as a site of risk management. *Soc Sci Med*. 1998; 46(2): 157–169.