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Socio-ecological factors associated with depression, suicidal ideation and suicidal attempt among female injection drug users who are sex workers in China

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Abstract

Objective—Female injection drug users who are also sex workers (FSW-IDUs) occupy a pivotal population in HIV transmission, whereas their mental health problems are largely overlooked. We aimed to investigate prevalence and associated socio-ecological factors of depression, suicidal ideation and suicidal attempts among FSW-IDUs in China.

Methods—Using snowball sampling methods, 200 FSW-IDUs were recruited from communities in Liuzhou, China. Anonymous face-to-face interviews were administered by trained doctors.

Results—Thirty-nine percent of participants had severe or extremely severe depression, 44.7% had suicidal ideation in the last six months and 26.8% had suicidal attempts in the last six months. After adjusting for background variables, self-stigma was significantly associated with severe or extremely severe depression (OR=1.18, 95% CI: 1.07–1.31). Self-stigma (OR=1.08, 95% CI:

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Conflict of Interest

There is no conflict of interest of all authors

Contributors

Jing Gu was responsible for the study design and drafted the manuscript. Joseph T. F. Lau contributed to the revising and finalization of the paper. Yuantao Hao contributed to the conceptualization and finalization of the paper. Mingqiang Li and Xianxiang Feng took part in the study design and were in charge of the coordination of the field work. Yu Bai was in charge of data collection and quality control of the study. Haochu Li managed the literature searches and summaries of previous related work. Qi Gao and Chun Hao analyzed the data.

1.01–1.15), depression (OR=1.11, 95% CI: 1.05–1.18), having completely broken up with family (OR=2.60, 95% CI: 1.35–5.02) and having been abused by clients or gatekeepers (OR=2.15, 95% CI: 1.32–3.50) were associated with suicidal ideation in the last six months, while self-stigma (OR=1.03, 95% CI: 1.10–1.16), depression (OR=1.12, 95% CI: 1.04–1.20) and being abused by clients or gatekeepers (OR=2.15, 95% CI: 1.09–4.24) were associated with suicidal attempt in the last six months. In mediation analyses, the associations between self-stigma and the two suicidal outcomes were fully mediated by depression.

Conclusions—There are unmet mental health needs of FSW-IDUs. Screening of mental health problems should be integrated into current HIV-related services. Psychological intervention efforts should include components such as self-stigma, family support and abuse.

Keywords

Injection drug users; sex workers; depression; suicide; China

1. INTRODUCTION

High proportions of HIV infection in China have been attributed to heterosexual transmission (46.5%) and injection drug use (28.4%; China Ministry of Health, 2012). It was estimated that there were respectively 4 to 10 million female sex workers (FSWs) and about 10 million drug users in China (Hu, 2014; Yang et al., 2005). Female injecting drug users who are sex workers (FSW-IDUs) may contract HIV through syringe sharing or unprotected heterosexual sex with injection drug users (IDUs; Gu et al., 2011, Lau et al., 2011). HIV prevalence among IDUs is high and ranged from 17.8% to 71.9% (Yin et al., 2007; Zhang et al., 2002). Through unprotected sex, infected FSW-IDUs may transmit HIV to male clients of sex work, a group of low HIV prevalence in China (0% to 0.5%; Zhao et al., 2005). Previous studies have reported high prevalence of such risk behaviors among FSW-IDUs (Gu et al., 2008, 2011).

HIV prevention tends to overlook mental health problems (e.g., depression and suicidal ideation), which are significantly associated with HIV-related risk behaviors, including unprotected sex among FSWs and syringe sharing among IDUs (Armstrong et al., 2013; Hong et al., 2007b). Previous studies conducted in China reported high prevalence of depressive symptoms among IDUs (57.5%) and FSWs (50%; Liang et al., 2008, Hong et al., 2010, 2007b). The prevalence of suicidal ideation was also high (40% among IDUs and 18% among FSWs; Jin et al., 2013; Hong et al., 2007a, 2013). Such prevalence is expected to be even higher among FSW-IDUs as they encounter layered stigma arising both from their IDU and FSW status, and stressors related to financial difficulties, poor family support and abuse. The three studies located by us, one of which was conducted in China, reported very high prevalence of depression (ranged from 70% to 86%) and suicidal attempt (53%) among FSW-IDUs (Gilchrist et al., 2005; Gu et al., 2010; Ulibarri et al., 2013).

Recently, socio-ecological models have been widely used to understand health-related risk factors at individual, interpersonal and social/structural levels (Sallis et al., 2008). Among IDUs, individual-level factors of depression included gender, drug use history and self-stigma (Evans et al., 2003; Latkin et al., 2003; Plotzker et al., 2007; Rusch et al., 2009);

interpersonal-level factors included social support and family relationships (Risser et al., 2010; Wang et al., 2012); social-level factors included social stigma and unstable living status (Daniulaityte et al., 2010; Semple et al., 2005). Among FSWs, individual-level factors of depression included HIV infection status and drug use behaviors (Alegria et al., 1994); interpersonal-level factors included partner relationship and social support (Hong et al., 2007a; Sagtani et al., 2013); social-level factors included abuse and perceived stigma (Alegria et al., 1994; Hong et al., 2010, 2013). As depression is strongly associated with suicidal ideation and suicidal attempt (Wild et al., 2004), suicidal ideation and attempt share many risk factors of depression among IDUs and FSWs, such as abuse history, social support, and perceived stigma (Alegria et al., 1994; Hong et al., 2007a; Jin et al., 2013; Kwon et al., 2013). There is only one study investigated risk factors of depression among FSW-IDUs and this study, which was conducted in Mexico, reported that abuse arising from partners and clients was associated with depression (Ulibarri et al., 2013). Since depression and suicidal ideation are strongly correlated with each other, it is also important to understand whether the risk factors' effect on suicidal ideation/attempt is fully mediated by depression. So far no study has tested this mediation hypothesis.

To fill the identified knowledge gaps, we investigated the prevalence of depression, suicidal ideation and suicidal attempt in a community-based sample of FSW-IDUs in China. We tested separately the significance of associations between four groups of independent variables of three dependent variables (depression, suicidal ideation and suicidal attempt), which included: 1) individual-level factors (perceived economic pressure and self-stigma), 2) interpersonal-level factors (relationship with regular partner and whether broken up with family), 3) organizational-level factors (level of sex work venue and charge per sex transaction), and 4) social-level factors (being abused and perceived social stigma). In addition, we hypothesized that depression would mediate the associations between the aforementioned socio-ecological factors and suicidal ideation/attempt.

2. METHODS

2.1 Study site and population

This cross-sectional study was conducted in Liuzhou of the Guangxi Zhuang Autonomous Region (Guangxi), China. Liuzhou has a population of 3.6 million and has the largest number of registered drug users (over 10,000) and reported HIV cases (3,084 in 2009) in Guangxi. This study was a part of a survey on psychosocial factors, HIV-related risks, and mental health of FSW-IDUs. Inclusion criteria were: 1) at least 18 years old, 2) at least one episode of injecting drug use in the last six months and 3) at least one episode of trading sex for money or drugs in the last six months. Participants who showed obvious withdrawal symptoms during the interview process were invited to complete the interview at another time. Those who could not be interviewed later were excluded from the study.

2.2 Recruitment of participants

As no sampling frame for FSW-IDUs exists, snowball sampling method was used in this study. Participants were recruited by ten paid peer IDUs of two syringe exchange programs (SEP) of the local Center for Disease Control and Prevention (CDC). The two programs

each served about 200 IDUs, of whom about one-fourth were female. The peer educators approached prospective participants, who might or might not be SEP users, and invited them to participate in this study. All participants were in turn requested to refer other eligible peers to join the study. As both drug use and sex work were illegal in China, written informed consent was not used. Instead, the interviewers signed a form pledging that they had explained the study to the participants in detail and have obtained their verbal informed consent before the interview started (Gu et al., 2009). A reimbursement fee of 50 RMB (about 8 USD) was provided to the participants as a compensation for their time. The study was approved by the Institutional Review Board of the Renmin University.

2.3 Data collection

Anonymous face-to-face interviews were administered by the trained interviewers, using a structured questionnaire in a privacy-ensured consultation room at the SEP centers. The interviewers were clinicians of the local CDC and were experienced in outreaching and surveying IDUs and FSWs. Each interview took about 20 minutes to complete. Of all 234 prospective participants who were invited to join the study, 13 were either ineligible according to the inclusion criteria (e.g., not having injected drugs or traded sex in the last six months) ($n=10$) or refused to participate in the study ($n=3$). We excluded data that were obtained from 21 of the remaining 221 interviewees from data analyses, as 12 of them left the study site without completing the questionnaire for reasons unrelated to the study (e.g., someone was waiting for her) and nine refused to answer some key questions (e.g., those related to depression). The effective sample size was hence 200.

2.4 Measurements

Information on participants' background characteristics, including age, current marital status (single, married, cohabiting or divorced), residential status in Liuzhou (yes or no), ethnicity (Han, Zhuang, Miao, Yao, and others), education level (primary or below, junior high, senior high or above), monthly personal income, duration of drug use and duration of sex work was collected. Continuous variables (e.g. age and income) were categorized according to literature of similar studies and the variables' frequency distribution (Gu et al., 2008a, 2014).

Probable depression was assessed by the 7-item Depression Subscale of the Chinese Depression Anxiety Stress Scale (DASS-21; Chan et al., 2012). Item ratings ranged from 0 ('did not apply to me at all') to 3 ('applied to me very much or most of the time'). Higher scores reflected more depressive symptoms. In order to yield equivalent scores to the full DASS-42, the total subscale score was multiplied by two (Tran et al., 2013). Scores of 10, 14, 21, and 28 were used as cut-off points for normal cases, mild depression, moderate depression, severe depression and extremely severe depression cases, respectively (Tran et al., 2013). In this study, the Cronbach's alpha of the subscale was 0.88 and the cut-off point of 21 was used (i.e., severe to extremely severe versus normal to moderate).

Suicidal ideation and suicidal attempt in the last six months were measured by two questions: 'Have you thought of committing suicide in the last six months?' and 'Have you attempted to commit suicide in the last six months?' The answers were binary ('Yes' and

‘No’). Participants who answered ‘yes’ to the questions were considered to have had suicidal ideation and/or suicidal attempt (Hong et al., 2007a).

Four groups of socio-ecological risk factors were assessed:

2.4.1 Individual-level factors—Perceived economic pressure was assessed by the 6-item Perceived Economic Pressure Scale (e.g., economic pressure due to debt, due to the need to support one’s drug use) which has been applied in our previous study targeting FSW-IDUs (Gu et al., 2008a). Response categories ranged from 0 to 3 (no, little, some and severe pressure). Higher scores reflecting higher economic pressure (Cronbach’s alpha = 0.82 in this study).

The 9-item Self-Stigma Scale-Short (SSS-S) has been validated among Chinese (Mak and Cheung, 2010). Examples of items included: ‘My identity as an FSW-IDU is a burden to me’ and ‘I estrange myself from others because I am an FSW-IDU’. Response categories ranged from 1 to 4 (extremely disagree to extremely agree). Higher scores reflected higher levels of self-stigma (Cronbach’s alpha = 0.81 in this study).

2.4.2 Interpersonal-level factors—The 4-item Social Support Scale was validated in a study targeting FSW-IDUs (Gu et al., 2010). It assesses perceived instrumental and emotional support obtained from participants’ family and friends (e.g., ‘How much instrumental help could you obtain from your family members when you face difficulties in life?’). Each item was rated on a scale of 1 (‘no support at all’) to 4 (‘a great deal of support’). Higher total scores indicated higher levels of social support (Cronbach’s alpha = 0.74 in this study).

Participants were also asked whether they agreed with two statements with respect to their relationships with their regular partners and family members: “You have a poor relationship with your regular partner” and “You have completely broken up with your family members”. Answers included extremely disagree, somehow disagree, somehow agree, extremely agree and not applicable (have had no regular partner or no family member).

2.4.3 Organizational-level factors—The main type of sex work venue attended by the participants in the last six months was asked. The answers were grouped into three categories according to literature (lower-end: soliciting on streets/parks, middle-end: working at salons/massage parlors/inns, and higher-end: working at hotels/night clubs; Gu et al., 2008a, Huang et al., 2004).

2.4.4 Social-level factors—Experience of being verbally abused (being scolded, belittled or humiliated) or physically abused (being beaten, pushed or kicked) or threatened (being warned of harm) by participants’ clients and/or gatekeepers of the sex work establishment in the last six months was asked (Yi et al., 2010).

The 6-item Perceived Social Stigma Scale was used to assess participants’ negative interaction with the social environment (Gu et al., 2013; e.g., ‘Do you agree that people in the society look down upon you?’). Responses ranged from 1 (completely disagree) to 4

(completely agree). Higher scores reflected higher levels of perceived social stigma (Cronbach's $\alpha = 0.79$ in this study).

2.5 Data analyses

Univariate logistic regression models were firstly applied to test separately the associations between background variables and the three dependent variables (depression, suicidal ideation and suicidal attempts). Using factors of individual-level (perceived economic pressure and self-stigma), interpersonal-level (relationship with regular partner and whether broken up with family), organizational-level (level of sex work venue and charge per sex transaction) and social-level (being abused and perceived social stigma) as key independent variables, univariate and adjusted analyses (adjusted for background variables with $p < 0.1$) were performed. Odds ratios and respective 95% confidence intervals (CI) were reported.

As depression and suicidal ideation/attempt are strongly correlated with each other, it is unclear whether such risk factors would have independent effects onto suicidal ideation/attempt after adjusted for depression. We therefore conducted a mediation analysis, following steps proposed by Baron and his colleagues (Baron and Kenny, 2010), to examine whether those risk factors of suicidal ideation/attempt would lose their significance after further adjusting for depression. Such a condition, if occurs, implies that the risk factors' effects onto suicidal ideation/attempt have been fully mediated by depression. To test the mediation hypothesis, an additional analysis was conducted for suicidal ideation/attempt, adjusting for both background variables and depression in the same logistic regression model. SPSS for Windows version 17.0 was used for data analyses and $p < 0.05$ was considered as statistically significant.

3. RESULTS

3.1 Background characteristics

The participants' mean age was 33.9 years (s.d.=5.3 years); 46.5% were currently married or cohabiting with someone; 86.5% were local residents of Liuzhou; 81% were ethnic Han (Zhuang: 8.5%; Miao: 7%; Yao: 2%; Dong: 1.5%); 29.4% had had monthly personal income $>1,000$ RMB (150 USD). Moreover, 78.8% and 69.5% had engaged in sex work and drug use for at least 10 years, respectively. The frequency distributions by mental health status were presented in Table 1.

3.2 Prevalence of depression, suicidal ideation/attempt

The prevalence of no depression, mild depression, moderate depression, severe depression and extremely severe depression was 8.1%, 13.1%, 39.9%, 20.7% and 18.2%, respectively (i.e. 39.0% for probable severe or extremely severe depression). Furthermore, 44.7% and 26.8% had had suicidal ideation and suicidal attempts in the last six months, respectively (Table 2).

3.3 Description of socio-ecological variables

Of the participants, 29.3% had had poor relationship with their regular partner, and 26.6% had completely broken up with their family; 67% charged <100 RMB (about 15 USD) per

commercial sex transaction; 25% reported they had been abused by their clients or gatekeepers in the last six months (Table 2). Also, many of them gave unfavorable responses to the scale items on economic pressure, self-stigma, perceived social support and perceived social stigma (footnotes of Table 2).

3.4 Associations between background variables and three outcomes

Longer duration of sex work (> 10 years) was associated with severe/extremely severe depression (OR=2.11, 95% CI: 0.99–4.51); divorced status was marginally associated with suicidal ideation (OR=1.90, 95% CI: 0.95–4.12); ethnic minorities was less likely than Hans to have made suicidal attempts (OR=0.26, 95% CI: 0.08–0.78) (Table 3).

3.5 Associations between socio-ecological variables and three outcomes

Adjusted for background variables with $p < 0.1$, self-stigma was significantly associated with probable severe/extremely severe depression (adjusted OR [AOR] =1.18, 95% CI: 1.07–1.31, see Table 4). Adjusted analysis further showed that participants with self-stigma (AOR=1.08, 95% CI: 1.01–1.15), having broken up with their family (AOR=2.60, 95% CI: 1.35–5.02) and having been abused by their clients or gatekeepers in the last six months (AOR=2.15, 95% CI: 1.32–3.50) were more likely than others to have suicidal ideation in the last six months (Table 5). Self-stigma (AOR=1.08, 95% CI: 1.00–1.16) and being abused by their clients or gatekeepers in the last six months (AOR=2.15, 95% CI: 1.09–4.24) were also significantly associated with suicidal attempt made in the last six months (Table 6).

3.6 Testing mediation effects

Associations between self-stigma and suicidal ideation/attempts were fully mediated by depression, as self-stigma, which were significantly associated with suicidal ideation and attempt in the original adjusted analyses, lost their significance after further adjusting for depression (AOR=1.02, 95% CI: 0.94–1.46, Table 5; AOR=1.01, 95% CI: 0.93–1.34, Table 6). Similar full mediation effect was however, not observed for the associations between the two other independent variables (completely broken up with family and being abused by clients or gatekeepers) and suicidal ideation/attempt (Table 5 and Table 6).

4. DISCUSSION

The psychological problems among FSW-IDUs are worrying. We found very high prevalence of depression (mild to extremely severe depression: 91.9%; severe to very severe depression: 39%), suicidal ideation (44.7%) and suicidal attempt (26.8%) in the last six months. Such problems have been under-researched among FSW-IDUs, as most of the studies targeting this population focused on their HIV-related risk behaviors (Gu et al., 2010; Sagtani et al., 2013). Health workers are alerted about the high prevalence of psychological problems of FSW-IDUs. The huge demand for mental health care in this group is however largely unmet, as there is a dearth of psychological interventions targeting FSW-IDUs.

One of the obstacles hindering mental health promotion among FSW-IDUs probably originates from the shortage of psychiatrists (only about 4,000 fully qualified psychiatrists in the entire country) and under-development of clinical psychology in China (Xiang et al.,

2012). Psychological interventions, especially those can be provided by current service providers with some basic psychological training (e.g., simple positive psychological intervention, Lyubomirsky et al., 2004; Seligman et al., 2005) should be built into existing health care services targeting FSW-IDUs (e.g., methadone maintenance treatment, SEP, condom distribution programs, and HIV voluntary counseling and testing). Screening for mental health problems should be considered as a part of such interventions and referrals should be made whenever possible. It is also recommended that the Chinese government should strengthen the linkage between HIV prevention and psychological services, and allocate more resources to develop new psychological services, specifically for this highly vulnerable population. Another challenge is that FSW-IDUs need a range of physical and mental health services, which may either be unavailable or not being sought by them. Integrated services need to be designed and implemented.

Psychological intervention targeting FSW-IDUs should take into account the findings of this study. Self-stigma is one of the observed issues, which is significantly associated with mental health problems. Self-stigma occurs when devalued people become aware of the prejudice, stereotype and discrimination in society, and internalize these beliefs and feelings (Corrigan and Watson, 2002; Mak et al., 2007). Stigmatization and discrimination against FSW-IDUs are explicit, as both sex work and drug use behaviors are illegal and are condemned as 'social evils' in China (Hong et al., 2010). FSW-IDUs have also been blamed for transmission of HIV and other sexually transmitted diseases. It is known that self-stigma leads to psychological problems in HIV-related populations such as people living with HIV and FSWs (Hong et al., 2010; Mak et al., 2007); our findings further extended such evidences to the FSW-IDU population. In addition, previous studies have reported interventions that are effective in reducing self-stigma, including those using cognitive behavioral approaches in other populations such as people with mental illness (Philip, et al., 2011). Pilot interventions are warranted to test efficacies of such approaches in FSW-IDUs.

FSW-IDUs experience poor family support as over half of them received no or little support from their family members when facing difficulties, while a substantial proportion of the participants have completely broken up with their families. Furthermore, broken family relationship was significantly associated with both suicidal ideation and attempts, and such association was independent to the effect of depression on suicidal ideation/attempts. FSW-IDU may be further stigmatized by their families as a result of their illegal behaviors. Family is a very important support system among Chinese (Bert and Jan, 2005). Issues related to the family hence needs to be addressed. It is however, a challenge to involve family members into mental health interventions targeting IDU-FSWs who often have poor relationship with their family. Counseling and pilot interventions are warranted.

Abuse related to sex work is prevalent among FSW-IDUs because of the cultural taboos related to sex work and drug use, women's submissive gender power in sexual transaction, and their lack of self-efficacy to contend due to need for quick income (Gu et al., 2008a, 2010). Consistent with the results of other studies targeting IDUs or FSWs, abuse encountered by FSW-IDUs was significantly associated with suicidal ideation and attempts (Fang et al., 2007; Hong et al., 2013; Lloyd et al., 2007). Hence, development of strategies for abuse prevention should be provided in future interventions. Such programs need to

improve self-esteem and ability to deal with power dynamics (Choi et al., 2007; Shannon and Csete, 2011), to train FSW-IDUs to identify risk situations, and to build up their negotiation skills (El-Bassel et al., 2001). The coverage of drug treatment services such as methadone maintenance treatment should also be enhanced among FSW-IDUs, as drug dependence enhances their already asymmetric power relationships with gatekeepers and clients.

Suicide is the fifth leading course of death in China (Phillips et al., 2002), and suicidal ideation and attempt lead to completed suicide (Crosby et al., 1999). In the Chinese general population, adverse life events tend to be important predictors of suicidal ideation, while in other countries, suicides tend to be more related to depression (Chen and Yip, 2008; Jin et al., 2013). In this study, self-stigma, a psychological risk factor, fully affected suicidal ideation/attempts through depression, whereas adverse life events (e.g., breaking up with family and being abused) exerted direct (or independent) effects onto suicidal ideation/attempt that was independent of depression. The findings imply that adverse life events might cause suicides without initiating observable psychological problems, and its effects might, therefore, be more difficult to trace. It is suggested to test such important hypothesis in future studies. In order to prevent suicides among FSW-IDUs, both prevention and treatment of psychological problems such as depression and pragmatic support to deal with adverse life events need to be considered.

Our study has some limitations. First, this was based on a convenient sample of FSW-IDUs and the study was conducted only in one city, we, therefore, may not be able to generalize the findings to all of China. Second, the data relied on self-reporting. Although confidentiality was guaranteed in data collection, reporting bias due to social desirability may still exist. Third, we did not assess sexual abuse and abuse involving regular partners of FSW-IDUs, and we combined several categories of abuse due to small sample size. Fourth, the study used a cross-sectional design, so that associations instead of causal relationships could be established. Fifth, we did not include some social-structural factors (e.g., policies and law enforcement on drug use and sex work) in the analyses, while such factors may also have important impact on the mental health status of FSW-IDUs. The strict laws and penalties against sex work and drug work create distress among FSW-IDUs, which may lead to depression and suicidal ideation or attempts. Compulsory drug detention and detention education for drug users and sex workers may also prevent drug users and sex workers from utilization of harm reduction and health-related services (Li, et al., 2010). Lastly, our study only focused on the mediation effects of depression, while other common mental health issues such as anxiety, insomnia, alcohol dependence and stress may also result in suicidal ideation, and may play an important role in explaining the pathway leading to suicides. Prevalence of such data was unavailable and future studies are warranted.

In conclusion, this study represents an important step toward better understanding of the risk factors of and relationships among depression, suicidal ideation and suicidal attempts among FSW-IDUs in China. The findings highlight a huge unmet mental health demand among FSW-IDUs. We suggest that psychological interventions should be built into existing health services used by FSW-IDUs, and new resources to be allocated for development of new services. Such psychological interventions need to tackle difficult issues such as self-stigma,

family support and abuse among FSW-IDUs. Such efforts are greatly warranted as FSW-IDUs are having very poor mental health, which has also shown to be associated with risk of HIV transmission.

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1. FSW-IDUs had high prevalence of depression, suicidal ideation and suicidal attempt in the last six months.
2. Self-stigma was significantly associated with depression, suicidal ideation and suicidal attempt.
3. The association between self-stigma and suicidal ideation/attempt was fully mediated by depression.
4. The association between family break-up, abuse history and suicidal ideation/attempt was partially mediated by depression.
5. Psychological intervention efforts should include components such as self-stigma, family support and abuse.

Table 1

Background characteristics of by mental health status (n=200)

	Total		Depression (column %)			Suicidal ideation (column %)			Suicidal attempt (column %)		
	n	%	No	Yes	P value	No	Yes	P value	No	Yes	P value
Age											
30	82	41.0	41.3	40.3	0.882	36.4	47.2	0.123	38.7	50.0	0.159
>30	118	59.0	58.7	59.7		63.6	52.8		61.3	50.0	
Current marital status											
Single	72	36.0	38.8	29.9	0.416	40.9	29.2	0.074 ⁺	36.6	30.8	0.502
Married/cohabiting	93	46.5	43.8	51.9		46.4	47.2		44.4	53.8	
Divorced	35	17.5	17.4	18.2		12.7	23.6		19.0	15.4	
Residential status											
Local (Liuzhou)	173	86.5	86.8	85.7	0.832	86.4	86.5	0.975	85.9	86.5	0.912
Non-local	27	13.5	13.2	14.3		13.6	13.5		14.1	13.5	
Ethnicity											
Han	162	81.0	79.3	83.1	0.510	78.2	84.3	0.277	76.1	92.3	0.012 [*]
Minorities	38	19.0	20.7	16.9		21.8	15.7		23.9	7.7	
Education level											
Primary or below	27	13.6	11.6	15.8	0.511	11.9	15.7	0.106	14.9	11.5	0.510
Junior high	125	62.8	62.8	64.5		69.7	53.9		63.8	59.6	
Senior high or above	47	23.6	25.6	19.7		18.3	30.3		21.3	28.8	
Monthly personal income											
1000 RMB (about 150USD)	139	70.6	73.1	68.4	0.480	67.9	74.7	0.296	69.5	76.0	0.383
>1000 RMB (about 150USD)	58	29.4	26.9	31.6		32.1	25.3		30.5	24.0	
Duration of sex work											
<10 years	42	21.2	26.1	14.3	0.050 [*]	21.1	21.6	0.933	23.4	17.6	0.394
10 years	156	78.8	73.9	85.7		78.9	78.4		76.6	82.4	
Duration of drug use											
<10 years	61	30.5	34.7	24.7	0.136	27.3	34.8	0.250	31.0	30.8	0.977
10 years	139	69.5	65.3	75.3		72.7	65.2		69.0	69.2	

* p<0.05;

Data with $p < 0.05$ are in bold.

¹
 $p < 0.1$
₊

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Table 2

Descriptive statistics of the dependent and independent variables

	n	%
<u>Depression, suicidal ideation and suicidal attempt</u>		
Depression^a		
Normal	16	8.0
Mild	27	13.5
Moderate	79	39.5
Severe	41	20.5
Extremely severe	37	18.5
Had suicidal ideation in the last six months		
No	110	55.3
Yes	89	44.7
Had suicide attempt in the last six months		
No	142	73.2
Yes	52	26.8
<u>Socio-ecological factors</u>		
Individual-level		
Perceived Economic Pressure Scale (mean, s.d.) ^b	8.9	3.7
Self-stigma Scale (mean, s.d.) ^c	26.7	3.2
Interpersonal-level		
Poor relationship with regular partner		
Extremely disagree	15	7.5
Somehow disagree	61	30.8
No applicable	64	32.3
Somehow agree	50	25.2
Extremely agree	8	4.0
Completely broken up with family members		
Extremely disagree	56	29.1
Somehow disagree	46	23.9
No applicable	39	20.3
Somehow agree	45	23.4
Extremely agree	6	3.2
Perceived Social Support Scale (mean, s.d.) ^d	9.3	2.5
Organizational-level		
Main venue of sex work in the last six months		
Lower-end (streets, parks, etc.)	27	14.3
Middle-end (saloons/massage parlors/inns)	93	49.2
Higher-end (hotel/night clubs)	69	36.5
Charge per transaction		
<50 RMB (8 USD)	38	19.0

	n	%
50–100 (8–15 USD)	96	48.0
>100 (15 USD)	66	33.0
Social-level		
Abused (verbal, physical or threats) by clients/gatekeepers in the last six months		
No	150	75.0
Yes	50	25.0
Perceived Social Stigma Scale (mean, s.d.) ^e	17.1	2.7

^a 82.6% to 94% reported having depression symptoms to the seven items of the Depression Subscale.

^b 63.4%–79.8% reported having some/severe economic pressure according to the six items of the Perceived Economic Pressure Scale.

^c 73%–92.5% gave agreeable or extremely agreeable answers to the nine items of the Self-stigma Scale.

^d 51.5%–54.5% received no or little support from family members and 67.5%–71.5% received no or little support from friends.

^e 54.0%–89.0% gave agreeable responses toward the six individual items of Perceived Social Stigma

Table 3

Associations between background variables and mental health outcomes (univariate analyses)

	Depression		Suicidal ideation		Suicidal attempts	
	Row %	OR _u (95%CI)	Row %	OR _u (95%CI)	Row %	OR _u (95%CI)
Age						
30	27.8	1.00	44.4	1.00	22.2	1.00
>30	40.0	1.73(0.59,5.07)	44.8	1.01(0.38,2.68)	27.3	1.31(0.41,4.18)
Current marital status						
Single	32.9	1.00	38.9	1.00	23.5	1.00
Married/cohabiting	43.0	1.54(0.81, 2.94)	45.7	1.32(0.70, 2.47)	30.8	1.44(0.70,2.95)
Divorced	40.0	1.36(0.59, 3.15)	54.3	1.90(0.95, 4.12) ⁺	22.9	0.96(0.36,2.53)
Residential status						
Local (Liuzhou)	42.5	1.00	44.2	1.00	28.2	1.00
Non-local	33.9	0.69(0.36,1.32)	49.2	1.22(0.65,2.26)	29.0	1.04(0.52,2.07)
Ethnicity						
Han	40.0	1.00	46.6	1.00	30.8	1.00
Minorities	34.2	0.78(0.37,1.63)	36.8	0.66(0.32,1.38)	10.5	0.26(0.08,0.78)[*]
Education level						
Primary or below	46.2	1.00	51.9	1.00	22.2	1.00
Junior high	39.2	0.75(0.32,1.76)	38.7	0.58(0.25,1.35)	25.6	1.20(0.44,3.26)
Senior high or above	32.6	0.56(0.21,1.51)	57.4	1.25(0.48,3.24)	33.3	1.75(0.58,5.25)
Monthly personal income						
1000 RMB (150USD)	37.8	1.00	43.3	1.00	29.5	1.00
>1000 RMB (150USD)	40.0	1.09(0.61,1.95)	45.3	1.08(0.61,1.90)	23.3	0.72(0.37,1.38)
Duration of sex work						
<10 years	26.2	1.00	28.6	1.00	14.3	1.00
10 years	42.9	2.11(0.99,4.51)[*]	45.3	2.06(0.39,10.92)	27.0	2.22(0.26,18.92)
Duration of drug use						
<10 years	31.1		50.8		26.7	
10 years	42.3	1.62(0.86,3.07)	42.0	0.70(0.38,1.28)	26.9	1.01(0.51,2.01)

OR_u: Odds ratios of univariate logistic regression models.

ORs and 95% confidence intervals with $p < 0.05$ are in bold.

[†] $p < 0.1$.
[‡] $p < 0.05$.
^{*}

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Table 4

Associations between socio-ecological factors and probable depression

	<u>Univariate analysis</u>	<u>Adjusted analysis (adjusting for background variable)</u>
	OR_u(95%CI)	OR_a(95%CI)
Individual-level:		
Perceived Economic Pressure Scale (mean, s.d.)	1.05(0.97,1.14)	1.04(0.96,1.12)
Self-stigma Scale (mean, s.d.)	1.19(1.08,1.32) ***	1.18(1.07,1.31) ***
Interpersonal-level:		
Poor relationship with regular partner		
Extreme disagree/somehow disagree/not applicable	1.00	1.00
Extremely agree/somehow agree	1.22(0.68, 2.20)	1.25(0.69, 2.25)
Completely broken up with family members		
Extreme disagree/somehow disagree/not applicable	1.00	1.00
Extremely agree/somehow agree	1.60(0.83,3.08)	1.63(0.84,3.17)
Perceived Social Support Scale (mean, s.d.)	0.93(0.83,1.05)	0.95(0.84,1.07)
Organizational-level:		
Main venue of sex work in the last six months		
Lower-end (streets, parks, etc.)	1.00	1.00
Middle-end (saloons/massage parlors/inns)	1.99(0.79,5.02)	1.78(0.69,4.56)
Higher-end (hotel/night clubs)	1.14(0.43,3.00)	0.97(0.36,2.63)
Charge per transaction		
<50 RMB (8 USD)	1.00	
50–100 (8–15 USD)	0.90(0.42,1.93)	0.89(0.41,1.93)
>100 (15 USD)	0.77(0.34,1.75)	0.78(0.34,1.79)
Social-level:		
Abused (verbal, physical or threats) by clients/gatekeepers in the last six months		
No	1.00	
Yes	1.74(0.91,3.34) ⁺	1.80(0.93,3.51) ⁺
Perceived Social Stigma Scale (mean, s.d.)	1.06(0.95,1.18)	1.05(0.94,1.17)

OR_u: Odds ratio of univariate logistic regression model.OR_a: Odds ratio of logistic regression model adjusting for background variable (duration of sex work).***
p<0.001;⁺
p<0.1.

ORs and 95% confidence intervals with p<0.05 are in bold.

Table 5

Associations between socio-ecological factors and suicidal ideation (last 6 months)

	<u>Univariate analysis</u>	<u>Adjusted analysis (adjusting only for background variables)</u>	<u>Adjusted analysis (adjusting for background variables And depression)</u>
	<u>OR_U(95%CI)</u>	<u>OR_A(95%CI)</u>	<u>OR_A(95%CI)</u>
Individual-level			
Perceived Economic Pressure Scale (mean, s.d.)	1.08(0.99,1.17) ⁺	1.08(1.00,1.17) ⁺	1.07(0.98,1.17)
Self-stigma Scale (mean, s.d.)	1.14(1.03, 1.24)**	1.08(1.01, 1.15)*	1.02(0.94, 1.46)
Interpersonal-level			
Poor relationship with regular partner			
Extreme disagree/somehow disagree/not applicable	1.00	1.00	1.00
Extremely agree/somehow agree	1.57(0.85,2.92)	1.34(0.70,2.54)	1.65(0.83,3.25)
Completely broken up with family members			
Extreme disagree/somehow disagree/not applicable			
Extremely agree/somehow agree	2.78(1.42, 5.42)**	2.60(1.35, 5.02)**	2.09(1.03,4.25)*
Perceived Social Support Scale (mean, s.d.)	0.99(0.89,1.10)	1.01(0.91,1.13)	1.03(0.92,1.16)
Organizational-level			
Main venue of sex work in the last six months			
Lower-end (streets, parks, etc.)	1.00	1.00	1.00
Middle-end (saloons/massage parlors/inns)	0.58(0.24,1.38)	0.56(0.23,1.35)	0.49(0.17,1.20)
Higher-end (hotel/night clubs)	0.42(0.17,1.03) ⁺	0.37(0.15,0.95) ⁺	0.37(0.14,0.94) ⁺
Charge per transaction			
<50 RMB (8 USD)	1.00	1.00	1.00
50–100 (8–15 USD)	1.16(0.54,2.48)	1.12(0.52,2.42)	1.14(0.52,2.52)
>100 (15 USD)	1.11(0.49,2.49)	0.99(0.43,2.28)	1.05(0.45,2.48)
Social-level			
Abused (verbal, physical or threats) by clients/gatekeepers in the last six months			
No	1.00	1.00	1.00
Yes	3.38(1.64, 6.98)***	2.15(1.32, 3.50)**	3.15(1.53,6.50)**
Perceived Social Stigma Scale (mean, s.d.)	1.06(0.95,1.18)	1.05(0.94,1.17)	1.04(0.93,1.16)

OR_U: Odds ratio of univariate logistic regression model.OR_A: Odds ratio of logistic regression model adjusting for background variable (marital status).***
p<0.001;**
p<0.01;*
p<0.05;⁺
p<0.1.

ORs 95% confidence intervals with p<0.05 are in bold.

Table 6

Associations between socio-ecological factors and suicidal attempt (last 6 months)

	<u>Univariate analysis</u>	<u>Adjusted analysis (adjusting for background variables)</u>	<u>Adjusted analysis (adjusting for background variables + depression)</u>
	OR_u(95%CI)	OR_a(95%CI)	OR_a(95%CI)
Individual-level			
Perceived Economic Pressure Scale (mean, s.d.)	1.06(0.97,1.15)	1.04(0.96,1.14)	1.04(0.95,1.13)
Self-stigma Scale (mean, s.d.)	1.10(1.00, 1.23) *	1.08(1.00, 1.16) *	1.01(0.93, 1.34)
Interpersonal-level			
Poor relationship with regular partner			
Extreme disagree/somehow disagree/not applicable			
Extremely agree/somehow agree	1.55(0.79,3.04)	1.45(0.73,2.88)	1.65(0.81,3.36)
Completely broken up with family members			
Extreme disagree/somehow disagree/not applicable			
Extremely agree/somehow agree	1.77(0.88,3.56)	1.75(0.86,3.57)	1.64(0.80,3.36)
Perceived Social Support Scale (mean, s.d.)	0.95(0.84,1.08)	0.96(0.84,1.09)	0.97(0.85,1.10)
Organizational-level			
Main venue of sex work in the last six months			
Lower-end (streets, parks, etc.)			
Middle-end (saloons/massage parlors/inns)	0.59(0.23,1.51)	0.50(0.19,1.31)	0.43(0.16,1.15)
Higher-end (hotel/night clubs)	0.91(0.35,2.37)	0.85(0.32,2.31)	0.83(0.31,2.28)
Charge per transaction			
<50 RMB (8 USD)			
50–100 (8–15 USD)	1.10(0.47,2.56)	0.97(0.41,2.31)	0.99(0.41,2.35)
>100 (15 USD)	0.93(0.37,2.36)	0.90(0.35,2.33)	0.86(0.33,2.24)
Social-level			
Abused (verbal, physical or threats) by clients/gatekeepers in the last six months			
No	1.00	1.00	1.00
Yes	3.18(1.33, 7.59) **	2.15(1.09, 4.24) *	3.30(1.36, 8.02) **
Perceived Social Stigma Scale (mean, s.d.)	1.01(0.89,1.14)	1.01(0.90,1.14)	1.01(0.90,1.14)

OR_u: Odds ratio of univariate logistic regression model.OR_a: Odds ratio of logistic regression model adjusting for background confounder (ethnicity).***
p<0.001;**
p<0.01;*
p<0.05;+
p<0.1.

ORs 95% confidence intervals with p<0.05 are in bold.