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A Syndemic including Cigarette Smoking and Sexual Risk Behaviors among a Sample of MSM in Shanghai, China

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Abstract

Objectives—We explored possible correlates of cigarette smoking and their associations with levels of smoking among a sample of Chinese men who have sex with men (MSM). We also explored the syndemic associations of substance use and psychosocial problems on sexual risk behaviors.

Methods—Cross-sectional data collection from 404 MSM in Shanghai, China.

Results—MSM exhibit a high prevalence of smoking (66.3%). Both light and heavy smoking were associated with alcohol and drug use, depression, intimate partner violence, sexual attitudes, and gay identity (though the associations for light smokers were moderate compared to those for heavy smokers).

Conclusions—Our findings indicate the presence of a health syndemic among MSM, and suggest that smoking prevention and cessation and other substance abuse interventions should be integrated into efforts preventing sexual risk behaviors among MSM.

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Contributors

This paper was based in part on a master's thesis of the first author co-chaired by Sullivan and Wong. Nehl served as a member on the thesis committee. Wong, Nehl, Zheng, and He are members of an ongoing study from which the data were drawn. Berg, Lin, Tran and Lemieux contributed to the interpretation of findings.

Conflict of Interest

No conflict declared

Keywords

Chinese MSM; Smoking; Health Syndemics; prevention; cessation

1. INTRODUCTION

Researchers in Western societies have found that men who have sex with men (MSM) and gay and bisexual men tend to experience more psychosocial problems such as depression, suicide, and intimate partner violence than their heterosexual counterparts (Herrick et al., 2011; Mustanski et al., 2007; Operario and Nemoto, 2010; Safren et al., 2010; Senn et al., 2010; Walkup et al., 2008). MSM also exhibit higher rates of cigarette smoking, alcohol abuse and drug use, and infection rates of HIV and other STIs (Colfax et al., 2004; Klein, 2011; Marshal et al., 2008; Rhodes et al., 1999; Van Tieu and Koblin, 2009; Walkup et al., 2008). Due to the multiple co-occurring biosocial issues that these sexual minority men face, researchers have argued that these MSM are experiencing a syndemic of health issues. Syndemic refers to the concentration within a specific population of two or more diseases that reinforce one another, ultimately giving rise to other health problems (Singer and Clair, 2003).

A variant of the syndemic framework is the “Minority Stress Theory” (Meyer, 1995, 2003), which posits that the stresses, including social discrimination against MSM, of being a minority are associated with adverse health outcomes, especially in the realm of mental health. Exposed to discrimination over time, these men are highly likely to experience stress, low self-esteem, and social isolation, all of which in turn compromise their health. Stall and colleagues have proposed a theory of “syndemic production” of health disparities among gay men in the urban United States, linking high rates of depression, substance use, and HIV/AIDS as intertwined epidemics among groups of gay men that arise from negative childhood or adolescent experiences associated with their emergent gay identities (Bruce and Harper, 2011; Friedman et al., 2008; Stall, 2008).

Western researchers have applied the syndemic framework to HIV research among MSM, finding considerable empirical support for a model in which co-occurring psychosocial problems such as substance use, depression, and intimate partner violence (IPV) are mutually reinforcing each other and together lower the health profile of gay men (Egan et al., 2011; Lee et al., 2009; Operario and Nemoto, 2010; Safren et al., 2010). For example, Storholm et al. found that young MSM (or YMSM) living in New York City were more likely to report cigarette smoking and that smoking was associated with using alcohol and a variety of illicit substances. In addition, YMSM who smoked cigarettes reported a greater number of casual sex partners and transactional sex partners than non-smokers (Storholm et al., 2011).

1.1 Cigarette Smoking in China

Globally, tobacco use is the second leading cause of death (Ezzati et al., 2002) and the leading preventable cause of disease, disability, and death (WHO, 2009). Cigarette smoking causes approximately five million deaths per year, accounting for one in ten deaths among adults worldwide (WHO, 2009). China is home to nearly one-third of all smokers worldwide (Yang et al., 1999) and is the leading producer and consumer of tobacco products (Lam et al., 1997; O’Connor et al., 2010). Evidence has shown that tobacco use in China significantly increases the risk of many diseases such as Chronic Obstructive Pulmonary Disease (COPD) and respiratory tuberculosis (Zhang and Cai, 2003), and vascular and heart diseases (Chen et al., 1997; Gu et al., 2009; He et al., 2005). Additionally, smoking is responsible for a high burden of many cancers including lung, esophagus, stomach, and liver

cancers (Chen et al., 2003, 1997; Gan et al., 2007; Liu et al., 1998; Qiu and Chen, 2009; Wang et al., 2010, 2000; Yang et al., 1999; Zhang and Cai, 2003; Zhong et al., 1999). Currently, more than one third of cancer deaths in China are attributable to smoking, while the number of smoking attributable deaths has declined in the US (Rostron, 2012; Wang et al., 2010). Over one million annual deaths in China have been attributed to smoking, and estimated mortality will reach two million by the year 2025 (Liu et al., 1998; Yan, 2008). Besides its impact on health outcomes, smoking also increases the economic burden on the country. While the tobacco industry itself is profitable in China, the negative economic consequences caused by tobacco use are undeniable. The total economic cost of smoking in China increased from US$17.1 billion in 2003 to US$28.9 billion in 2008, accounting for 0.7% of China's Gross Domestic Product and 3.0% of total national health expenditures (Yang et al., 2011).

Research in China has also shown that smoking is significantly related to education, occupation, income, and location (Yang et al., 1999). For example, prevalence among adult men is lowest among those with at least a college education (54.2%) and highest among those with no more than a primary school education (72.4%; Yang et al., 1999). In addition, more than 70% of Chinese smokers are farmers, factory or service workers, private company employees, self-employed, or members of the floating or itinerant population who lack a fixed residence (Yang et al., 1999). Other studies have found that smoking is more prevalent among lower-income populations, and that urban residents exhibit significantly lower rates of smoking and cigarette consumption (Anderson Johnson et al., 2006).

The most striking feature of Chinese smokers is that the vast majority of them are adult males. Smoking prevalence ranges from 52.4% to 64% among males over 15 years old (Anderson Johnson et al., 2006; Li et al., 2011; Shi et al., 2008; Wang, 2006; WHO, 2009; Zhang et al., 2011) versus 2.4% to 6.4% among females (Li et al., 2011; Shi et al., 2008; Wang, 2006; Zhang et al., 2011). Tobacco use also accounts for more than 50% of gender differences in life expectancy (Wang et al., 2010).

Among male smokers in China, certain sub-groups justify particular attention. One such sub-group are MSM. As indicated above, Western and international literature have consistently documented higher prevalence of smoking among MSM than their heterosexual counterparts (Stall et al., 1999; Tang et al., 2004). However, the reach of Chinese governmental health initiatives into the gay community remains limited due to continued social stigma and fear of experiencing discrimination, which discourages MSM from engaging health authorities (Daily, 2010). Only one study has assessed smoking and other substance use behaviors among a sample of MSM in Shanghai, China. This study found that smoking prevalence and cigarette consumption were higher among MSM than adult males in general (Berg et al., 2011), suggesting the need for further research into smoking among this population.

Guided by the syndemic framework and findings from previous research, in this study we aimed to (1) identify and describe the psychosocial correlates for cigarette smoking among a sample of MSM in China; (2) compare the associations of these correlates (e.g., alcohol and drug use, depression, IPV, sexual attitudes, and gay identity) on levels of smoking to examine the associations among these behavioral and psychosocial factors; and (3) explore the syndemic associations of substance use and psychosocial problems with sexual risks.

2. METHODS

2.1 Data Source

The data used were part of a larger study examining the characteristics of HIV/STIs, sexual risks, and health issues among MSM in Shanghai, China. Using a cross-sectional design, data were collected between February and April 2009 using respondent-driven sampling (RDS) during Phase I of the study (Abdul-Quader et al., 2006). Using RDS, a social network methodology used to estimate population characteristics, eight initial seeds (four "money boys" and four general MSM) were selected based upon their self-identifying as either a member of the "money boy" (i.e., MSM who sell sex to other men) or general MSM population. The seeds were then asked to recruit up to three peers each and received U.S. $10 for each successful recruit. The recruited peers themselves were then asked to recruit other participants using the same method. A payment of U.S.$40 to participants for completing the survey was commensurate with their efforts and did not constitute an excessive amount based on local standards. All participants were informed of the nature and purpose of the study, survey procedures, the sensitive nature of questions, and confidentiality parameters and then provided their written consent. Institutional review boards (IRB) in the U.S. and China approved all protocols and consent forms, and all forms and procedures underwent standard and rigorous translation and back-translation (Chinese-English-Chinese). Four hundred and four participants met the following criteria and were enrolled in the study: each (1) self-identified as a male; (2) was aged 18 or above; (3) was able to give verbal and written (in Mandarin) consent; and (4) had had sex (oral, anal, or both) with another man in the last 12 months. A de-identified dataset was used for data analysis.

2.2 Measures

2.2.1 Socio-demographic Characteristics—Participants were asked to report demographic characteristics such as date of birth, ethnicity (Han vs. other), occupation, education level (illiterate to middle school, high school or the equivalent, and college or more), marital status (married and other), monthly income (<1000 Yuan, 1000–2999 Yuan, 3000–4999 Yuan, and 5000 Yuan), location of legal residency (*hukou*) (Shanghai vs. other), and sexual orientation (openly gay or bisexual, closeted gay or bisexual, heterosexual or other). Subjects were also asked if they ever had had sexual or intimate contact with a woman, the age at which they experienced their first sexual contact with a man and woman (if applicable), and whether they ever had had sex for money.

2.2.2 Smoking Status and Level—All participants were asked if they had ever used cigarettes or tobacco and, if yes, how many cigarettes or tobacco products they had used on average per day during the past three months. A continuum including non-smokers, light smokers (those who smoked less than 10 cigarettes per day) and heavy smokers (those who smoked 10 or more cigarettes per day) was created for ease of interpretation.

2.2.3 Alcohol and Drug Use—Participants were asked if they had ever consumed any alcoholic drinks (e.g., beer, wine, and liquors) and, if yes, how many drinks they had consumed on average per day during the past three months. Responses were then coded into two levels: alcohol use and no alcohol use. Subjects were also asked if they had ever used any drugs (i.e., ecstasy, heroin, marijuana, opium, ice toxic, methamphetamine, cocaine, tranquilizers and stimulants) and, if yes, how many times they had used drugs on average per day during the past 3 months.

2.2.4 Depression—A short-form version of the Center for Epidemiologic Studies Depression Scale (CES-D) was used to screen for depressive symptoms (Poulin et al., 2005).

Twelve items (e.g., “You had trouble keeping your mind on what you were doing.”) were used to assess depressive symptoms by asking participants to indicate the number of days in the past week during which they had experienced the stated emotion or exhibited the stated behavior. Participants were asked to respond using a four-point range from 0 (rarely or none of the time [less than one day in the past week]) to 3 (most or all of the time [5 to 7days in the past week]). The Cronbach’s Alpha of the short-form CES-D scale was 0.85. A higher score indicated more depressive symptoms for the participant. The sum score of the depression items was calculated for each subject and a dichotomous variable of depression was created: participants with a score higher than 10 were coded as depressive and those with a score of 10 or less were coded as normal.

2.2.5 Intimate Partner Violence—A scale for IPV was developed and used to screen for partner violence. Both verbal and physical violence were assessed. For example, participants were asked if their partners ever hit or threw something at them or if they were ever verbally threatened, and were asked to respond either “Yes” or “No” to these questions. The Cronbach’s Alpha of the IPV scale was 0.73. The total number of “Yes” responses yielded a sum score for IPV, and a higher score indicated greater exposure to IPV.

2.2.6 Lesbian, Gay, and Bisexual Identity Scale—The Lesbian, Gay, and Bisexual Identity Scale (LGBIS) was used to assess sexual orientation or gay identity. Participants were asked to rate 18 items such as “I prefer to keep my same-sex romantic relationships private” using a 7-point Likert format (1 = strongly disagree, 7 = strongly agree). The core domains of the scale cover internalized homonegativity, the need for acceptance and privacy, identity confusion, and feelings of superiority. The Cronbach’s Alpha of LGBIS was 0.62. A higher scale score indicated more comfort with one’s gay identity, suggesting that the participant was proud of being homosexual.

2.2.7 Sexual Attitudes—We assessed sexual attitudes using a scale of 23 questions covering three domains: permissiveness, birth control, and instrumentality. All items were rated on a 7-point Likert format (1 = disagree strongly, 7 = agree strongly). For example, participants were asked if they agreed with statements such as “Casual sex is acceptable.” The Cronbach’s Alpha of the scale was 0.79. The sum score of sexual attitudes was calculated and a higher score indicated a more open attitude about sex.

2.2.8 Sexual Risk Behaviors—Eleven questions were developed to assess lifetime sexual risk behaviors. The scale was developed using HIV public health literature to reflect dimensions of sexual behaviors that have been found to increase the possibility of STIs. For example, participants were asked to report if they ever had had unprotected sex with their main sex partner, a prostitute, or a casual partner. They were also asked if they ever had sex after drinking alcohol or using drugs, or had sex without a condom while under the influence of alcohol or drugs. All responses were coded dichotomously (0 = No and 1 = Yes) and the sum score (0–11) of the 11 items was calculated. The reliability of the scale was 0.62. A higher sum score for sexual risk behaviors indicated a greater number of risky sexual practices engaged in by the participant.

2.3 Analytic Strategies

Preliminary analyses were performed to assess the participants socio-demographic characteristics, stratified by cigarette smoking status (i.e., non-smoker, light smoker, or heavy smoker). Characteristics included age, *hukou*, education, income, sexual orientation, participant type (general MSM or “money boy”), and age at first sexual contact with a man and woman. We selected age, *hukou*, education, and income based on previously published associations (Anderson Johnson et al., 2006; Yang et al., 1999, 2001), and sexual

orientation, participant type, and age at first sexual contact based on our selection of MSM as the target population. We used one-way analysis of variance (ANOVA) for statistical testing on continuous variables and chi-squares on categorical variables. Subsequently, the psychosocial health problems found to be significantly associated with cigarette smoking were then entered into separate logistic regression models to explore their associations with cigarette smoking.

To assess syndemic effects, relationships between factors (substance use such as smoking, alcohol and drug use, and psychosocial conditions such as depression and IPV) and sexual risk behaviors were tested. First, a linear regression model was constructed to explore if a cluster of psychosocial conditions would exert a synergistic effect on sexual risks. Then, substance use was entered into the model to test if the seven predictors (smoking status, alcohol use, drug use, depression, sexual attitudes, IPV, and gay identity) worked together to produce a syndemic effect on sexual risk behaviors. SPSS 19 was used for data analysis.

3. RESULTS

We examined homophily (similarity) and heterophily (social distance) to explore recruitment patterns resulting from the RDS (e.g., seeds are theoretically more likely to recruit participants similar to themselves). Results indicated extremely high recruitment homophily and corresponding heterophily, i.e., almost 97% of the time money boys recruited other money boys, and over 95% of general MSM recruited fellow general MSM. Based on these results and the significant differences in personal demographics between money boys and general MSM, RDS weights were not used for subsequent analyses. Instead, we opted to treat these groups as separate comparison groups throughout the study. Table 1 summarizes the sample's demographic characteristics. The average age of participants was 29.7 years. Most were Han Chinese (96%), were migrants to Shanghai (79.7%), had at least a high school education (63.2%), and had a monthly income between 1000 to 4999 Yuan (79.1%). The distribution of cigarette smoking varied by educational group ($p = .001$); for example, 35.3% of non-smokers, 19.4% of light smokers, and 15.2% of heavy smokers had at least a college education. Most participants were closeted gay or bisexual (79.5%), not married (85%), and about half of them identified as "money boys" (49.5%). The average age at first sexual contact with men was 19.9 years old, and 20.4 years with women.

Of the 404 participants, prevalence of smoking during the past 3 months was approximately 66.3%. One hundred and thirty-six participants were non-smokers, while 108 were categorized as light smokers and 160 as heavy smokers.

Table 2 presents the results of logistic regressions of demographics, alcohol use, drug use, and psychosocial behaviors on smoking. In our sample, smoking was not associated with age. Smoking was, however, significantly associated with having less than a college level education; participants with a high school or equivalent level of education were more likely to engage in smoking than those with a lower level of education. Compared to alcohol users, participants who had not consumed alcohol during the past three months were less likely to smoke. In particular, the results indicated similar associations for specific alcohol types such as beer, rice wine and Chinese wine. Drug use was also significantly related to smoking; participants who did not use drugs were also less likely to smoke (OR < 1). Also, more participants with depressive symptoms engaged in smoking. In our sample, however, smoking was not related to the extent of exposure to IPV.

Overall, the predictors exerted an effect in the same direction, though of varying magnitudes of effect on predicting different levels of smoking. That is, the effects on heavy smokers were generally more extreme (i.e., further from 1.00). For example, compared to participants

with a college education or higher, those with a high school education were more likely to be light smokers (OR = 2.39, $p < 0.05$) and were even more likely to be heavy smokers (OR = 3.07, $p < 0.001$). Similarly, compared to drug users, participants who had never used drugs were less likely to be light smokers (OR = 0.47, $p < 0.05$) and were even less likely to be heavy smokers (OR = 0.36, $p < 0.01$). The effects on light smokers were moderate compared to those on heavy smokers, indicating a syndemic effect from these demographic, substance use, and psychosocial factors by the level of smoking.

There were significant correlations between substance use, psychosocial conditions, and sexual risk behaviors. The correlations indicated that sexual risks were significantly correlated with smoking ($p < 0.01$), alcohol use ($p < 0.01$), drug use ($p < 0.01$), sexual attitudes ($p < 0.01$), IPV ($p < 0.01$), and gay identity (LGBIS, $p < 0.05$). Depression, however, was not correlated with sexual risks in this sample. In the linear regression model predicting sexual risks in Table 3, the first-step regression included four psychosocial conditions to predict smoking status. Sexual attitudes (p<0.001), IPV ($p < 0.001$) and gay identity ($p < 0.01$) were statistically significant predictors of sexual risk behaviors. The second-step included psychosocial conditions and behavioral predictors. Smoking (p<0.05), alcohol (p<0.001), and drug use (p<0.001), sexual attitudes (p<0.001), IPV (p<0.001) and gay identity (p<0.01) were statistically significant predictors of sexual risk behaviors. Cigarette smoking, alcohol and drug use, and exposure to IPV significantly increased the odds of engaging in more sexual risk behaviors. In contrast, more open attitudes about sex and being more comfortable with one's gay identity were associated with fewer sexual risk behaviors.

4. CONCLUSIONS

Findings from this study are consistent with previous studies from Western countries indicating a high prevalence of cigarette smoking among MSM. The strong association found between education level and smoking is consistent with previous research in China, suggesting the importance of health interventions for MSM smokers with lower education levels. Smokers were more depressed and more likely to use alcohol and drugs. Although we did not formally test for a dose-response effect, the point estimates for associations between psychosocial conditions and cigarette smoking suggest that heavy smokers might be more likely than light smokers to drink alcohol, use drugs, be more open about sex, and engage in sexual risk behaviors. Our results are consistent with the "Minority Stress Theory" that sexual minorities participate in more adverse health behaviors, possibly to cope with a stressful social environment. Further research should examine the impact of stress among Chinese MSM as a sexual minority group and explore additional correlates of sexual minority stress and adverse health behaviors.

Our results suggest that being more comfortable with gay identity is associated with smoking. It is possible that when a gay/bisexual man comes out in China, they may experience greater levels of social stigma, shame and fear of reprisal. Therefore, he may in turn be more likely to engage in risky behavior as a coping mechanism. Also, the "syndemic production" of health disparities among Shanghai gay men in our sample linked high rates of depression, substance use and HIV/AIDS as an intertwined epidemic. According to the syndemic theory, the combined effects of those health conditions may influence the sexual risk-taking behaviors of MSM. These findings suggest multiple opportunities for interventions to reduce HIV/AIDS risks and decrease health disparities among gay and bisexual men in China.

This study is one of the first to examine smoking prevalence by applying the syndemic theory to HIV research among MSM in China. With its adequate sample size, this study can

serve as a building block for further investigation. However, since our study relies on self-reported measures of both exposure and outcome variables, results may be subject to measurement error or misclassification biases (Perez-Stable et al., 1992; Wagenknecht et al., 1992). In addition, the breadth of sexual risk behaviors in this study was limited to condom use and sex with casual sex partners or prostitutes, so that conclusions may not be generalizable to other sexual risks.

Finally, we did not weight the sample data to compensate for the over-sampling of participants who have larger network sizes and more recruitment paths (Semaan et al., 2002). In our sample, recruitment was very homogenous (with the exception of 7 people) by participant type, money boys by and large only recruited money boys and general MSM by and large only recruited general MSM. Our study sample is somewhat consistent with other MSM studies in China in terms of demographic characteristics (Choi et al., 2008; Wong et al., 2008). However, future studies should attempt to draw more representative samples of Chinese MSM.

Overall, our findings confirm that Chinese MSM exhibit a high prevalence of smoking, and their level of smoking may be influenced by multiple factors such as alcohol and drug use, depression, and IPV. The adverse behaviors and psychosocial conditions work together in a syndemic fashion to lower the sexual health status of MSM. Therefore, It is likely that a comprehensive behavioral intervention may be more effective if it addresses several syndemic problems (i.e., smoking, alcohol abuse and drug use, etc). However, further research is needed for a clear understanding of how these factors interrelate and affect sexual risk-taking behaviors among MSM.

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Table 1

Demographic Characteristics of 404 MSM by Cigarette Smoking Status Recruited by Respondent-Driven Sampling in Shanghai Men's Study in Shanghai, China, 2008–2009

Characteristics	Non- Smoker (n = 136)	Light Smoker (n = 108)	Heavy Smoker (n = 160)	P-Value
		Mean (SD)		
Age (years)	29.4 (10.8)	28.2(9.6)	30.8(10.5)	F(2) = 2.04, p = 0.13
Age at first sexual contact with men (years)	20.2(5.9)	19.1(5.3)	20.2(6.7)	F(2)=1.26, p=0.29
Age at first sexual contact with women (years)	21.0(5.2)	19.9(4.0)	20.3(4.4)	F(2)=1.39, p=0.25
		n (%)		
Ethnicity				
Han	133 (97.8)	101(95.3)	152(95.0)	x2 (2) =1.71, p=0.43
Other	3 (2.2)	5(4.7)	8(5.0)	
Hukou				
Shanghai	31 (22.8)	15(13.9)	36(22.5)	x2 (2)=3.75, p=0.15
Other	105 (77.2)	93(86.1)	124(77.5)	
Education Level				
Illiterate to Middle School	43 (31.6)	40(37.0)	65(41.1)	x2 (4)=17.93, p =0.001
High School or equivalent	45 (33.1)	47(43.5)	69(43.7)	
College or more	48 (35.3)	21(19.4)	24(15.2)	
Income (Yuan)				
<1000	14 (10.3)	5(4.7)	6(3.8)	x2 (6)=7.57, p=0.27
1000–2999	61 (44.9)	56(52.3)	87(54.4)	
3000–4999	40 (29.4)	29(27.1)	46(28.8)	
≥5000	21 (15.4)	17(15.9)	21(13.1)	
Sexual Orientation				
Openly Gay/Bisexual	19 (14.0)	6(5.6)	24(15.0)	x2 (4)=7.13, p=0.13
Closeted Gay/Bisexual	108 (79.4)	90(83.3)	123(76.9)	
Other	9 (6.6)	12(11.1)	13(8.1)	
Participant Type				
'Money Boy'	60 (44.1)	63(58.3)	77(48.1)	x2 (2)=5.07, p=0.08
General MSM	76 (55.9)	45(41.7)	83(51.9)	
Marital Status				
Married	24 (17.9)	11(10.3)	25(15.6)	x2 (2)=2.81, p=0.25
Other	110 (82.1)	96(89.7)	135(84.4)	

Table 2

Bivariate Logistic Regression Models: Associations Between Demographic, Behavioral, and Psychosocial Predictors by Smoker Type among 404 MSM Recruited by Respondent-Driven Sampling in Shanghai Men's Study, Shanghai, China, 2008–2009

	Heavy smoking		Light smoking	
Predictors	**OR**	**(95% CI)**	**OR**	**(95% CI)**
Age	1.01	(0.99, 1.04)	0.99	(0.96, 1.01)
Education Level				
College or more	Reference		Reference	
Illiterate to Middle School	3.02***	(1.62, 5.64)	2.13*	(1.09, 4.15)
High School or equivalent	3.07***	(1.65, 5.67)	2.39**	(1.24, 4.60)
Consumed Alcohol in Past Three Months?				
Yes	Reference		Reference	
No	0.32*	(0.13, 0.83)	0.34*	(0.12, 0.92)
Consumed Beer in Past Three Months?				
Yes	Reference		Reference	
No	0.40***	(0.25, 0.65)	0.33***	(0.19, 0.57)
Consumed Rice Wine in Past Three Months?				
Yes	Reference		Reference	
No	0.39**	(0.20, 0.73)	0.71	(0.34, 1.52)
Consumed Chinese Wine in Past Three Months?				
Yes	Reference		Reference	
No	0.42*	(0.19, 0.95)	0.69	(0.27, 1.78)
Ever Used drugs?				
Yes	Reference		Reference	
No	0.36**	(0.18, 0.72)	0.47*	(0.22, 0.98)
Ever Used Ecstasy?				
Yes	Reference		Reference	
No	0.30*	(0.11, 0.84)	0.42	(0.14, 1.30)
Depression?				
Yes	Reference		Reference	
No	0.54**	(0.34, 0.86)	0.56*	(0.34, 0.94)
Intimate Partner Violence	1.13	(0.95, 1.33)	1.01	(0.84, 1.23)
Sexual Attitudes	0.98***	(0.96, 0.99)	0.99	(0.98, 1.01)
Gay Identity	1.29	(0.94, 1.77)	1.98***	(1.37, 2.87)

*Significant at an alpha level = 0.05.

**Significant at an alpha level = 0.01.

***Significant at an alpha level = 0.001.

Table 3

Linear Regression Models: Mental Health Conditions and Substance Use in Relation to Sexual Risk Behaviors among 404 MSM Recruited by Respondent-Driven Sampling in Shanghai Men's Study, Shanghai, China, 2008–2009.

	Lifetime Sexual Risk Behaviors			
Predictors	**Beta Coefficient in Model 1**	**R^2 in Model 1**	**Beta Coefficient in Model 2**	**R^2 in Model 2**
Depression	0.03	0.1	0.02	0.19
Sexual Attitudes	−0.02***		−0.02***	
Intimate Partner Violence	0.28***		0.24***	
Gay Identity (LGBIS)	−0.44**		−0.41**	
Cigarette Smoking in Past Three Months			0.23*	
Alcohol Use in Past Three Months			1.16***	
Lifetime Drug Use			1.04***	

* Significant at an alpha level = 0.05

** Significant at an alpha level = 0.0.1

*** Significant at an alpha level = 0.001