Published in final edited form as:
AIDS Behav. 2014 February ; 18(0 2): 181–191. doi:10.1007/s10461-013-0434-z.

Social Environmental factors and condom use among female injection drug users who are sex workers in China

Jing Gu[1], **Yu Bai**[2], **Joseph TF Lau**[3], **Yuantao Hao**[1], **Yu Cheng**[4], **Runan Zhou**[4], and **Chengpu Yu**[4]

[1]School of Public Health, Sun Yat-Sen University, Guangzhou, China

[2]Liuzhou Center for Disease Prevention and Control, Guangzhou, P. R. China

[3]Center for Health Behaviours Research, School of Public Health and Primary Care, Faculty of Medicine, The Chinese University of Hong Kong, Hong Kong, China

[4]Centre for Medical Anthropology and Behavioral Health, Sun Yat-sen University, Guangzhou, P. R. China

Abstract

In order to understand the social environmental forces faced by females involved in both injection drug use and sex work, and their associations with condom use during commercial sex, 200 participants were recruited using snowball sampling methods in Liuzhou, China. Of the participants, 41.0% used condoms consistently during commercial sex in the last six months. Adjusting for significant background variables, factors significantly associated with consistent condom use included: monthly income, soliciting venue, pattern of sex-work organization, experience of violence, social support, others' support of condom use, and utilization of HIV/STI-related services. In the final multivariate model, history of violence (OR=0.39, 95% CI=0.12 to 0.44), service utilization (OR=2.18, 95% CI= 1.05 to 5.20), clients' willingness to use condoms (OR= 2.63, 95% CI=1.06 to 6.54) and social support (OR=0.39, 95% CI=0.12 to 0.44) were significant. Service gaps for FSW-IDU exist, and expansion of social services and integration of psychosocial interventions are necessary.

Keywords

Injection drug user; female sex worker; social environment; condom; China; HIV/STI

1. Introduction

The number of people living with HIV and AIDS (PLWHA) in China was estimated to be 740,000 at the end of 2009 (1). Among all newly reported HIV cases, 42.2% and 24.3% could be attributed to heterosexual transmission and injection drug use, respectively (1). Females involved in both injection drug use and sex work (FSW-IDU) constitute an important bridge population, connecting the high-HIV prevalence injection drug use (IDU) population (HIV prevalence in this group ranges from 17.8% to 71.9% in China) with the low-HIV prevalence clients of female sex workers (FSW) population (HIV prevalence in this group ranges from 0% to 0.5% in China) (2,3). FSW-IDU have a higher prevalence of HIV, sexually transmitted infections (STI), and related risk behaviors compared to FSW

Corresponding author: J. Gu, 309, School of Public Health, Sun Yat-Sen University, No. 74, Zhongshan Road II, Guangzhou, China (510080). Tel: +86-20-87335413, Fax: +86-20-87330446, gujing5@mail.sysu.edu.cn.

Conflict of interests: There is no conflict of interests of all authors.

who do not inject drugs and female IDU who do not sell sex (4,5). As suggested by many researchers, the overlap between injection drug use and commercial sex behavior is an important driver of China's HIV epidemic (6).

Many studies have investigated factors associated with condom use among FSW. Such factors include age, education level, ethnicity/religion, HIV/condom-related cognitions, and mental health status, among others (7-9). Although several studies have focused on FSW, relatively little is known about FSW-IDU. Some studies suggest that high levels of drug use and fear of withdrawal symptoms may cause FSW-IDU to engage in unprotected sex (10,11). In prior work with this population in China, severity of drug dependence, economic pressure and psychological factors, such as depression, were significantly associated with unprotected commercial sex (12,13).

Most studies investigating condom use among female injection drug users who engaged in commercial sex focused on factors at the individual level (12,14); however, individual-level factors only partially explain sexual risk behaviors (15). According to Rhodes and colleagues, HIV-related risk behaviors are shaped by risk environments, the framework of which comprises risk factors exogenous to the individual, and the interactions between two key dimensions – type (physical, social, economic and policy) and level (micro and macro) (15-17). In Strathdee's study in the Mexico-U.S. border region, the risk environment framework successfully explained FSW-IDU's HIV infection (18).

Condom use behaviors are contextually and environmentally dependent (17,18). Factors related to the risk environments such as utilization of health-related services, social support, workplace venue, availability of condoms, and violence, have all been found to be associated with condom use during commercial sex (19-21). Compared to other FSW, those who inject drugs may find it even more difficult to use condoms consistently during commercial sex, as their drug dependence and need to buy drugs may compromise their ability to negotiate for safer sex (22). Furthermore, injection drug use and sex work are both hidden and stigmatized activities, and are both illegal in China. Those who engage in these activities are marginalized for their deviant behaviors, and blamed for spreading HIV/STI to others (23). In particular, drug-using sex workers in China live at the lowest social stratum, experiencing negativity in family, work, and health care contexts. These environmental factors may be associated with inconsistent condom use during commercial sex (24), but such associations have not been studied among FSW-IDU in China.

In the present study, we investigated the physical, social, economic and policy environments, at the micro- and macro-level, of FSW-IDU in Liuzhou, China to identify correlates of consistent condom use during commercial sex. Measurements of environmental factors, including those related to service utilization, social support, violence experienced, perceived social stigma, condom availability and sex work environment were selected or developed for this study using a literature search (10,12,13,18,25). The findings of this study will contribute to our understanding of FSW-IDU and pave the way for developing targeted interventions among this vulnerable population.

2. Methods

2.1 Study site and study population recruitment

A cross-sectional survey was conducted among female injection drug users who engage in commercial sex in Liuzhou, a city in Guangxi Zhuang Autonomous Region (Guangxi), China. Greater Liuzhou has a population of 3.6 million, including four urban districts and six counties. It is a transportation hub linking China's border provinces with Southeast Asia, and has the highest number of registered drug users (about 10,000) and reported HIV/AIDS

cases (3,084 in 2009) in Guangxi. The HIV prevalence among IDU and FSW was 21% and 2.3%, respectively, in 2008 (26,27).

Inclusion criteria for the survey was being at least 18 years old, addicted to heroin, self-report of at least one instance of injecting drugs in the last six months, self-report of at least one instance of trading sex for money or drugs in the last six months, and informed consent to participate in the study. Women who had withdrawal symptoms during the interview process were excluded. We achieved our target sample size of 200, in order to confine the maximum width of the 95% confidence interval of prevalence estimates to be +/− 6% (PASS 2000).

As there is no known sampling frame of this population, snowball sampling was used to recruit prospective respondents. Participants were recruited from two of the five local syringe exchange programs (SEP), which are run by Liuzhou Center for Disease Prevention and Control. Each SEP had 5 to 10 peer workers, exchanging syringes for 150 to 250 IDU, among whom about 25% were female. The peer workers were informed about the study background, requirements for participation and the voluntary nature of participation. The peer workers identified potential participants from SEP users and invited them to participate in the study. All participants were requested to invite other drug injecting FSW to join the study. The eligibility of all participants was confirmed by the interviewers (trained SEP doctors) before each interview.

As drug use and sex work are both illegal in China, participants were not required to give written consent. Instead, the interviewers signed a form pledging that verbal informed consent was obtained from the participants before the interview commenced. A reimbursement fee of RMB 50 (about 8 USD) was given to the participants as compensation for their time. The study was reviewed and approved by the Institutional Review Board of Renmin University of China.

2.2 Data collection

Participants were interviewed by trained doctors from the SEP center. Anonymous face-to-face interviews were administered using a structured questionnaire in the consultation room of the SEP center, where privacy and safety was ensured. The response rate was 90% (number of participants who finished the interview / number of eligible FSW-IDU approached). Twelve left the SEP center without completing the questionnaire; nine did not finish the interview because they refused to answer some of the questions. Throughout the recruitment process, no personal identification was collected or retained.

2.3 Measures

Background characteristics and condom use—Information about socio-demographic characteristics, participants' lifetime individual risk behaviors (age at first drug use and sex work, duration of drug use and sex work) was collected. A question was asked to record condom use during commercial sex: ‘Did you use condoms with clients in the last six months?’ The answers included “used all the time”, “used more than half of the time”, “used about half of the time”, “used less than half of the time” and “not used at all”. Those who used condoms all the time with clients were regarded as consistent condom users (12,23).

Risk environments—According to Rhodes' risk environment framework (15,16), we measured FSW-IDU's condom use-related physical, social, economic and policy environments at the micro- and macro-level. Factors of the micro-physical environment included average number of daily drug injections and sexual transactions, history of

incarceration, main venue of soliciting (streets/parks, inns/hostels, salons/massage parlors or hotels/night clubs) (12), pattern of sex-work organization (non-organized, organized or both), and experience of violence. Here violence was defined as verbal abuse (being abused, belittled or humiliated), physical abuse (being beaten, pushed or kicked) or threats (being warned of harm) (28) from clients, mommies/gatekeepers (people who organized or managed the sex work establishment) and regular sex partners in the last six months.

Factors of the micro-social environment included perceived social support and condom norms in the sex-work environment. We used a four-item Social Support Scale, which was validated in our previous study on FSW-IDU (13), to assess the level of perceived physical and psycho-social support obtained from participants' family members and friends. The four items were: ‘How much physical help could you obtain from your family members when you have difficulties in life’, ‘How much psychological support could you obtain from your family members when you want to speak your heart out’; two other similar questions were asked about the same types of support received from the participants' friends. Each item was rated on a 1 (‘no support at all’) to 4 (‘a great deal of support’) scale. A summary scale was formed, with a higher total score indicating a higher level of perceived social support. A factor analysis identified (Cronbach's alpha = 0.75) only one factor (60.1% of total variance explained). Condom norms in the sex-work environment were measured by three items: “Whether mommies/gatekeepers supported condom use with clients”, “Whether most FSW in the venue use condoms consistently” and “Whether most clients visiting the venue were willing to use condoms” Dichotomous answers were used. For those who had no mommies/gatekeepers or had no other FSW in the same venue, we asked about hypothetical situations.

At the macro-social level, participants were measured for their Perceived Social Stigma. The 6-item scale was constructed by the authors according to qualitative interviews conducted with 20 FSW-IDU before the survey and a literature review of related studies, with emphasis on the findings of Hong and colleagues in their study of FSW and their perceived stigma that was also conducted in Liuzhou (29). The six items were: 1) “do you agree that people in the society look down upon you”; 2) “do you agree that your family looks down upon you”; 3) “do you agree that people in the society are prejudiced against you”; 4) “do you agree that people in the society are unfair to you”; 5) “do you agree that people in the society distrust you” and 6) “do you agree that you are stigmatized by the society”. Answers (1=completely disagree, 4=completely agree) of all items were summed; higher scores on the scale indicated higher levels of perceived social stigma. In the study, a single factor was identified (64.6% of total variance explained; Cronbach's alpha = 0.79).

Factors of the micro-economic environment included participants' monthly income, price for a commercial sex transaction, and score of Perceived Economic Pressure. Perceived Economic Pressure was assessed from six items (i.e., economic pressure due to being in debt, due to the need to support one's drug use, due to the need to support one's daily life, due to the need to support a partner's drug use, due to the need to support other family members' lives, and the overall evaluation of economic pressure). The scale was validated in our previous study on FSW-IDU (13). Response categories ranged from 0 to 3 (no, little, some and great pressure). An overall scale was formed by summing up the scores of the six items (Cronbach's Alpha = 0.78; the only one factor explained 50.1% of the total variance in this study).

Factors of the micro-policy environment consisted of condom availability in the venue, lifetime utilization and need of the following services: medical insurance, subsistence allowances, STI diagnosis and treatment, free condoms, methadone maintenance treatment (MMT), SEP and HIV voluntary counseling and testing (VCT). Dichotomous answers were used for all questions.

2.4 Data analyses

First, using logistic models, univariate odds ratios and 95% confidence intervals regarding the associations between background variables and the outcome variable (consistent condom use during commercial sex in the last six months) were reported. Next, to investigate associations between the environmental variables and consistent condom use, univariate logistic regression models and logistic regression models adjusting for significant background variables identified in the first step were fit for each variable. A final stepwise (forward) logistic regression model, adjusting for significant background variables and using all environmental variables that were significant in the adjusted analyses as candidates for selection, was also fit to provide an overall summary of the independent associations. SPSS for Windows version 17.0 was used for data analyses and $p<0.05$ was considered statistically significant.

3. Results

3.1 Background characteristics

The background characteristics of the 200 participants are summarized in Table 1. The average age of the participants was 33.9±5.3 years; about 76% had attained junior high or lower education. Most of the participants (86.5%) were local residents of Liuzhou and 19% were of a minority ethnicity. About 70% of the participants started drug use and sex work when they were no more than 25 years old; most of them had used drugs (69.5%) and traded sex (78.8%) for more than 10 years (Table 1).

3.2 Risk environment characteristics

Micro-physical Fifteen percent injected drugs more than three times a day; 31% had served more than seven sex-work clients in the last week; 88.3% had ever been incarcerated (Table 2). Fourteen percent of the participants were working at lower-end locations, such as working on the street or in the park; 28.1% were working as freelance sex workers. The prevalence of having experienced violence from their clients, mommies/gatekeepers and regular partners in the last six months was 46.2%, 30.2% and 39.5%, respectively; overall, 56.9% experienced violence from at least one source (Table 2).

Micro-social The average score of the Social Support Scale was 9.3±2.5. In the last six months, respectively 51.5% and 54.5% of the participants received no/little functional and psychological support from their family members, while respectively 67.5% and 71.5% received no/little functional and psychological support from their friends (data not shown). Less than half (44.9%) of the participants perceived that their mommies/gatekeeper would support condom use with their clients; 85.6% perceived that most FSW in their venues were using condoms consistently during commercial sex, and 70.3% reported that most of their clients were willing to use condoms (Table 2).

Macro-social The average score of the Perceived Social Stigma Scale was 17.1±2.6. The prevalence of responses indicating the presence of stigma for the six individual items (completely agree/agree) ranged from 54.0 to 89.0%; the prevalence of responses indicating complete agreement with the presence of the studied stigma items ranged from 7.0 to 21.0 % (data not shown).

Micro-economic Over 70% of the participants had monthly income of no more than 1000 RMB (156 USD); 67% charged less than 100 RMB (16 USD) for a commercial sex transaction. The average score of the Perceived Economic Pressure Scale was 7.8±3.9. Of all participants, 68.9% perceived that, in general, there was substantial (some or great) economic pressure. Respectively, 58.4%, 49.5% and 37.6% of the participants perceived

high economic pressure due to their drug use, the need to support their daily life or being in debt, while 19.7% and 25.4% thought that such economic pressure was a result of supporting their regular partner and other family members (data not shown).

Micro-policy Condoms were available at 42.9% of the places where sex was traded. Only 22.4% and 26.3% of the participants ever had medical insurance or subsistence allowances respectively, while the need for such services was 87.8% and 94.5%. Regarding HIV-related services, the prevalence of exposure was relatively high for some services (distribution of free condoms: 65.1%; SEP: 71.4%; VCT: 65.1%) but was lower for other services (STI-related service: 20.7%; MMT: 36.1%). The majority of the participants also stated that they needed aforementioned HIV/STI-related services (78.0 to 91.4%).

3.3 Prevalence of condom use during commercial sex and associated background factors

Of all participants, only 41% had used condoms consistently during commercial sex in the last six months. The results of the univariate analysis showed that FSW-IDU who were older than 30 years old (OR=2.58, 95% CI: 1.41 to 4.69, $p<0.05$) or had a duration of sex work for more than 10 years (OR=2.07 95% CI: 1.01 to 4.35, $p<0.05$) were more likely to use condoms consistently.

3.4 Associations between environmental characteristics and consistent condom use during commercial sex in the last six months

Environmental variables significantly associated with consistent condom use during commercial sex in the last six months are shown in Table 2. After adjusting for significant background variables (age and duration of sex work), all studied types of risk environments, except for macro-social environment (i.e., score of Perceived Social Stigma), were significantly associated with the outcome. At the micro-physical level, FSW-IDU who worked at salon/massage parlors (as compared to soliciting on streets or in parks, AOR=3.63, $p<0.05$) or had sex work organized by mommies/gatekeepers (as compared to non-organized sex-work) (AOR=3.22, $p<0.05$) were more likely to use condoms consistently with clients. Those who had experienced violence from clients (AOR=0.41, $p<0.01$), from mommies/gatekeepers (AOR= 0.46, $p<0.05$), from regular partners (AOR=0.41, $p<0.05$), or had experienced at least one type of violence (AOR=0.36, $p<0.01$) were less likely to use condoms with clients in the last six months.

At the micro-social level, all studied variables (i.e., score of Social Support and condom norms in the sex-work environment) were significant in the adjusted analyses (AOR=1.14 and 1.90 to 4.90, $p<0.05$). At the micro-economic level, higher monthly income was associated with consistent condom use with clients (AOR=2.19, $p<0.05$). In terms of participants' micro-policy environment, utilization of MMT and VCT was significantly associated with consistent condom use with clients (AOR=1.82 and 1.91, $p<0.05$). Participants who had ever used any HIV/STI-related services were more likely to be consistent condom users during commercial sex (AOR=2.29, $p<0.05$).

The final multivariate stepwise logistic regression model (Table 2) indicated that two micro-social environmental variables (i.e., score of Social Support (OR=1.27, $p<0.05$) and agreement that most clients visiting the venue were willing to use condoms (OR= 2.63, $p<0.05$)), as well as one micro-policy environmental variable (i.e., had ever used at least one HIV/STI-related service (OR=2.18, $p<0.05$)), were significantly associated with a higher likelihood of consistent condom use during commercial sex. The micro-physical environmental variable, i.e., having experienced violence from at least one source (clients, mommies/ gatekeepers, or regular partners), was associated with a lower likelihood of consistent condom use during commercial sex (OR=0.39, $p<0.01$).

4. Discussion

The study uncovered two important findings. First, female injection drug users who engage in commercial sex were confronted with different types and levels of negative social environments both in their daily lives and in sex work. They faced limited access to social services, lacked social support, and experienced stigma and violence from different sources. Second, some environmental factors were significantly associated with sexual risk behaviors during commercial sex. The findings confirmed that improving social support might be useful in HIV prevention services targeting this population.

Most women in this study articulated a need for health insurance, subsistence allowances and employment-related services, but their access to these services was quite low. Health insurance is mandatory in the registered formal work sector; unemployment, therefore, means deprivation of insurance as most of these women would find self-paid insurance unaffordable (30). Hence they have to pay for health services themselves. This partially explains their failure to access medical services for STI care (31). Over 90% of the sampled FSW-IDU indicated that they need subsistence allowances (also known as monthly minimum living allowances), which is provided by the government to those with monthly incomes below a threshold, but less than 10% had it. The reasons may lie in their ineligibility, as drug users are ineligible for subsistence allowances (32,33), and their fears of social stigma that may be encountered during the application process. One conclusion from this survey is a need for prioritizing this population for receiving social services to improve their access to care and overall living conditions.

In this study, use of VCT and MMT (65.1% and 36.1% perceptively) was significantly associated with condom use during commercial sex. VCT is an effective means of both detecting HIV cases and reducing HIV-related risk behaviors (34). VCT should be promoted further among this population, especially for those who are older and who have more clients per day, as these FSW are more likely to be infected with HIV but are less likely to test for HIV (35). Though there is no consensus on the effectiveness of MMT in promoting protective sexual behaviors among IDU (36), it is possible that MMT can reduce the heroin dependence in this population, which may, in turn, increase their control over condom use in commercial sex. This is consistent with the findings of our previous study in which the severity of drug dependence was significantly associated with inconsistent condom use among female injection drug users who engage in commercial sex (12). Since only 36.1% of participants used MMT in this study, there is room for MMT promotion.

Our study participants received little social support and were subject to significant levels of physical and emotional abuse. The lack of support from their families might result from their illegal drug use, while the lack of support from peers might lie in the lack of trust among IDU and competitive relationships with other FSW for clients. Lacking social support may increase social isolation and, hence, aggravate one's psychological problems, as well as reduce motivation to insist on adapting protective behaviors, such as condom use, during commercial sex (37,38). Social support is a key construct of some theoretical models that explain successful condom use (39). Interventions targeting this population should take into consideration improving family acceptance, strengthening ties with drug-free networks and building trustful and supportive relationships with peers (40,41).

Overall, 57% of the participants reported some kind of violence in the last six months. Our findings also support international literature that has documented significant relationships between violence and sexual risk behaviors among vulnerable women who are injection drug users, sex workers, or both (18,42). Similar findings were documented in other studies in China. In a study in Sichuan Province, 68% of FSW experienced client-perpetrated

violence in the last year (43). In another study, also conducted in Guangxi province, 58% of FSW experienced violence from their stable partners and 45% from their clients (44).Violence reduces the victims' capacity to control their working conditions and lessens their power for negotiating condom use, resulting in more unwanted sex and less condom use (45-47).

Violence prevention and coping strategies should be designed and integrated into current interventions. However, such interventions are mostly non-existent in China. Violence prevention interventions can take into account, while not being limited to, the following conditions. First, trainings on self-esteem, gender equality and negotiation skills in their relationships (e.g., with gatekeepers, clients and regular partners) can empower FSW when facing unequal power dynamics (42,48). Second, trainings for identifying risk situations would protect vulnerable women from potential violence (45) while trainings on coping strategies when experiencing violence can help them escape risks or reduce harm. Third, the interventions should be designed according to the source of the violence, as the reasons for violence and coping strategies vary according to whether the violence is caused by gatekeepers, clients or regular partners. Fourth, supportive working environments and social norms of gender equality can prevent violence, hence structural interventions (such as community organizing and advocacy) are also important in violence prevention (49). Fifth, as drug dependence weakens FSW-IDU in their relationships with gatekeepers or clients, the coverage of drug treatment services should be further increased for FSW-IDU (12).

Empirical research among FSW has addressed the importance of sex work environments in condom use promotion (50). Similar to prior studies, the study participants who worked at lower-end locations, like parks or the street, had the lowest condom use rate with clients (28). From our previous studies on FSW-IDU, these FSW appear to be the most marginalized – they were older in age, had more clients but less income per day, and had the least access to HIV prevention resources (12,13). According to our observations during this study, most of the outreach interventions in Liuzhou were conducted in institution-based venues. FSW working on streets or in parks are less accessible by outreach workers, especially when drug use is also involved; at the same time, outreach activities are failing to target them. Our findings suggest that intervention programs should be expanded and service information should be disseminated to cover the most hard-to-reach settings.

Mommies/gatekeepers', clients' and other FSW's positive condom norms were significant predictors of protective sex with clients in the adjusted analyses, suggesting that supportive sex work environments, in general, is a necessary component, along with interventions to strengthen individual cognitions (e.g., knowledge, attitudes, self-efficacy), in condom promotion. Such findings are consistent with those of a study conducted in Liuzhou that investigated the associations between environmental support (managers', peers' and clients' support of condom use and condom availability) and HIV-related behaviors (51). In addition, as shown in the multivariate analyses, clients' norms for condom use – rather than mommies'/gatekeepers' or other FSW norms –were independently associated with condom use. Dependence on drug use and urgent needs for money to buy drugs might augment unequal relationships between these women and their clients in sex-related conversations; hence, condom use may rely more on the clients' decisions.

The study has some limitations. First, according to the number of registered drug users and the personal communication with local outreach workers, there are several thousand FSW-IDU in Liuzhou. As there is no sampling framework of this population, we used a snowball sampling method to recruit participants at one syringe exchange program location. It is impossible to know the extent of bias that this introduces into our study findings, or whether our respondents represent individuals (particularly drug users) who do not attend this

program, but it is possible that those not included may have even lower accesses to services and higher prevalence of perceived social stigma. However, confidence in our findings is strengthened by the large number of participants and the diversity across the 200 individuals in key demographic and behavioral characteristics, as well as in type and price of reported sex work. Second, those who had withdrawal symptoms were excluded for the study sample, hence the study might underestimate severely drug-dependent women. Third, the data relied on self-report. Although confidentiality was guaranteed, reporting bias due to social desirability may still exist. Fourth, we did not include a comparison group of non-FSW-IDU or non-IDU FSW, hence the differences in environmental characteristics between the women who are both injection drug users and FSW and the other two populations are unknown. Fifth, some participants were asked about hypothetical situations if the question was not applicable to them (e.g., those working on streets being asked about mommies/gatekeepers), and thus comparability across responses is less reliable. Sixth, we did not assess sexual violence and violence perpetrated by police or service providers. The violence measured may have under-estimated the extent of violence the sample experienced. Finally, the study was cross-sectional so causal relationships could not be tested.

Despite these limitations, understanding this population from the structural environmental level is critical for addressing its potential bridging effect in HIV transmission. Greater challenges may lie in the development and implementation of targeted services. These problems require multidimensional, integrative and interdisciplinary approaches involving public health workers, social scientists, and epidemiologists in order to design theory-based and needs satisfied interventions for FSW-IDU. Capacity building for intervention implementers should also be addressed. Though China is at an early stage in interdisciplinary research, the development of such research will benefit FSW-IDU well as other vulnerable HIV-risk populations.

Acknowledgments

This study is supported by the *Partnership for Social Science Research on HIV/AIDS in China* (NIH Grant # R24 HD056670), the *UNC Center for AIDS Research* (NIH Grant # P30 AI50410) and the *Fundamental Research Funds for the Central Universities* (2009158). The authors would like to thank Dr. Gail Henderson, Ms. Laurie Abler and Ms. Malena Rousseau for their inputs in manuscript revision. The authors would also thank all doctors of the Syringe Exchange Centers of Liuzhou CDC. We extend thanks to all participants of the study.

References

1. China Ministry of Health, UNAIDS, WHO. 2009 Estimate for the HIV/AIDS Epidemic in China. Beijing: China Ministry of Health; 2010.
2. Yin L, Qin G, Qian HZ, et al. Continued spread of HIV among injecting drug users in southern Sichuan Province, China. Harm Reduction Journal. 2007; 4:6. [PubMed: 17286871]
3. Zhang C, Yang R, Xia X, et al. High prevalence of HIV-1 and hepatitis C virus coinfection among injection drug users in the southeastern region of Yunnan, China. J Acquir Immune Defic Syndr. 2002; 29(2):191–6. [PubMed: 11832691]
4. Strathdee SA, Philbin MM, Semple SJ, et al. Correlates of injection drug use among female sex workers in two Mexico-U.S. border cities. Drug Alcohol Depend. 2008; 92(1-3):132–140. [PubMed: 17714888]
5. Paone D, Cooper H, Alperen J, et al. HIV risk behaviours of current sex workers attending syringe exchange: the experiences of women in five US cities. AIDS Care. 1999; 11(3):269–280. [PubMed: 10474627]
6. UNAIDS, WHO. AIDS epidemic update. Geneva: UNAIDS and WHO; p. 2006
7. Alegria M, Vera M, Freeman DH Jr, Robles R, Santos MC, Rivera CL. HIV infection, risk behaviors, and depressive symptoms among Puerto Rican sex workers. Am J Public Health. 1994; 84(12):2000–2002. [PubMed: 7998647]

8. Markosyan KM, Babikian T, DiClemente RJ, et al. Correlates of HIV risk and preventive behaviors in Armenian female sex workers. AIDS Behav. 2007; 11(2):325–334. [PubMed: 16823626]
9. Hong Y, Li X, Fang X, et al. Depressive symptoms and condom use with clients among female sex workers in China. Sex Health. 2007; 4(2):99–104. [PubMed: 17524287]
10. Weeks MR, Grier M, Romero-Daza N, Puglisi-Vasquez MJ, Singer M. Streets, drugs, and the economy of sex in the age of AIDS. Women Health. 1998; 27(1-2):205–229. [PubMed: 9640643]
11. Battjes, Robert J.; Sloboda, Zili; Grace, WC. The Context of HIV Risk Among Drug Users and Their Sexual Partners. Rockville: National Institute on Drug Abuse; 1994.
12. Gu J, Chen H, Chen X, et al. Severity of drug dependence, economic pressure and HIV-related risk behaviors among non-institutionalized female injecting drug users who are also sex workers in China. Drug Alcohol Depend. 2008; 97(3):257–267. [PubMed: 18482804]
13. Gu J, Lau JT, Chen H, Chen X, Liu C, Liu J. Mental health and interpersonal factors associated with HIV-related risk behaviors among non-institutionalized female injection drug users who are also sex workers in China. Women Health. 2010; 50(1):20–36. [PubMed: 20349393]
14. Gu J, Lau JTF, Chen X, et al. Using the Theory of Planned Behavior to investigate condom use behaviors among female injecting drug users who are also sex workers in China. AIDS Care. 2009; 21(8):967–975. [PubMed: 20024752]
15. 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. [PubMed: 15955404]
16. Rhodes T. Risk environments and drug harms: a social science for harm reduction approach. Int J Drug Policy. 2009; 20(3):193–201. [PubMed: 19147339]
17. Rhodes T, Stimson GV, Quirk A. Sex, drugs, intervention, and research: from the individual to the social. Subst Use Misuse. 1996; 31(3):375–407. [PubMed: 8834267]
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):e19048. [PubMed: 21541349]
19. Ford K, Wirawan DN, Fajans P, Meliawan P, MacDonald K, Thorpe L. Behavioral interventions for reduction of sexually transmitted disease/HIV transmission among female commercial sex workers and clients in Bali, Indonesia. AIDS. 1996; 10(2):213–222. [PubMed: 8838711]
20. Morisky DE, Pena M, Tiglao TV, Liu KY. The impact of the work environment on condom use among female bar workers in the Philippines. Health Educ Behav. 2002; 29(4):461–472. [PubMed: 12137239]
21. Sedyaningsih-Mamahit ER. Clients and brothel managers in Kramat Tunggak, Jakarta, Indonesia: interweaving qualitative with quantitative studies for planning STD/AIDS prevention programs. Southeast Asian J Trop Med Public Health. 1997; 28(3):513–524. [PubMed: 9561601]
22. Sherman SG, German D, Cheng Y, et al. The evaluation of the JEWEL project: an innovative economic enhancement and HIV prevention intervention study targeting drug using women involved in prostitution. AIDS Care. 2006; 18(1):1–11. [PubMed: 16282070]
23. Gu J, Wang R, Chen H, et al. Prevalence of needle sharing, commercial sex behaviors and associated factors in Chinese male and female injecting drug user populations. AIDS Care. 2009; 21(1):31–41. [PubMed: 19085218]
24. Ao T, Sam N, Manongi R, Seage G, Kapiga S. Social and behavioural determinants of consistent condom use among hotel and bar workers in Northern Tanzania. Int J STD AIDS. 2003; 14(10): 688–696. [PubMed: 14596773]
25. Ford K, Wirawan DN, Fajans P. Factors related to condom use among four groups of female sex workers in Bali, Indonesia. AIDS Educ Prev. 1998; 10(1):34–45. [PubMed: 9505097]
26. Lu F, Jia Y, Sun X, et al. Prevalence of HIV infection and predictors for syphilis infection among female sex workers in southern China. Southeast Asian J Trop Med Public Health. 2009; 40(2): 263–272. [PubMed: 19323011]
27. Tan Y, Wei QH, Chen LJ, et al. Molecular epidemiology of HCV monoinfection and HIV/HCV coinfection in injection drug users in Liuzhou, Southern China. PLoS One. 2008; 3(10):e3608. [PubMed: 18974888]

28. Yi H, Mantell JE, Wu R, Lu Z, Zeng J, Wan Y. A profile of HIV risk factors in the context of sex work environments among migrant female sex workers in Beijing, China. Psychol Health Med. 2010; 15(2):172–187. [PubMed: 20391235]
29. Hong Y, Fang X, Li X, Liu Y, Li M, Tai-Seale T. Self-perceived stigma, depressive symptoms, and suicidal behaviors among female sex workers in China. J Transcult Nurs. 2010; 21(1):29–34. [PubMed: 19820172]
30. Dumoulin-Smith, A. [Accessed on Oct 1, 2011] Social Health Insurance in China: An Example of Nascent Social Security in China. 2009. Available at: http://inequality.cornell.edu/people/PapersAbstracts/Dumoulin%20Smith_paper.pdf
31. Zhao P, Yu H. Study on sexual and drug use behaviors of high risk among sex workers in entertainment in establishments in Shanghai. Zhonghua Liu Xing Bing Xue Za Zhi (in Chinese). 2001; 22(5):341–343.
32. Tang YL, Zhao D, Zhao C, Cubells JF. Opiate addiction in China: current situation and treatments. Addiction. 2006; 101(5):657–665. [PubMed: 16669899]
33. Liu H, Grusky O, Zhu Y, et al. Do drug users in China who frequently receive detoxification treatment change their risky drug use practices and sexual behavior? Drug Alcohol Depend. 2006; 84(1):114–121. [PubMed: 16443333]
34. Lau JT, Tsui HY, Cheng S, Pang M. A randomized controlled trial to evaluate the relative efficacy of adding voluntary counseling and testing (VCT) to information dissemination in reducing HIV-related risk behaviors among Hong Kong male cross-border truck drivers. AIDS Care. 2010; 22(1):17–28. [PubMed: 20390477]
35. Xu J, Brown K, Ding G, et al. Factors associated with HIV testing history and HIV-test result follow-up among female sex workers in two cities in Yunnan, China. Sex Transm Dis. 2011; 38(2):89–95. [PubMed: 20838364]
36. Gowing L, Farrell M, Bornemann R, Ali R. Substitution treatment of injecting opioid users for prevention of HIV infection. Cochrane Database of Systematic Reviews. 2007; 4
37. Logan TK, Cole J, Leukefeld C, Logan TK, Cole J, Leukefeld C. Women, sex, and HIV: social and contextual factors, meta-analysis of published interventions, and implications for practice and research. Psychol Bull. 2002; 128(6):851–885. [PubMed: 12405135]
38. Gaede BM, Majeke SJ, Modeste RR, et al. Social support and health behaviour in women living with HIV in KwaZulu-Natal. SAHARA J. 2006; 3(1):362–368. [PubMed: 17601018]
39. Becker MH, Joseph JG. AIDS and behavioral change to reduce risk: a review. Am J Public Health. 1988; 78(4):394–410. [PubMed: 3279837]
40. El-Bassel N, Ivanoff A, Schilling RF, Gilbert L, et al. Preventing HIV/AIDS in drug-abusing incarcerated women through skills building and social support enhancement: Preliminary outcomes. Soc Work Res. 1995; 19(3):131–141. [PubMed: 10172402]
41. El-Bassel N, Ivanoff A, Schilling RF, Borne D, Gilbert L. Skills building and social support enhancement to reduce HIV risk among women in jail. Crim Justice Behav. 1997; 24(2):205–223.
42. Shannon K, Csete J. Violence, condom negotiation, and HIV/STI risk among sex workers. JAMA. 2011; 304(5):573–574. [PubMed: 20682941]
43. Choi SY, Chen KL, Jiang ZQ. Client-perpetuated violence and condom failure among female sex workers in southwestern China. Sex Transm Dis. 2008; 35(2):141–146. [PubMed: 17921913]
44. Zhang C, Li X, Hong Y, Chen Y, Liu W, Zhou Y. Partner Violence and HIV Risk Among Female Sex Workers in China. AIDS Behav. 2012; 16(4):1020–30. [PubMed: 21598033]
45. El-Bassel N, Witte SS, Wada T, Gilbert L, Wallace J. Correlates of partner violence among female street-based sex workers: substance abuse, history of childhood abuse, and HIV risks. AIDS Patient Care STDS. 2001; 15(1):41–51. [PubMed: 11177587]
46. Wechsberg WM, Luseno WK, Lam WK, Parry CD, Morojele NK. Substance use, sexual risk, and violence: HIV prevention intervention with sex workers in Pretoria. AIDS Behav. 2006; 10(2): 131–137. [PubMed: 16482408]
47. Pettifor AE, Measham DM, Rees HV, Padian NS. Sexual power and HIV risk, South Africa. Emerg Infect Dis. 2004; 10(11):1996–2004. [PubMed: 15550214]

48. Choi SY, Holroyd E. The influence of power, poverty and agency in the negotiation of condom use for female sex workers in mainland China. Cult Health Sex. 2007; 9(5):489–503. [PubMed: 17687674]

49. Reza-Paul S, Lorway R, O'Brien N, et al. Sex worker-led structural interventions in India: A case study on addressing violence in HIV prevention through the Ashodaya Samithi collective in Mysore. Indian J Med Res. 2012; 135(1):98–106. [PubMed: 22382190]

50. Hong Y, Li X. Behavioral studies of female sex workers in China: a literature review and recommendation for future research. AIDS Behav. 2008; 12(4):623–636. [PubMed: 17694431]

51. Hong Y, Fang X, Li X, Liu Y, Li M. Environmental support and HIV prevention behaviors among female sex workers in China. Sex Transm Dis. 2008; 35(7):662–667. [PubMed: 18418288]

Table 1

Background characteristics of FSW-IDU and associations with consistent condom use during commerical sex in the last six months

	Total (n=200)		Consistent condom use during commercial sex in the last six months		
	n	*%*	Row %	OR_u (95%CI)	*P*
Socio-demographic status					
Age (ranging from 22 to 55)					
≤30	82	41.0	28.1	1.00	
>30	118	59.0	50.1	**2.58 (1.41,4.69)**	**0.01**
Current marital status					
Single	72	36.0	38.9	1.00	
Married/ cohabiting	93	46.5	44.1	1.24 (0.66,2.32)	0.50
Other	35	17.5	37.1	0.93 (0.40,2.14)	0.86
Ethnicity					
Han	162	81.0	40.7	1.00	
Other	38	19.0	42.1	1.06 (0.52,2.17)	0.87
Local resident (Liuzhou or not)					
Yes	173	86.5	41.6	1.00	
No	27	13.5	37.0	0.83 (0.36,1.91)	0.65
Education level					
Primary or below	27	13.6	33.3	1.00	0.25
Junior high	125	62.8	39.2	1.29 (0.54,3.10)	0.57
Senior high or above	47	23.6	51.1	2.09 (0.78,5.58)	0.14
Lifetime individual risk behaviors					
Age at first drug use (ranging from 13 to 40)					
≤25	135	67.5	42.2	1.00	
>25	65	32.5	38.5	0.86 (0.47,1.57)	0.61
Duration of drug use					
≤10 years	61	30.5	37.7	1.00	
>10 years	139	69.5	42.4	1.22 (0.66,2.26)	0.53
Age at first sex work (ranging from 14 to 44)					
≤25	144	72.7	41.7	1.00	

	Total (n=200)		Consistent condom use during commercial sex in the last six months		
	n	***%***	**Row %**	**OR_u (95%CI)**	***P***
>25	54	27.3	40.7	0.96 (0.51,1.82)	0.90
Duration of sex work					
≤10 years	42	21.2	27.8	1.00	
>10 years	156	78.8	44.4	**2.07 (1.01,4.35)**	**0.04**

OR_u: Odds ratios of univariate analyses.

Significant values were in bold.

Table 2

Environmental characteristics and associations with consistent condom use during commercial sex in the last six months (n=200)

	n	%	Consistent condom use during commercial sex in the last six months			
			Row%	OR_u(95%CI)	OR_a(95%CI)	OR_m(95%CI)
Physical Risk Environment						
Micro-physical						
Average number of daily drug injections in the last week						
≤3	170	85.4	43.8	1.00	1.00	--
>3	29	14.6	22.6	**0.37(0.15,0.94)***	0.46(0.18,1.08)	
Number of clients in the last week						
≤7	138	69.0	37.0	1.00	1.00	--
>7	62	31.0	50.0	**1.70(0.93,3.13)***	1.79(0.96,3.34)	
Had ever been incarcerated						
No	23	11.7	30.4	1.00	1.00	--
Yes	174	88.3	42.5	1.69(0.66,4.32)	1.54(0.59,4.02)	
Main venue you soliciting in the last six months						
Streets/parks	27	14.3	25.9	1.00	1.00	N.S.
Inns/hostels	29	15.3	31.0	1.29(0.40,4.13)	1.35(0.41,4.45)	
Salons/massage parlors	64	33.9	54.7	**3.45(1.28,9.29)****	**3.63(1.31,10.04)***	
Hotels/night clubs	69	36.5	35.9	1.84(0.68,4.93)	1.79(0.65,4.93)	
Pattern of sex-work organization						
Not-organized (freelance)	55	28.1	30.9	1.00	1.00	N.S.
Organized by mommies/gatekeepers	48	24.5	58.3	**3.13(1.39,7.04)***	**3.22(1.41,7.39)***	
Combined both of the above	93	47.4	37.6	1.35(0.66,2.74)	1.32(0.64,2.73)	
Experienced violence from clients†						
No	106	53.8	50.9	1.00	1.00	
Yes	91	46.2	29.7	**0.41 (0.23,0.73)****	**0.41(0.23,0.75)****	N.S.
Experienced violence from mommies/ gatekeepers†						
No	127	69.8	46.5	1.00	1.00	N.S.

	n	%	Consistent condom use during commercial sex in the last six months			
			Row%	OR_u(95%CI)	OR_a(95%CI)	OR_m(95%CI)
Yes	55	30.2	29.1	**0.47 (0.24,0.93)***	**0.46(0.23,0.91)***	
Experienced violence from regular partners†						
No	112	60.5	49.1	1.00	1.00	N.S.
Yes	73	39.5	28.8	**0.42 (0.22,0.78)****	**0.41(0.21,0.77)****	
Experienced violence from any of the three types of people†						
No	78	43.1	66.7	1.00	1.00	1.00
Yes	103	56.9	35.9	**0.37(0.20,0.68)*****	**0.36(0.20,0.68)*****	**0.39 (0.12,0.44)****
Social Risk Environment						
Micro-social						
Score of Social Support (ranging from 4 to 16) ‡	9.3	2.5	N.A.	0.99(0.91,1.19)	**1.14(1.01,1.28)***	**1.27(1.07,1.51)****
Mommies/gatekeepers support your condom use with clients§						
No	103	55.1	34.0	1.00	1.00	N.S.
Yes	84	44.9	51.2	**2.04(1.13,3.68)***	**1.90(1.04,3.46)***	
Most FSW in the venue use condoms consistently§						
No	28	14.4	14.3	1.00	1.00	N.S.
Yes	167	85.6	44.9	**4.89(1.63,14.72)***	**4.90(1.62,14.78)***	
Most clients visiting the venue are willing to use condoms						
No	58	29.7	24.1	1.00	1.00	1.00
Yes	137	70.3	48.2	**2.92(1.47,5.82)****	**2.98(1.49,5.97)***	**2.63(1.06,6.54)***
Macro-social						
Score of Perceived Social Stigma ‡	17.1	2.6	N.A.	**0.90(0.66,0.98)***	0.92(0.91,1.16)	--
Economic Risk Environment						
Micro-economic						
Monthly income (ranging from 500 to 6000 RMB)						
≤1000 RMB (156USD)	139	70.6	36.0	1.00	1.00	N.S.
>1000 RMB	58	29.4	53.4	**2.04(1.10,3.80)***	**2.19(1.15,4.17)***	

	n	%	Consistent condom use during commercial sex in the last six months			
			Row%	**OR_u(95%CI)**	**OR_a(95%CI)**	**OR_m(95%CI)**
Price for a commercial sex transaction (ranging from 15 to 500 RMB)						
≤100 RMB (16 USD)	134	67.0	40.3	1.00	1.00	--
>100 RMB	66	33.0	42.4	1.09(0.60,1.98)	1.14(0.62,2.08)	
Score of perceived economic pressure (ranging from 1 to 18) ‡	3.1	1.6	N.A.	0.95(0.86,1.02)	0.94(0.85,1.01)	
Policy Risk Environment						
Micro-policy						
Condom availability in the venue or street						
Yes	82	42.9	46.3	1.55(0.86,2.78)	1.56(0.86,2.83)	
No	109	57.1	35.8	1.00	1.00	--
Ever had medical insurance						
No	152	77.6	40.1	1.00	1.00	--
Yes	44	22.4	45.5	1.24(0.63,2.44)	1.22(0.62,2.41)	
Ever had subsistence allowance						
No	143	73.7	39.9	1.00	1.00	--
Yes	51	26.3	49.0	1.45(0.76,2.76)	1.38(0.72,2.64)	
Ever received STI-related services						
No	149	79.3	43.0	1.00	1.00	--
Yes	39	20.7	41.0	0.92(0.45,1.89)	0.87(0.42,1.80)	
Ever received free condoms						
No	66	34.9	39.0	1.00	1.00	--
Yes	123	65.1	47.0	1.38(0.76,2.54)	0.69(0.37,1.28)	
Ever used methadone maintenance treatment						
No	122	63.9	33.3	1.00	1.00	N. S.
Yes	69	36.1	46.7	**1.76(1.02,3.22)** *	**1.82(1.03,3.53)** *	
Ever used syringe exchange program						
No	55	28.6	34.5	1.00	1.00	--
Yes	137	71.4	45.3	1.56(0.82,3.00)	1.49(0.77,2.88)	
Ever used HIV voluntary counseling and testing						
No	67	34.9	32.8	1.00	1.00	

	n	%	Consistent condom use during commercial sex in the last six months			
			Row%	**OR_u(95%CI)**	**OR_a(95%CI)**	**OR_m(95%CI)**
Yes	125	65.1	47.2	**1.83(0.99,3.40)***	**1.91(1.01,3.35)***	N. S.
Ever used any HIV/STI-related services						
No	17	12.6	25.9	1.00	1.00	1.00
Yes	174	87.4	44.3	**2.27(1.10,5.67)***	**2.29(1.10,5.69)***	**2.18(1.05,5.20)***

†Last six months.

‡Mean and S.D.

§For those who had no mommies/gatekeepers or had no other FSW in the same venue, hypothesized situations were asked

OR_u: Odds ratios of univariate analyses.

OR_a: Adjusted odds ratios, adjusting for background variables (age and duration of sex work) which were significantly associated with consistent condom use in the last six months.

OR_m: Odds ratios of multivariate analysis, in which environmental variables significant in the adjusted analyses were used as candidates for stepwise logistic regressive models, after adjusting for significant background variables.

N.S.: Non-significant. N.A.: Not applicable. --: Non-significant in the adjusted analyses hence not included in the multivariate analysis.

*$p<0.05$;

**$p<0.01$;

***$p<0.001$.

Significant values were in bold.