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An exploration of contextual factors that influence HIV risk in female sex workers in Mexico: The Social Ecological Model applied to HIV risk behaviors

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Abstract

The present study examined the applicability of the Social Ecological Model for explaining condom use in a sample of female sex workers (FSWs) (N=435) participating in a behavioral intervention to increase condom use in Tijuana, Mexico. Using a multi-group path analysis, we compared women who work in bar settings (n=233) to those who worked on the street (n=202) with regard to an individual factor (self efficacy), an interpersonal factor (client financial incentives), and a structural factor (condom access). Competing models showed differential impacts of these factors in the two venue-based groups. Having access to condoms was associated with greater self-efficacy and less unprotected sex in women who worked in bars. Among street-based FSWs, having clients offer monetary incentives for unprotected sex was related to greater unprotected sex while having access to condoms was not. Understanding the contextual factors associated with condom use among subgroups of FSWs has important implications for the development of HIV prevention interventions.

Keywords

sex workers; condom use; Mexico; HIV risk; Social Ecological Model

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Introduction

HIV infection is increasing at an alarming rate along the Mexico-U.S border, particularly in Baja California (CENSIDA, 2008). Recent studies have shown that FSWs along the Mexican-U.S. border are experiencing rising prevalence of HIV and sexually transmitted infections (STIs). In 1988, HIV prevalence among FSWs in Tijuana was less than 1% (Guereña-Burgueño, Benenson, & Sepulveda-Amor, 1991). In 2006, HIV prevalence among FSWs in Tijuana was 6%, while the lifetime prevalence of syphilis was 31% (Patterson, Semple, et al., 2008). Studies have linked contextual factors such as institutional support for condom use (Kerrigan et al., 2003), access to free condoms (Dandona et al., 2005), and client centered factors (McMahon, Tortu, Pouget, Hamid, & Neaigus, 2006) to HIV risk behaviors in FSWs. However, few studies have attempted to explain HIV risk behaviors using specific behavioral models.

The Social Ecological Model describes five levels of influence on behavior including individual, interpersonal, institutional, community, and policy (McLeroy, Bibeau, Steckler & Glanz, 1988). This framework has been used to examine contextual influences on contraception and condom use in women (Bull, & Shlay, 2005), and STI risk behaviors in adolescents (Voisin, DiClemente, Salazar, Crosby, & Yarber, 2006). In HIV prevention, interventions have recently been developed that consider both the situational and dispositional determinants of behavior (e.g., Kerrigan et al., 2006), but few models that incorporate multiple-level determinants of behavior have been tested in FSWs.

In international settings, location of sex work has been shown to relate to sexual practices and risk of HIV transmission (Dandona et al., 2005; Strathdee, Philbin, et al., 2008). Institutional structures such as work environment can influence health behaviors by making condoms available, while local authorities can enforce policies mandating behavior change (Cohen, Scribner, & Farley, 2000). Although these types of policies have not been introduced in Mexico, Thailand implemented a national program mandating 100% condom use in brothels that reduced the prevalence of HIV among FSWs in Chiang Mai by 14%, from 44% in 1991 to 30.4% in 1993 (Siraprapasiri et al., 1991; Chaisiri, Danutra, & Limanonda, 1993). Self-contained environments, such as bars, can impart important health information to workers and patrons (Morisky, Pena, Tiglaio, & Lui, 2002) while establishment influences are more likely to be associated with condom use than are individual factors (Morisky et al., 1998). Many FSWs who cannot personally afford condoms will use them if the working environment provides them (Tran, Deteles, & Lan, 2006). Even availability for purchase in the workplace seems to make condom use more likely (Oladosu, 2005).

Interpersonal factors have also been shown to impact condom use in FSWs. A recent qualitative study with FSWs in Mexico found that one of the major barriers to condom use was the financial incentive that some clients provide for unprotected sex (Bucardo, Semple, Fraga-Vallejo, Davila, & Patterson, 2004). Substance use prior to sex with a client can impair FSWs' ability to negotiate condom use or to engage in other self-protective behaviors (Naranjo & Bremner, 1993; Testa & Parks, 1996). In the Philippines, alcohol use by FSWs before sex was related to an increased likelihood of having a STI (Chiao, Morisky, Rosenberg, Ksobiech, & Malow, 2006). Methamphetamine use before sex also increases the risk of transmission of STIs (Urbina & Jones, 2004; Reback, Larkins, & Shoptaw, 2004; Volkow et al., 2007). Recent studies among FSWs in Tijuana have found that drug use, particularly methamphetamine use, is associated with high risk sexual behaviors and higher HIV/STI prevalence (Patterson, Semple, et al., 2008; Strathdee, Philbin, et al., 2008).

Access to alcohol and drugs varies by environment. Women who work in bars may have greater access to alcohol, whereas FSWs working on the street may have more access to illicit drugs.

Understanding these structural differences can help formulate appropriate prevention efforts to target drug and alcohol use as it pertains to sexual risk behaviors.

Self-efficacy is an important individual factor that has been found to influence condom use in FSWs around the world (Ford et al., 1998; Oladosu, 2005). FSWs who believe more strongly that they can negotiate condom use in various situations have been found to perform more safe-sex behaviors (Wang et al., 2007). Among disadvantaged women living in the United States, drug and alcohol use has been associated with reduced self-efficacy for condom use (Tucker et al., 2005). Low self efficacy has also been linked to increased needle sharing among U.S. women who inject (Wagner et al., 2007).

The current study uses the Social Ecological framework to explore how venue of sex work, access to condoms, and economic incentives relate to number of unprotected sex acts in a sample of FSWs. In bar workers, we hypothesized that access to condoms would directly and indirectly (through an increase in self-efficacy) relate to fewer unprotected sex acts. In contrast, for street FSWs we hypothesized that economic incentives would be a more important predictor of unprotected sex. In both groups, it was hypothesized that duration of sex work would be related to unprotected sex. Women with more experience may know where to access free condoms, or might have more experience negotiating condom use with their partners decreasing their likelihood of having unprotected sex.

Methods

Analyses were conducted using baseline data from a larger study designed to implement and evaluate the efficacy of a culturally relevant sexual risk reduction intervention to increase condom use among FSWs who engage in high-risk sex in U.S. border cities in Mexico (Patterson et al., 2006; Patterson, Mausbach, et al., 2008). Only data gathered in Tijuana between September 2004 and March 2006 were included in this analysis.

Participants

To be eligible for the study, women had to be 18 years of age, report sex work as their primary source of income, and report unprotected sex (vaginal, oral, anal) with one or more clients in the past two months. A total of 472 women met eligibility criteria and completed the baseline assessment.

Measures

Independent variables

Condom Access: Participants reported how often they got condoms for free, either never (0), sometimes (1), often (2), or always (3). This variable was dichotomized to distinguish those who reported never or sometimes having access to free condoms (0) and those who often and always had access (1). Participants were also asked if they were able to obtain condoms from pimps, fellow sex workers, a municipal clinic, or if they obtained condoms from another location and where. A composite score was created by summing all of the locations where FSWs obtained condoms, with higher numbers representing greater access to condoms.

Condom use self-efficacy: Participants' condom use self-efficacy was measured with five items scored on a 4-point Likert scale. Items included, "I can use a condom properly;" "I can use a condom every time I have vaginal or anal sex;" "I can have condoms available every time I have vaginal or anal sex;" "I can use a condom for sex while under the influence of drugs or alcohol;" and "I can use a condom without any instruction." Responses ranged from 1 (*strongly disagree*) to 4 (*strongly agree*). Scores were averaged to create a composite score that ranged from 1 to 4 in the present sample ($\alpha = .77$).

Substance use before sex: Two questions measured the frequency with which participants drank alcohol or used drugs prior to sex with clients in the past month. Response options included never, sometimes, often, or always. Questions were standardized and Z scores for each item were used separately in the analyses.

Increased monetary rewards for unprotected sex: Participants were asked how much money they earn per sex act both with a condom and without. The difference was calculated and used in the analyses.

Length of time as a sex worker: To account for experience in the sex trade, participants were asked how long (in years) they have been sex workers.

Dependent Variable

Condom use: Our primary outcome variable was the number of unprotected sex acts performed in the last 30 days. Women were asked how many sex acts they had had with clients, "In the past 30 days, how often did you not use condoms for oral, vaginal, and anal sex with your male clients?" Since all items had the same response scale, and were highly correlated ($p < .01$) we treated each item as if it were part of a larger scale (unprotected sex acts) and summed them to create a total count for number of unprotected sex acts, with higher scores representing less condom use.

Analyses

Missing data: The data set was examined using SPSS v 15.0 to determine accuracy of data entry, missing data, and skewness. Several variables were found to be positively skewed (condom use, amount of money earned for non-condom use) and were logarithmically transformed. Most variables had less than 10% missing data, and AMOS version 7 (Analysis of Moment Structures; Arbuckle, 2006) was used to run full information maximum likelihood estimation to handle this.

Chi-square analyses and analyses of variance: Chi-square tests were used to compare differences for binary variables between bar and street workers, and Analyses of Variance (ANOVAs) were used for differences on the continuous independent variables.

Path analysis: Path analysis was used to examine relationships among variables and explore overall model fit. Fit statistics were employed to assess model fit, including Comparative Fit Index (CFI; Bentler, 1990) with values greater than .90, the Root Mean Square Error of Approximation (RMSEA; Steiger, 1990) with values less than .08, and a non-significant chi-square likelihood ratio test (see Tanaka, 1993). A significance level of .05 was employed for individual model parameters (e.g., path coefficients).

To further establish model fit in our sample, competing models that included paths between drug and alcohol use before sex and self-efficacy were run in each group. Non-significant paths were deleted from the respective models. In path analysis, causal interpretations should be undertaken in the context of comparing alternative models, since path analysis is particularly sensitive to model specification, and failure to include relevant causal variables or inclusion of extraneous variables often substantially affects the path coefficients (Cohen, Cohen, West, & Aiken, 2003). The competing model approach has been used extensively in both social and basic sciences (Ward & Tittle, 1994; Mitchell, 1992). Fit statistics of the competing model were compared to those of the original model.

Results

Participant characteristics

In the entire sample (N=472), FSWs were approximately 32.92 years old (IQR= 25-39), a majority (92.16%) reported having children and more than half of the sample was single (54.2%). Approximately 42.80% (n=202) of the women described the street as their main venue for sex work, while 49.36% (n=233) identified themselves as bar workers. Those who identified their primary venue as “other” (7.84%, n=37) were not included in the analyses. For participant characteristics of bar and street samples, see Table 1.

Comparison of bar and street workers—Women who worked in bars reported more financial dependents than did women who worked on the streets ($p=.002$) and fewer regular ($p=.039$) and non-regular clients ($p<.001$). As hypothesized, the women who worked in bars reported more condom use than women who worked on the street ($p<.01$) (see Table 2).

Women who identified the bars as their main location for sex work reported having greater access to condoms ($p<.001$) and a higher level of condom use self-efficacy ($p=.02$). Although women did not significantly differ in the amount of money earned for sexual intercourse in general, bar workers reported making an average of 20 dollars more per unprotected sex act than did the women who worked on the street ($p=.017$).

Exploration of condom access showed that a majority of both bar (65.8%, n=150) and street workers (65.3%, n=132) could afford to buy their own condoms. Few women in either group endorsed municipal clinics, fellow sex workers, or pimps as sources for condoms. In the sample, less than 40% of bar workers (n=92) and a majority of street workers (87.7%, n=71) identified “other sources” for obtaining condoms. These sources include hotels, mobile vans, clients, and religious associations. Chi-square analyses showed significant differences between bar and street workers on where they obtained their condoms, with street workers more likely to obtain condoms from mobile vans ($p=.008$) and bar workers more likely to acquire their condoms from their workplace ($p=.001$).

Differences among the women on several drug use variables were examined. Chi-square statistics compared bar and street workers on the types of drugs ever used and on their route of administration. Overall, women who worked on the street used more drugs and were more likely to have ever injected drugs ($p<.001$) than were women working in bars. When it came to substance use before sex with a client, ANOVAs showed that women working in bars were more likely to use alcohol ($p<.001$), while street workers were more likely to use drugs ($p<.001$).

Path Analysis—A path analysis was conducted independently for each group, with the model fitting well in the bar sample ($\chi^2=9.7$, ns, [df = 5], CFI= .823, RMSEA= .06) but poorly in the street sample ($\chi^2=12.09$, $p<.05$, [df = 5], CFI= .603, RMSEA= .08). In the bar sample, separate paths between condom access to condom use self-efficacy and unprotected sex were both significant. Length of time working in the sex trade was also positively related to increased unprotected sex in the bar workers although financial incentive was not significant (see Figure 1 for path coefficients). In the street sample, greater self-efficacy for condom use was related to less unprotected sex while increased economic incentives for unprotected sex was related to greater unprotected sex (see Figure 2).

Considering the different degrees of model fit in each group, different competing models were tested in each group. In the bar sample, previous analyses showed more alcohol use, so a competing model was run incorporating paths between alcohol use and self-efficacy for condom use, and after deleting the financial incentives variable, this model showed improved

fit ($\chi^2 = 8.70$ ns, [df = 5], CFI = .897, RMSEA = .06). See Figure 1. For the street sample, a path between drug use before sex and self-efficacy was included, and the non-significant variables (i.e. condom access, duration of sex work) were dropped, resulting in improved model fit ($\chi^2 = 6.03$ ns [df = 3], CFI = .827, RMSEA = .07). See Figure 2. RMSEA performed better than CFI for continuous outcomes, and according to the RMSEA statistic, the model fit reasonably well.

Discussion

Understanding how contextual factors relate to condom use in FSWs living and working in Tijuana is vital to inform multilevel interventions to reduce their risk of acquiring HIV and other STIs, thereby improving their health and that of their partners and families. Using the Social Ecological Model as a framework, the present study took a multilevel approach to examine how individual, interpersonal, and institutional factors influence condom use in women at high risk for contracting HIV/STIs. Path analyses showed significant differences in how these factors differentially impacted condom use based on their primary place of work. For women who worked in bars, having more access to condoms was related to increased self efficacy and less unprotected sex. For street workers, economic incentives for unprotected sex, and lower levels of self-efficacy were related to more unprotected sex.

We also explored locations where street- and bar-based FSWs accessed condoms. Qualitative analysis noted the *Prevemovihl* as a source of condoms for the street workers. This customized van, donated by the University of California San Diego, serves as a mobile HIV prevention clinic and provides HIV testing and prevention materials in Tijuana, especially in the Zona Roja [red light zone], where sex work is tolerated (Strathdee & Magis Rodriguez, 2008). FSWs working on the streets accessed condoms from the *prevemovihl* in higher numbers than did the bar workers, yet having access to condoms did not increase condom use self-efficacy or condom use. In contrast, women who worked in bars reported having greater access to condoms from their workplace. Having institutional support for condom use has been shown to increase condom use (Morisky et al., 2002), and having access to condoms might be a reflection of this support. As hypothesized, for the women who worked in the bars, institutional factors (i.e., condom access) appeared to play a greater role in their condom use.

Among bar workers, having worked in the sex industry longer was related to greater numbers of unprotected sexual acts. The bar community values novelty and youth, and it is possible that as women get older and better known in the bar scene, they may feel the need to acquiesce to demands for unprotected sex in order to be competitive with younger, less experienced women. An alternative explanation might be that women who have a long career as a sex worker may feel demoralized and hopeless about their life circumstances and thus may be less careful during their encounters with clients. Depression has been shown to increase risky sexual behaviors in young women living in the United States (Mazzaro et al., 2006).

For the women who worked on the street, length of time in the sex trade was not significantly related to unprotected sex. In their case, financial incentives were more important in determining condom use. Consistent with previous qualitative findings, we showed that being offered a higher financial incentive was related to more unprotected sex in the women working on the street (Bucardo et al., 2004). Women who work on the street may lack institutional support and thus have to rely more heavily on interpersonal factors when making decisions related to condom use behaviors.

Research suggests that drug and alcohol use varies by work environment (Strathdee, Philbin, et al., 2008), and the current study supports this. Substance use before sex reduces an individual's self-efficacy for condom use, making unprotected sex more likely. While type of

substance use varied by work environment, both groups showed a negative relationship between substance use and self-efficacy. In response to the important role that drug use plays in the HIV/STI epidemics among FSWs in Tijuana, a new study is underway to test a behavioral intervention to reduce high risk sex occurring within the context of drug use.

This study has important limitations. Since the inclusion criteria for the larger study required unprotected sex with clients in the past month, the data reflect baseline measurements of women who were all practicing high-risk behaviors. The current findings therefore do not necessarily reflect predictors of condom use in women who use condoms more consistently with their clients. Despite this, the present study helps describe risk behaviors in women at a very high risk for acquiring HIV/STIs. When working to prevent the spread of HIV/AIDS in developing countries the issue of resource allocation is crucial. Findings from the present study can help tailor prevention efforts to FSWs based on location of sex work possibly increasing the cost-effectiveness of these efforts. Future studies should examine how the variables included in the present study (e.g. substance use, self-efficacy, access to condoms) interact to explain condom use in FSWs who do use condoms more consistently.

The consistent finding that bar and street workers differ on condom use, drug use, and the factors associated with these behaviors lends credence to the inclusion of structural and environmental targets when developing interventions for this population. The combination of more clients, less condom use, and higher drug use confirms that street-based FSWs are among the highest subgroup at risk of contracting HIV/STIs in Tijuana. For these women, client focused prevention efforts that increase safe sex negotiation skills may be more effective, but attention should also be paid to their non-paying partners as well. Poverty and drug use are also important motivating factors for unprotected sex in these women, therefore providing drug treatment, monetary incentives for condom use (i.e. contingency management), or job training opportunities may be novel prevention approaches for this group of women. For the women who work in bars, prevention efforts should focus on institutional incentives for promoting condom use, as well as individual level factors such as alcohol use and improving self efficacy for condom use. For both groups of women, our findings support the need for a multifaceted approach to HIV prevention that addresses both individual and environmental determinants of condom use, including poverty, drug and alcohol use, and location of sex work.

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References

- Arbuckle, J.L. AMOS 7.0 User's Guide. Spring House PA: Amos Development Corporation; 2006.
- Bentler PM. Comparative fit indexes in structural models. *Psychological Bulletin* 1990;107:238–246. [PubMed: 2320703]
- Bucardo J, Semple SJ, Fraga-Vallejo M, Davila W, Patterson TJ. A qualitative exploration of female sex work in Tijuana, Mexico. *Archives of Sexual Behavior* 2004;33(4):343–351. [PubMed: 15162080]
- Bull SS, Shlay JC. Promoting "dual protection" from pregnancy and sexually transmitted disease: a social ecological approach. *Health Promotion Practice* 2005;6(1):72–80. [PubMed: 15574531]
- CENSIDA. Casos nuevos y acumulados de SIDA (15-29 años), por categoria de transmission. Registro Nacional de Casos de SIDA. 2008. Datos al 30 de Junio de 2008. Downloaded from <http://www.salud.gob.mx/conasida/> on August 21, 2008
- Chaisiri N, Danutra V, Limanonda B. Prevalence of syphilis and anti-HIV-1 seropositive among prostitutes in two urban areas of Thailand. *International Conference on AIDS*. 1993 Jun 6-11;

- Chiao C, Morisky DE, Rosenberg R, Ksobiech K, Malow R. The relationship between HIV/sexually transmitted infection risk and alcohol use during commercial sex episodes: Results from the study of female commercial sex workers in the Philippines. *Substance Use & Misuse* 2006;41:1509–1533. [PubMed: 17002991]
- Cohen DA, Scribner RA, Farley TA. A structural model of health behavior: A pragmatic approach to explain and influence health behaviors at the population level. *Preventative Medicine* 2000;30(2):146–154.
- Cohen, J.; Cohen, P.; West, SG.; Aiken, LS. *Applied multiple regression/correlation analysis for the behavioral sciences*. Mahwah, NJ: 2003.
- Dandona R, Dandona L, Gutierrez JP, Kumar AG, McPherson S, Samuels F, et al. High risk of HIV in non-brothel based female sex workers in India. *BMC Public Health* 2005;5(87):1–10. [PubMed: 15627405]
- Ford K, Nyoman D, Fajans P. Factors related to condom use among four groups of female sex workers in Bali, Indonesia. *AIDS Education and Prevention* 1998;10(1):34–45. [PubMed: 9505097]
- Guereña-Burgueño F, Benenson AS, Sepulveda-Amor J. HIV-1 prevalence in selected Tijuana sub-populations. *American Journal of Public Health* 1991;81(5):623–625. [PubMed: 2014864]
- Kerrigan D, Ellen JM, Moreno L, Rosario S, Katz J, Celentano DD, et al. Environmental-structural factors significantly associated with consistent condom use among female sex workers in the Dominican Republic. *AIDS* 2003;17(3):415–23. [PubMed: 12556696]
- Kerrigan D, Moreno L, Rosario S, Gomez B, Jerez H, Barrington C, et al. Environmental-structural interventions to reduce HIV/STI risk among female sex workers in the Dominican Republic. *American Journal of Public Health* 2006;96(1):120–125. [PubMed: 16317215]
- Mazzaro KE, Murray PJ, Ness RB, Bass DC, Tyus N, Cook RL. Depression, stress, and social support as predictors of high-risk sexual behaviors and STIs in young women. *Journal of Adolescent Health* 2006;39(4):601–603. [PubMed: 16982400]
- McLeroy KR, Bibeau D, Steckler A, Glanz K. An ecological perspective on health promotion programs. *Health Education Quarterly* 1988;15(4):351–377. [PubMed: 3068205]
- McMahon JM, Tortu S, Pouget ER, Hamid R, Neaigus A. Contextual determinants of condom use among female sex exchangers in East Harlem, NYC: An event analysis. *AIDS and Behavior* 2006;10:731–741. [PubMed: 16779657]
- Mitchell RH. Testing evolutionary and ecological hypotheses using path analysis and structural equation modeling. *Functional Ecology* 1992;6(2):123–129.
- Morisky DE, Pena M, Tiglaio TV, Lui KY. The impact of work environment on condom use among female bar workers in the Philippines. *Health and Education and Behavior* 2002;29(4):461–472.
- Morisky DE, Tiglaio TV, Sneed CD, Tempongko SB, Baltazar JC, Detels R, et al. The effects of establishment practices, knowledge and attitudes on condom use among Filipina sex workers. *AIDS Care* 1998;10(2):213–220. [PubMed: 9625904]
- Naranjo CA, Bremner KE. Behavioral correlates of alcohol intoxication. *Addiction* 1993;88(1):25–35. [PubMed: 8448514]
- Oladosu M. Consistent condom use dynamics among sex workers in Central America 1997-2000. *Journal of Biosocial Science* 2005;37:435–457. [PubMed: 16082856]
- Patterson TL, Semple SJ, Fraga M, Bucardo J, de la Torre A, Salazar J, et al. A sexual risk reduction intervention for female sex workers in Mexico: Design and baseline characteristics. *Journal of HIV/AIDS & Social Services* 2006;5(2):115–137.
- Patterson TL, Mausbach B, Lozada R, Staines H, Semple SJ, Fraga-Vallejo M, et al. Efficacy of a brief behavioral intervention to promote condom use among female sex workers in two Mexican-US border cities. *American Journal of Public Health* 2008;98(11):2051–2057. [PubMed: 18799768]
- Patterson TL, Semple SJ, Staines H, Lozada R, Orozovich P, Bucardo J, et al. Prevalence and correlates of HIV infection among female sex workers in 2 Mexico–US border cities. *Journal of Infectious Diseases* 2008;197:728–732. [PubMed: 18260766]
- Reback C, Larkins S, Shoptaw S. Changes in the meaning of sexual risk behaviors among gay and bisexual male methamphetamine abusers before and after drug treatment. *AIDS Behavior* 2004;8(1):874–878.

- Siraprapasiri T, Thanprasertsuk S, Rodklay A, Srivanichakorn S, Sawanpanyalert P, Temtanarak J, et al. Risk factors for HIV among prostitutes in Chiang Mai, Thailand. *AIDS* 1991;5(5):579–582. [PubMed: 1863411]
- Steiger JS. Structural model evaluation and modification: An interval estimation approach. *Multivariate Behavioral Research* 1990;25:173–180.
- Strathdee SA, Magis Rodriguez C. Mexico's evolving HIV epidemic. *Journal of the American Medical Association* 2008;300(5):571–573. [PubMed: 18677029]
- Strathdee SA, Philbin MM, Semple S, Pu M, Orozovich P, Martinez G, et al. Correlates of injection drug use among female sex workers in two Mexico-U.S. border cities. *Drug and Alcohol Dependence* 2008;92(1-3):132–140. [PubMed: 17714888]
- Tanaka, JS. Multifaceted conceptions of fit in structural equation models. In: Bollen, KA.; Long, JS., editors. *Testing structural equation models*. Newbury Park, CA: Sage Press; 1993. p. 10-39.
- Testa M, Parks KA. The role of women's alcohol consumption in sexual victimization. *Aggression and Violent Behaviour* 1996;1(3):217–234.
- Tran TN, Detels R, Lan HP. Condom use and its correlates among female sex workers in Hanoi, Vietnam. *AIDS and Behavior* 2006;10(2):159–167. [PubMed: 16477510]
- Tucker JS, D'Amico EJ, Wenzel SL, Golinelli D, Elliot MN, Williamson S. A prospective study of risk and protective factors for substance use among impoverished women living in temporary shelter settings in Los Angeles County. *Drug and Alcohol Dependence* 2005;80(1):35–43. [PubMed: 16157229]
- Urbina A, Jones K. Crystal methamphetamine, its analogues, and HIV infection: Medical and psychiatric aspects of a new epidemic. *Clinical Infectious Diseases* 2004;38(6):890–894. [PubMed: 14999636]
- Voisin DR, DiClemente RJ, Salazar LF, Crosby RA, Yarber WL. Ecological factors associated with STD risk behaviors among detained female adolescents. *Social Work* 2006;51:71–79. [PubMed: 16512512]
- Volkow ND, Wang GJ, Fowler JS, Telang F, Jayne M, Wong C. Stimulant induced enhanced sexual desire as a potential contributing factor in HIV transmission. *American Journal of Psychiatry* 2007;164(1):157–160. [PubMed: 17202559]
- Wagner KD, Hudson SM, Latka MH, Strathdee SA, Thiede H, Mackesy-Amiti ME, et al. The effect of intimate partner violence on receptive syringe sharing among young female injection drug users: An analysis of mediation effects. *AIDS and Behavior*. 2007 Epub ahead of print.
- Wang B, Li X, Stanton B, Fang X, Liang G, Liu D, et al. Gender differences in HIV-related perceptions, sexual risk behaviors, and history of sexually transmitted diseases among Chinese migrants visiting public sexually transmitted disease clinics. *AIDS Patient Care and STDs* 2007;21(1):57–68. [PubMed: 17263658]
- Ward DA, Tittle CR. IQ and delinquency: A test of two competing explanations. *Journal of Quantitative Criminology* 1994;10(3):189–212.

$p < .001$ ***, $p < .01$ **, $p < .05$ *

Note: All coefficients shown are standardized.

Figure 1.
Final Model for Bar Workers

$p < .001^{***}$, $p < .01^{**}$, $p < .05^*$

Note: All coefficients shown are standardized.

Figure 2.
Final model for Street Workers

Table 1

Characteristics of bar and street worker participants

	BAR			STREET		
	N	Value	Quartiles (25,75)	N	Value	Quartiles (25,75)
Age, mean	233	33.48	26.00, 39.00	200	32.57	25.00, 38.00
Marital status, n (%)	233			201		
Married		6 (2.6%)			4 (2.0%)	
Separated		47 (20.2%)**			23 (11.4%)**	
Divorced		20 (8.6%)**			6 (3.0%)**	
Living together		27 (11.6%)**			48 (23.9%)**	
Single		119 (51.0%)			113 (56.2%)	
Widowed		14 (6.0%)			7 (3.5%)	
No. years completed in school, mean	230	6.79	5.00, 9.00	196	6.44	4.00, 9.00
No. financial dependents, mean	233	2.50**	1.00, 4.00	202	1.96**	0.00, 3.00
No. weeks working in sex trade, mean	231	288.11	42.50, 364.00	199	318.50	104.00, 416.00
No. regular clients per month, mean	231	4.50*	1.00, 5.00	200	6.70*	2.00, 6.50
No. non-regular clients per month, mean	231	9.62**	1.00, 10.00	201	19.08**	4.00, 20.00
Hours worked during a week, mean	233	43.17	32.00, 56.00	198	45.07	28.00, 56.00
Have children, n (%)	233	217 (93.1%)		201	184 (91.5%)	
Registered with city as a sex worker, n (%)	102	75 (32.2%)**		46	15 (7.4%)**	
No. unprotected vaginal sex acts with clients in past month, mean	227	9.48*	1.00, 10.00	201	16.98*	3.50, 19.50
No. unprotected oral sex acts with clients in past month, mean	115	10.64*	1.00, 8.00	132	12.62*	1.00, 14.00
No. unprotected anal sex acts with clients in past month, mean	33	5.45	1.00, 6.00	50	7.46	1.00, 8.00
No. unprotected anal or vaginal sex acts with clients in past month, mean	227	10.27*	1.00, 10.00	201	18.84*	4.00, 22.50
Previous HIV test, n (%)	233	167 (71.7%)*		202	123 (60.6%)*	

**
p < .001,*
p < .05

ANOVAs for bar and street workers

	N	M	SD	t	p	d	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Access to condoms	233	1.73	.95	202	1.47	.65	1.434	10.71***					
Commercial partner violence	231	.58	.94	200	.80	1.20	1.429	4.16*					
Condom use self-efficacy	231	3.00	.47	200	2.90	.51	1.430	5.30*					
Average amount earned without a condom	233	296.63	1018.12	202	205.27	258.27	1.434	1.54					
Average amount earned with a condom	225	160.93	190.44	197	142.34	138.59	1.421	1.28					
Extra amount women earn for unprotected sex	225	34.36	111.67	197	14.57	30.96	1.421	5.79*					
Emotional support	231	2.85	.54	200	2.71	.47	1.430	7.10**					

ANOVA = analysis of variance
SD = standard deviation
df = degrees of freedom
F = F statistic