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RESEARCH ARTICLE

Effects of Socioeconomic Status on Engagement with Community-Based HIV Prevention Services and HIV-Related Behavioral and Health Outcomes among Female Sex Workers in Yunnan Province in Southwest China

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ABSTRACT

Background: This study examined whether the socioeconomic status (SES) of female sex workers (FSWs) was related to their participation in a community-based peer-led HIV intervention program and HIV-related behavioral and health outcomes, using data from a behavioral survey conducted in Yunnan Province in Southwest China. **Methods:** A sample of 348 adult women (ages 18-49) who had exchanged sex for cash in the past month were recruited in Mengzi city, using the time location sampling (TLS) method. Face-to-face interviews were conducted using structured questionnaires. F-ratio test, chi-square analysis and multivariate logistic regression were used to analyze the data. **Results:** The FSWs on average had more than three commercial partners in past week and 88% had used condoms consistently. 57% of FSWs had sex with regular partners in the past month, among whom 70% used condoms consistently. 17% of FSWs had STs in past three months and 55% reported at least one lifetime abortion. Controlling for confounding factors, the odds of CCU with commercial partners in FSWs who received more than 100 RMB from last sex trade were over five times the odds of those who received less payment (OR=5.38, P<0.1). Attending DiC 1-3 times was related to higher odds of CCU with commercial partners, and the association was stronger for better-educated FSWs (OR high education*DiC 1-3 visits = 13.01,

P<0.05; OR DiC 1-3 visits =0.14, P<0.05; OR high education = 0.82, P=0.27 not sig), relative to the less-educated ones. **Conclusion and discussion:** SES had a significant association with the utilization of HIV prevention services and the risk for HIV/STIs in FSWs in Yunnan. Findings highlighted the need to identify more innovative intervention strategies to address the high co-morbidity of sexual and reproductive health problems in FSWs in China, particularly at the lower-end commercial sex settings.

Key words: Female sex workers (FSWs), Time location sampling (TLS), Drop-in-Center (DiC), Peer education, Behavioral change communication (BCC), Interpersonal communication (IPC), HIV counselling and testing (HCT), Sexually transmitted infections (STIs).

摘要：本文运用在云南省蒙自市的女性性工作者（FSWs）人群中所收集的行为跟踪调研数据来研究FSWs的社会经济状况对其参与社区艾滋病预防服务，性行为及其性生殖健康结果之间的关系。本研究采用时间-地点抽样方法，采集样本包括348名在过去一个月曾经以金钱交换过性行为的成年女性(年龄：18-40岁)。数据收集采用结构式问卷和一对一面对面访谈方式。数据分析采用了F-分布检验，卡方分析和二元逻辑回归分析法。研究结果揭示在过去一周蒙自的FSWs平均有三个以上商业性伴，与其持续使用安全套的比率为88%。57%的FSWs在过去一个月中有固定性伴侣，与其持续使用安全套比率为70%。17%的FSWs在过去三个月中有过性病史，55%的FSWs曾经流产至少一次。在控制相关的协变因素后，收入高于100人民币的FSWs在过去一个月和商业性伴持续使用安全套的几率五倍于收入更低的FSWs。参与社区艾滋病干预服务对降低无保护商业性行为的影响在接受中学教育程度或以上的FSWs中效果更显著。FSWs的社会经济状况与其参与防艾项目和感染艾滋病及性病的危险有显著联系。未来的艾滋病项目需要去发掘更创新的干预策略来真正有效地降低FSWs的性生殖健康相关问题,特别是针对社会底层提高低端服务的FSWs。

1 Introduction

Commercial sex work represents a crucial high-risk area for negative sexual and reproductive health outcomes, including human immunodeficiency virus (HIV), other sexually transmitted infections (STIs) and unintended pregnancy (UNAIDS, 2014; Shannon et al., 2015). A global systematic review revealed that the odds of HIV infection in female sex workers (FSWs) were 12 times higher than that in the general female population at reproductive age (Baral et al., 2012). In China, data from the national HIV surveillance system indicate that HIV prevalence rates are generally lower in FSWs (0.36%) relative to other key affected populations, e.g. people who inject drugs (9.08%) and men who have sex with men (5.98%) (Chow et al., 2015). However, much higher HIV rates were reported among FSWs (1.95%) in Yunnan province - the historical HIV epicenter in China.[5] In particular, the prevalence of HIV in FSWs at the China/Vietnam border was 10-20 times the national average, ranging from 3.1% - 7.7% (Reilly et al., 2012; Wang et al., 2012, Wang et al., 2015). Furthermore, high rates of other STIs were documented, with the rates of herpes simplex virus type 2 (HSV-2) ranging from 33.7% to 60.9% Wang et al,, 2012; Wang et al., 2015). The prevalence of HIV (9.2%) and HSV-2 (26.5%) was also high in the male clients of these FSWs (Reilly et al., 2012). In addition, high rates of unintended pregnancy and abortion in FSWs were documented (Reilly et al., 2012). In a study of adolescent FSWs (ages 15-20 years) in Kunming, half of respondents reported one or more lifetime abortions; 27% had never used any type of modern contraception (Lim et al., 2015).

Male and female condoms, if used correctly and consistently, offer effective barrier protection to prevent pregnancy and HIV/STIs. However, levels of consistent condom use (CCU) were low, according to the self-reports of both FSWs (57.8%) and their male clients

(49.2%) at the China/Vietnam border (Reilly et al., 2012). High rates of clients' refusal to use condoms were reported by FSWs (Wang et al., 2009). Less than 10% of FSWs were able to refuse to have sex with clients who insisted on not wearing a condom Chow et al., 2015; Yang and Xia, 2013). The majority of FSWs said that they would accept a client not wearing a condom if they observed that the client was clean (Yang and Xia, 2013).The use of condoms was particularly difficult to negotiate with regular clients or intimate partners, (boyfriends or husbands) (Yang and Xia, 2013).

It has been widely acknowledged that FSWs, particularly those who provide low-end sex services, are at high risk for HIV/STIs themselves, meanwhile, serving as a key "bridge population" for the spread of the infections to the general population (Lau et al., 2009; Wang et al., 2009, Chen et al., 2015). Low-end FSWs may experience more frequent sexual intercourse, have less control over consistent condom use, and report limited knowledge/use of modern contraceptive methods and other sexual and reproductive health (SRH) services (Lau et al. 2009; Chen et al., 2015;). Although socioeconomic status (SES) has been frequently highlighted as a key variable in understanding HIV/STIs risk in FSWs (Fang et al., 2008; Wang et al., 2009; Lau et al. 2009), the magnitude and mechanism of the relationship between SES and risk for HIV/STIs has not been well examined empirically.

With support from the United States Agency for International Development (USAID), in 2005 Population Services International (PSI) began to implement community-based peer-led behavioral change communication (BCC) interventions for HIV prevention targeting FSWs in Mengzi City, located in the Hani and Yi Minorities Prefecture in Yunnan Province in Southwest China. The Sisterhood Health Home (SHH), a drop-in-center (DiC) for FSWs, was launched as a focal site to promote a comprehensive package of HIV prevention services for FSWs. The program reached FSWs through DiC-based activities/services and outreach activities to venues (including KTV bars, beauty parlors, parks and streets) where FSWs and their clients congregated, with interpersonal communication (IPC) and information, education and communication (IEC) materials which focused on increasing knowledge of and positively changing behaviors around HIV/STIs prevention, testing and treatment. The DiC was operated by both peer and non-peer program staff. Services offered at SHH included HIV counselling and testing (HCT), gynecological check-ups, condom provision, peer counseling and psychological support as well as referrals to a range of services provided by the local Center for Disease Control and Prevention (CDC) and maternal and child health hospital, such as confirmatory HIV testing and STIs treatment. Peer educators who shared similar experience, demographic background and SES with the target populations were recruited from local communities to promote HIV prevention activities. Since 2009 the SHH program emphasized targeting low-income and street-based FSWs, as the program was gradually transitioned to the city Public Health Bureau and CDC in March 2012. During the seven-year program cycle, three rounds of behavioral tracking surveys were conducted among FSWs in Mengzi (2005, 2008 and 2010) to collect strategic information to inform program design and implementation and to support evidence-based program monitoring and evaluation. This study employed 2010 behavioral survey [1] data to examine whether program services had reached FSWs with different SES (i.e. educational attainment and income); whether program intervention was associated with HIV-related behavioral outcomes, and whether the association differed by SES.

[1] In 2009, USAID tasked PSI to lead the development of a standardized monitoring and evaluation framework in support of the comprehensive prevention package of services program for key affected that USAID supported in Southwest China. The 2010 survey of FSWs (N=1,068) covered three USAID supported sites in Yunnan, including Mengzi led by PSI/China, Gejiu and Kunming led by FHI 360.

2 Method

The behavioral survey of FSWs was conducted in March/April 2010. The Mengzi sample included 348 adult women (aged 18-49), who had exchanged sex for cash in the past one month. The study was reviewed and approved by the institutional review board (IRB) at Yunnan Provincial CDC, and the implementation of the survey complied with all policies and procedures of the Ethics Board.

The time location sampling (TLS) method, also known as time-space sampling or venue-based sampling, has been widely used to collect data from hard-to-reach populations, including FSWs, who can be found at identifiable locations (Family Health International, 2001; Muhib, 2001). Working closely with the SHH program staff including peer educators and key local stakeholders (e.g. commercial sex venue owners and representatives of the local FSW community), a mapping process was conducted prior to the survey to locate the venues and sites where FSWs were known to congregate and to give estimates of the numbers of FSWs at each venue/location at different times of the day and across different days of the week. Each venue identified was divided into four time units representing the following time slots: (1) Peak days/peak time, (2) Peak days/lean time, (3) Lean days/peak time, (4) Lean days/lean time. Total primary sampling units (PSUs) for the study was the number of venues/location x 4 time points. Given that a size estimate was determined prior to the fieldwork for each sampling unit (i.e. an estimate of the number of FSWs using the venue in each time/location unit) clusters were selected using probability proportional to size (PPS) with a fixed (equal) number of participants selected at each PSU. PPS is an established method of probability sampling that provides efficiency in fieldwork while also ensuring that all members of a subject population have an equal probability of selection (Groves et al., 2009). Venues/time slots that were estimated to have a small number of FSWs available to participate were combined at the outset to form single clusters, with the objective to ensure that there was a sufficient number of participants in each cluster. A total of 18 venues were identified through mapping, including bars, karaoke clubs, beauty salons, sauna/massage parlors, night clubs, dancing halls, hotels, small inns and rental apartments, which produced a total of 72 PSUs.[2]

Once interview times and locations were selected and agreements made with venue operators, SHH peer educators and outreach teams approached potential participants for enrollment. Respondents were recruited at each selected PSU, subject to a list of inclusion criteria, (1) age 18-49; (2) had exchanged vaginal and/or anal sex for cash in past one month, (3) had worked in one of the selected sample districts for a minimum of one month, (4) was not under the influence of drugs or alcohol, (5) could speak and comprehend Mandarin to a sufficient level to respond meaningfully to survey questions, and (6) gave informed consent. In most instances, all women were approached in the venue and a screening tool was applied to identify whether they met the inclusion criteria. The informed consent of those meeting the inclusion criteria was then obtained through reading a standard informed consent script. Once recruited, participants were interviewed at nearby locations that ensured privacy and confidentiality and at which both interviewers and participants were comfortable. In each time/location cluster, recruitment continued until the required number of participants had been obtained. Less than 5% FSWs approached refused to participate.

[2] There were some changes on PSUs selection during fieldwork implementation. Additional sites were included some on-the-ground commercial sex venues (e.g. small inns, rental apartments, streets) to reach the more hidden street-based and freelance FSWs, in addition to those who could be reached at bigger/regular commercial sex venues (such as karaoke clubs). However, specific information related those addition sites were not available for sampling weights calculation and to support a multi-level analysis to adjust for the venue-level factors and intra-cluster correlations in this study. And excluding those respondents would have resulted in a reduced sample size.

Face-to-face interviews were conducted with eligible women, using a structured questionnaire, which covered: demographic information, SES, reproductive health history, CCU with different types of sexual partners, behavioral determinants of consistent condom use, condom availability, lubricant use, self-reported STI symptoms, use of HIV testing and counseling service, knowledge and attitudes towards HIV, alcohol and drug use, and participation in SHH program activities/services supported by USAID. Each respondent was provided with an incentive of 20 RMB to compensate their time and participation after completing the survey.

Key measures of individuals' SES included educational attainment and income levels. A binary variable was created based on the number of schooling years reported by respondents to summarize those FSWs with higher versus lower educational levels (middle school education was used a cutoff point). Respondents' income levels were measured by a binary variable categorizing higher versus lower level of payment received from last commercial sex practice, with earning more than 100 RMB as a cutoff point[3].

Program exposure was defined through degrees of engagement with USAID-funded HIV prevention program activities in the past 12 months. For the analysis presented in this paper, we defined four categories of program exposure: (1) no exposure to any intervention, (2) contact with outreach and IPC teams from SHH or other local partners only, (3) visited SHH DiC 1-3 times, (4) visited SHH DiC 4 times or more. The dependent variables are HIV-related behavioral and health outcomes, including sexual partnership, CCU with commercial partners in the past week, CCU with regular and casual partners in the past month, having STIs in the past three months, utilization of HCT and screening for STI in the past 12 months, and the number of lifetime abortions.

We used SPSS 23 software package for data analyses. Sample characteristics are presented using descriptive statistics. F-ratio test, chi-square analysis and multivariate logistic regression were used to examine the associations between individual's SES, participation in program intervention, and behavioral and health outcomes. Due to the small sample size, all the analyses in this study were conducted at 90% confidence interval with $P<0.1$ being considered as statistically significant.

3 Results

3.1 Population Characteristics

Results in Table 1 show that respondents had a mean age of 24.8 years (std =0.28, median = 24), with 63% 25 years old or younger. The majority (69%) of respondents were Han Chinese, while 12% were Hani ethnic minority, and 7% were Yi. About 26% of the respondents received below middle school education; including 19% having completed only elementary school and 7% having never attended school. The majority of respondents were never married (70%), 16% were currently married and 14% were divorced, separated or widowed. About 25% of respondents reported having received a payment of 100 RMB or less from last sex trade. These individuals generally worked in a beauty salon, hair salon, small inn or rental apartment, compared to the higher income FSWs who were more likely to work in bars and karaoke clubs. The majority of

[2] Monthly income was also explored. However, there was no any pattern of significant association between levels of monthly income and any of the behavioral and health outcomes under study. The underlying reason might be because monthly income for FSWs depends on two factors: the number of clients served and the payment from each sex trade. FSWs on the higher social ladder could receive 500 RMB by serving one client, while it takes other FSWs a high number of sex trades to earn the same amount of income, which would put them at a much higher risk for HIV/STIs. So payment received from the last sex, together with education, although not ideal, may be a better measure of FSWs' SES. Based on local economic development conditions and input from SHH program staff, earning more than 100 RMB was chosen as the cut-off point to distinguish FSWs who worked at the lower end with other FSWs.

respondents (59%) reported having had first sex at the age of 18 years or younger (mean age at first sex = 18.44, std = 2.12). About half of the respondents started commercial sex practice before age 20 (47%), and 20.5% started at 18 years old or younger (mean age at first commercial sex = 22.3, std = 4.69). (Results not presented in Table I).

Background Indicators	Mean (std) or % (n)
Age (mean)	24.8 (0.28)
Age in two groups	
Younger: 18- 25 years old	63% (221)
Older: 26 - 40 years old	37% (127)
Ethnicity	
Han people	69% (242)
Hani people	12% (40)
Yi people	7% (26)
Other ethnicities	12% (40)
Educational Levels	
Higher education: middle school or more	74% (259)
Lower education: Elementary school or less	26% (89)
Marital status	
Never married	70% (244)
Currently married	16% (55)
Divorced/widowed	14% (49)
Income: payment received from last commercial sex	
More than 100 RMB	75% (261)
100 RMB or less	25% (87)

Table 1: Sample characteristics (*N*=348).

3.2 Behavioral/Health Outcomes and Program Exposure

Table 2 shows that multiple sexual partnership was common in FSWs in Mengzi, with over half of the respondents (57%) reporting also having had sex with a regular partner, and 10% with a casual partner in the past month, in addition to their commercial partners. Respondents, on average, reported more than 3 commercial partners in the past week. Levels of CCU in the past month varied depending on partner types; 70% with regular partners, 88% with commercial partners, and 65% with casual partners. The majority of respondents reported having received an HIV testing and counselling (77%) and screening service for STIs (81%) in the past 12 months; 17% of respondents reported having (or suspected) STIs in past three months. Almost half (48%) of those with symptoms reported self-treating or not-treating at all the last time when they experienced symptoms, while 36% reported obtaining treatment at a public hospital, and 8.6% reported seeking treatment at private clinics or visiting a DiC supported by a non-governmental organization (results not presented in Table 2).

Overall, the level of engagement with SHH's program activities (DiC-based or outreach) was high (Table 2) in FSWs in Mengzi. Only 22% of the respondents had not attended any service or activity provided by SHH program in the past 12 months. One third (33%) of the respondents reported having received outreach IPC contact from SHH peer educators in the past 12 months, although they never visited SHH DiC. About 45% of the respondents had attended SHH DIC-based activities in the past 12 months; of these 27% had visited SHH DiC 1-3 times, and 18% visited SHH DiC 4 times or more.

Program exposure, behavioral and health outcomes variables	Total sample	**Educational levels**		**Income from last commercial sex**	
		Middle school or higher	Primary school or lower	More than 100 RMB	100 RMB or less
	% (n)	% (n)	% (n)	% (n)	% (n)
Sexual behaviors with different types of partners ⌖					
Had sex with regular partners in past month	57% (197)	56% (50)	57% (147)	**49% (43)^**	**59% (154)**
CCU with regular partners in past month	70% (138)	74% (106)	64% (32)	71% (110)	67% (28)
Had sex with casual partners in past month	9.8% (34)	10% (25)	10% (9)	11% (28)	7% (6)
CCU with casual partners in past month	65% (34)	68% (17)	56% (5)	61% (17)	83% (5)
Number of commercial partners in past week ⌖	3.69 (5.23)	**3.26 (5.09)****	**4.94 (5.47)**	**2.77 (4.62) *****	**6.46 (5.97)**
CCU with commercial partners in past week	88% (307)	**92% (238)*****	**78% (69)**	**93% (243)*****	**74% (64)**
Number of abortions life time					
No abortion	45% (158)	44% (115)	48%(43)	45% (118)	46% (40)
1 abortion	28% (97)	30% (78)	21% (19)	28% (73)	28% (24)
2 abortions or more	27% (93)	26% (66)	30% (27)	27% (70)	26% (23)
Had STIs in past 3 months	17% (59)	16% (41)	20% (18)	17% (43)	18% (16)
Received screening service for STIs in past 12 months	81% (281)	**83% (215)***	**74% (66)**	80% (209)	83% (72)
Received HCT service in past 12 months	77% (264)	77% (199)	73% (65)	74% (194)	81% (70)
Exposure to program intervention					
No exposure	22% (75)	21% (53)	25% (22)	22% (56)	22% (19)
Outreach activities only	33% (116)	34% (87)	33% (29)	33% (85)	36% (31)
Dic visits 1 -3 times	27% (95)	**31% (79)^**	**18% (16)**	28% (74)	24% (21)
DiC visits 4 times and more	18% (62)	**25% (22)^**	**15% (40)**	18% (46))	18% (16)

Notes: ^ Significant at $p < 0.1$ level. * Significant at $p<0.05$, ** Significant at $P<0.01$, ** Significant at $p < 0.001$ level.

⌖Definition for sexual partnership types: A regular partner refers to a cohabiting or non-cohabitating male sexual partner, who is considered to be the main sexual partner (e.g. boyfriend). A commercial partner refers to a male who pays money for having a sexual intercourse. A casual partner is a male who is not a regular partner (e.g. have sex with only as one-night stand), but does not pay money for having a sexual intercourse.

⌖Differences on the number of commercial partners in past one week used F-ration test; the reported statistics are means/standard deviations (Std.)

Table 2: Bivariate associations between SES, program exposure, HIV related behavioral and health outcomes (*N*=348).

3.3 Bivariate Association between SES, Program Exposure, and Behavioral/Health Outcomes

Table 2 shows that FSWs with below middle school education, on average, had served more clients in the past week (means: 4.94 vs 3.26, P<0.01), had a lower level of CCU with commercial partners in the past week (78% vs 92%, P<0.001), and had a lower level of STI screening service utilization (74% vs 83%, P<0.05) in the past 12 months, relative to FSWs who achieved middle school education or above. A higher percentage of the lower-income FSWs reported having a regular sexual partner in the past month (59% vs 49%), relative to the higher-income FSWs (marginally significant at p<0.1). FSWs who received 100 RMB or less from the last sex trade on average had served more clients (means: 6.46 vs 2.77; P<0.001) and had a lower rate of CCU with commercial partners (74% vs 93%, P<0.001) in the past week, relative to FSWs who received more than 100 RMB.

Overall, levels of participation in outreach activities were similar between FSWs with different education levels. However, DiC-based intervention covered a higher percentage of FSWs with middle school education or above, relative to the FSWs with less than middle school education. A smaller percentage of FSWs who received below middle school education had attended SHH DIC-based activities (18% for DIC 1-3 times and 15% for DIC 4 times or more), relative to FSWs middle school education or above (31% for DIC 1-3 times and 25% for DIC 4 times or more; The difference is marginally significant (P<0.1), largely due to small sample size. There was no significant difference in program coverage between FSWs with different income levels from last sex trade.

3.4. Multivariate Association between SES, Program Exposure, and CCU with Commercial Sexual Partners

Because the above bivariate analysis reveals consistent and significant associations between education, income and CCU with commercial partners, we focused only on this outcome for the multivariate logistic regression analysis. Age, ethnicity, marital status, education, income, program exposure as well as the interaction terms between education and program exposure, and between income and program exposure were entered in the model to examine whether program exposure was associated with CCU with commercial partners, and whether the association differed between FSWs with different income and education levels.

Table 3 reveals an association between income and CCU with commercial partners. The odds of using condoms consistently in a commercial sex setting among FSWs who received more than 100 RMB from the last sex trade had more than five times the odds among FSWs who received 100 RMB or below (OR = 5.38, P<0.1). The association was marginally significant. There was no significant interaction between program exposure and education levels. Participation in program intervention did not have significantly different influence between FSWs who received different levels of payment from last sex trade. However, the results show a significant interaction between education levels and the degree of program engagement in the model predicting CCU with commercial partners. In particular, the odds of CCU with commercial partners of FSWs who had a higher education and 1-3 DIC visits were about 10 times the odds of FSWs who had no exposure and lower education (OR high education*DiC 1-3 visits = 13.01, P<0.05; OR DiC 1-3 visits =0.14, P<0.05; OR high education = 0.82, P=0.27 not sig). The interaction terms between education and other two levels of program exposure were not statistically significant.

Predictors	CCU with commercial partners in past week	
	Odds Ratio	90% Confidence Intervals
Age		
26 - 40 years old (ref)	--	
18-25 years old	1.25	0.54-2.87
Ethnicity		
Other ethnic groups (Ref)	--	
Han Chinese	1.50	0.78-2.88
Marital status		
Currently married (ref)	--	
Never married	1.03	0.41-2.64
Separated, divorced or widowed	2.59	0.76-8.81
Educational Levels		
Lower education: less than middle school (ref.)	--	
Higher education: middle school or higher	0.82	0.19-3.42
Income from last commercial sex		
Lower income: 100 RMB or less (ref.)	--	
Higher income: more than 100 RMB	**5.38^**	**1.16 – 24.92**
Participation in program Intervention		
No exposure (ref.)	---	
Attended outreach only	0.31	0.08-1.20
Visited DiC 1-3 times	**0.14***	**0.03-0.76**
Visited DiC 4 times or more	1.05	0.18-6.20
Program Exposure* education		
No exposure* lower education (ref.)		
Outreach only* higher education	2.57	0.42-11.22
DiC visits 1-3 times* higher education	**13.01***	**1.52-56.92**
DiC visits 4 times or more* higher education	3.45	0.36-23.36
Program Exposure* income		
No exposure* lower income (ref.)	---	
Outreach only* higher income	0.63	0.10-3.72
DiC visits 1-3 times* higher income	2.30	0.26-10.58
DiC visits 4 times or more* higher income	0.33	0.05-3.15
Constant	8.52*	
Pseudo R square	0.22	

Notes: ^ Significant at $p < 0.1$ level. * Significant at $p < 0.05$ level.

Table 3: Multivariable logistic regression on CCU in commercial sex setting (*N*=348).

4. Conclusion and Discussion

We found significant disparity in behavioral and health outcomes between FSWs with different education and income levels in Mengzi City. FSWs who had less than middle school education and who receive 100 RMB or less from last sex trade consistently had a higher number of commercial partners and a lower proportion of CCU in the commercial sex setting. In addition, FSWs with a below middle school education have a lower level of utilization of STIs screening. And FSWs who received lower payment also reported a high level of partnership with regular sexual partners. Controlling for confounding factors, payment earned from last commercial sex

has a strong association with CCU as commercial sex setting, with those earning less than 100 RMB having substantially higher odds of not using condoms consistently with commercial sexual partners. The findings revealed that lower SES FSWs who are faced with a higher likelihood/frequencies of HIV/STI exposure, also reported a significantly lower level of protective behaviors and service use. The results highlighted the elevated HIV/STI risk among this population in general, as well as their greater risk of 'bridging' the infection between different types of partners and sex settings unknowingly, pointing to the urgent need to prioritize interventions targeting the low-end FSWs in Mengzi. Although the overall level of CCU in the commercial sex setting was high among FSWs in Mengzi (88%), from the From the estimated number of commercial partners in the past week (mean = 3.69), this would still aggregate to each FSW having almost two unprotected sex episodes on average each month with commercial partners, which represents a substantial risk of HIV transmission.

With regard to program intervention, SHH program had overall achieved success in reaching FSWs with different income and education levels. That may be attributed to the particular efforts that the SHH program team had made in promoting outreach into different types of commercial sex venues, including bars and karaoke clubs to reach out to higher-end FSWs as well as beauty salons, hair salons, small inn or rental apartments which were the more hidden and “on-the-ground” venues where low-end FSWs conducted sex trade. However, SHH DiC-based activities involved a higher proportion of better educated FSWs, relative to the less educated ones who, nevertheless, reported a high-level of HIV/STIs risk behaviors and a greater need for care and support services provided at no cost. Over the past several years, SHH had developed a series of edutainment activities/programs including cooking classes, handcraft making trainings, used goods exchange events, fitness offering, edutainment activities and internet services, other life skills trainings, and outdoor activities. However, those activities seemed to be more effective in attracting FSWs with better education.

In addition, although the specific SES into which FSWs fell played an important role in affecting their ability to practice behaviors to protect themselves against HIV or other negative reproductive health outcomes, findings from this study on the significant interaction between education and program intervention in determining CCU with commercial sexual partners pointed out that attending DIC-based activities had a stronger influence on FSWs with higher education. Less-educated FSWs did not seem to be as responsive to the DIC-based intervention with regard to practicing safe sex in commercial sex setting. The results indicated that promoting the use of DiC-based services or increasing overall program coverage alone do not necessarily contribute to a reduction on high risk behaviors among low-paid FSWs. Future targeted program intervention needs to focus on identifying program activities or services in line with the needs and characteristics of low-end FSWs and addressing the complexity of issues that confront them in order to effectively reduce their elevated risks for HIV/STIs.

This study also reveals a high level of abortion and STIs among FSWs in Southwest China, consistent with findings from other studies in the literature (Reilly et al., 2012; Wang et al., 2012; Lim et al., 2015; Wang et al., 2015). Although efforts against HIV epidemics over the last three decades have resulted in significant decreases in HIV incidence and prevalence in FSWs both in China and elsewhere (Baral et al., 2012; UNAIDS, 2014; Shannon et al., 2015). FSWs still bear a disproportionately large burden of other STIs, unintended pregnancies and associated negative health outcomes (Duff et al., 201; Decket et al., 2013; Schwartz et al., 2015). Health-related intervention for FSWs in the past have overwhelmingly focused on reducing risks for HIV/STIs. Overall, there is a lack of synergy between HIV prevention and family planning services particularly in resource poor settings. There is a pressing need for effective interventions to address the high co-morbidity of SRH problems associated with this high risk occupation. These must go beyond promoting consistent condom use, over which these women are often not able to

maintain control due to financial disadvantages and gender-based power dynamics embedded in their complex sexual partnerships and other social and cultural contexts (Bui et al. 2013; Maher et al. 2013).

More recently, it has been increasingly recognized that methods which are affordable, long-acting, women-initiated/controlled with dual protection against HIV/STIs and unintended pregnancy are urgently needed to meet the SRH needs of vulnerable women (Romano et al., 2014; Friend, 2016), The development of new generation multi-purpose prevention technologies products in the biomedical field, such as the Tenofovir gels and the Levonorgestrel/Tenofovir-Releasing Intravaginal Rings that provide simultaneous prevention of HIV/STIs and unintended pregnancy, represent a potential novel solution to existing SRH challenges faced by vulnerable women, particularly the FSWs who work at the low-end commercial sex settings (Romano et al., 2014; Lusti-Narasimhan et al., 2014; Malcolm et al., 2014).

There were several limitations in this study. First, the study design was cross-sectional in nature which would not allow inference on causal relations. Second, the sample size was small; which restricted the scope of analysis and our capability in identifying more factors related to CCU in a commercial sex setting. Third, the inclusion criteria of having exchanged vaginal and/or anal sex for cash in the past one month excluded some women who engaged in commercial sex in the study areas less frequently, or who, for whatever reason, had not sold sex in one month prior to the survey being conducted. Fourth, the use of TLS implied that the resulting sample would be more representative of FSWs who frequented venues and may have excluded women who might not be regular visitors to these venues but who might nonetheless be involved in commercial sex. The venues sampled in this study were limited to those that were known to and mapped by SHH program team prior to sampling. There might be other venues where FSWs congregated at the program site that were not known about or mapped at the time when the survey was conducted.

Competing interests

The authors declare that they have no competing interests.

Authors' contributions

HF conceptualized the study, analyzed data and wrote the manuscript. KW supported the study design, coordinated data collection fieldwork, and supported with data analysis and manuscript development. GM led the survey design, supported with data analysis and manuscript development. All authors read and approved the final manuscript.

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