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Alcohol use and binge drinking among men who have sex with men in China: Prevalence and correlates

Wenjian Xu[a,b,c], Yong Zheng[b,*], John Mark Wiginton[c], Michelle R. Kaufman[c]

[a] Department of Sociology & Psychology, School of Public Administration, Sichuan University, Chengdu 610065, Sichuan, China
[b] Faculty of Psychology, Southwest University, Beibei, Chongqing, 400715, China
[c] Department of Health, Behavior & Society, Johns Hopkins Bloomberg School of Public Health, Baltimore, MD, 21205, USA

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ABSTRACT

Background: Both alcohol use/misuse and HIV incidence are increasing among men who have sex with men (MSM) in China. Little is known about predictors of alcohol use/misuse.
Methods: An online nationwide sample (n = 1100) of MSM from mainland China was recruited between 2014 and 2015. The study objective was to examine the prevalence of a history of alcohol use and frequency of binge drinking in the previous 6 months in this population and assess their relationship with psychological and public health issues.
Results: Nearly 62.1% of respondents reported a history of alcohol use; 30.7% were current infrequent binge drinkers; and 13.6% were current frequent binge drinkers. Adjusted logistic models showed that MSM who reported a history of alcohol use were more likely to report drug use in the previous 6 months (AOR = 1.67); higher levels of internalized homophobia (AOR = 1.49); and partial or full disclosure of their sexual orientation (AOR = 1.46). MSM engaging in current frequent binge drinking were more likely to report female sexual partners (AOR = 2.04) and drug use (AOR = 1.61) in the previous 6 months; higher levels of sexual sensation seeking (AOR = 1.68); and higher levels of homosexual stigma (AOR = 1.69). MSM who reported being unsure of their HIV status were less likely to be current frequent binge drinkers (AOR = 0.46).
Conclusions: A high prevalence of a history of alcohol use and binge drinking exists among Chinese MSM. Strategies that target alcohol use/misuse in this population are needed.

1. Introduction

Men who have sex with men (MSM) are encountering an upsurge in HIV burden in China, where the proportion of HIV infection increased from nearly 1%–8% from 2003 to 2014 (National Health and Family Planning Commission of the People's Republic of China, 2015). A meta-analysis (Zhou et al., 2014) including 84 studies conducted from 2009 to 2014 showed that an average estimated proportion of HIV among MSM was 6.5%, much higher than the average for the general population (less than 0.1%). With the striking increase in HIV infections among MSM in China, there is an urgent need for more robust HIV prevention programs, especially ones that target high risk factors, such as alcohol use/misuse. A great deal of literature has documented the link between alcohol use/misuse and HIV risk behavior in a variety of settings (Baliunas et al., 2010).

1.1. Alcohol use and binge drinking

Alcohol use/misuse results in substantial morbidity, mortality, and economic cost (Rehm et al., 2009). Alcohol usage is estimated to be the third leading cause of disability and death worldwide, contributing to nearly 3.3 million deaths each year (World Health Organization, 2014). Binge drinking, a common pattern of excessive alcohol use, has been found to be associated with a wide range of social and public health issues such as interpersonal violence, unintentional injuries and suicide, and alcohol poisoning (Centers for Disease Control and Prevention, 2014). As a risk factor for developing alcohol use disorder and its potentially adverse risk for numerous problems (Arria et al., 2013), binge drinking has drawn increased attention from a variety of perspectives (Rowe et al., 2016; Piano et al., 2017; Fish et al., 2018).

* Corresponding author.
E-mail address: zhengy@swu.edu.cn (Y. Zheng).

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1.2. Binge drinking among MSM

Binge drinking may be defined as a pattern of drinking that results in a blood-alcohol concentration level of 0.08 g/dl, which, for men, typically requires five drinks during a two-hour time period (NIAAA, 2018). There are other definitions that vary slightly in terms of quantity (Courtney and Polich, 2009); duration (Piano et al., 2017); and time-frame such as past week (Yang et al., 2015), past month (Okoro et al., 2004), and past 6 months (Weissenborn and Duka, 2003). Regardless of the definition used, a high prevalence of binge drinking has consistently been documented among MSM (Newcomb et al., 2014; Hess et al., 2015; Santos et al., 2015). For example, Hess et al. (2015) used the 2011 National HIV data to find that 59% of MSM in the United States who drank reported ≥1 episode of binge drinking in the previous month. In multiple countries, research has revealed associations between binge drinking and HIV-related risks for MSM. For example, high rates of binge drinking among MSM have been linked to increased drug use, condomless anal sex, multiple sexual partners, sexually transmitted infections (STIs), and even HIV in the U.S. (Hess et al., 2015; Rowe et al., 2016), Peru (Herrera et al., 2017), and Thailand (Holtz et al., 2015). However, other studies regarding MSM have found no association between binge drinking and unprotected anal intercourse (Golin et al., 2009) or sex with multiple male partners (Martinez et al., 2016). Research examining associations between binge drinking and HIV risk among MSM in China is limited; to our knowledge, only two studies have been conducted, and they demonstrated that reported binge drinking was associated with knowing multiple gay/bisexual men (Lu et al., 2013), having more recent male sexual partners (Lu et al., 2013), having condomless insertive anal intercourse (Liu et al., 2016), and being HIV-infected (Liu et al., 2016).

1.3. Minority stress

The stress sexual minorities might experience as a result of social exclusion, a culture's stigma against sexual minorities, and internalized homophobia may contribute to associations between binge drinking and HIV-related risks. For example, a higher level of internalized homophobia has been positively associated with greater alcohol use severity in sexual minorities in the U.S. (Lehavot and Simoni, 2011).

Sexual minorities in China experience stigma due to their sexual orientation (Choi et al., 2016). Same-sex marriage is illegal in the country. Moreover, sexual minority men in China report a relatively high prevalence of internalized homophobia (Xu et al., 2017a). MSM in China may utilize alcohol to cope with this stress. However, limited research has focused on the association between binge drinking and minority stress in China.

1.4. Sensation seeking

Researchers have also found that sensation seeking is consistently related to binge drinking or greater alcohol consumption (Heidinger et al., 2015). Sensation seeking, which has been labeled as a "disinhibited personality", is defined by the need for varied, novel, and complex sensations and experiences and the willingness to take physical and social risks for the sake of the experiences (Kalichman et al., 1994). Studies in the U.S. have observed that young MSM with higher sensation seeking scores tend to engage in a greater frequency of alcohol and drug use with partners (Newcomb et al., 2011), and MSM with higher levels of sexual sensation seeking are more likely to engage in risky sexual behavior while under the influence of alcohol (Heidinger et al., 2015). In China, researchers found that MSM with higher levels of sexual sensation seeking have a significant tendency to engage with multiple casual sexual partners and to have condomless anal sex as compared to those with lower levels of sensation seeking (Xu et al., 2016; Gao et al., 2017). Aside from these two studies, little is known about the relationship between alcohol use/misuse and sensation seeking among MSM in the Chinese context.

1.5. The present study in China

Research on alcohol use/misuse patterns and HIV-related risks among Chinese MSM is scarce (Lu et al., 2013; Fan et al., 2016; Liu et al., 2016), and findings from past research examining risky behavior and binge drinking among MSM is inconsistent (Hess et al., 2015). The increasing HIV incidence among Chinese MSM is alarming, and targeting factors associated with HIV transmission is needed. Therefore, we aimed to explore the prevalence of alcohol use and the frequency of binge drinking in a Chinese MSM sample. Further, we aimed to examine alcohol use and its association with HIV-related risks, minority stress, and selected personality traits.

2. Methods

2.1. Sampling methods and recruitment

Data for the current study was drawn from a cross-sectional online survey of 1100 MSM from December 2014 to February 2015. Participants were recruited through advertisements posted on gay-oriented online websites. Participants accessed the survey by clicking on the advertisement address. The recruitment design and data collection process were similar to methods described elsewhere (Xu et al., 2017b, Xu et al., 2018a,b). We targeted the aforementioned sites in almost all provinces, municipalities, and autonomous regions of mainland China. Inclusion criteria were: (1) assigned male sex at birth, (2) resident of mainland China (the click links can create the user's city address), (3) sexual contact with another male, and (4) aged 16 years or older. Online informed consent was received before inviting participants to complete the survey. All study design details and procedures were approved by the Ethics Committee of [institution blinded for review] prior to participant recruitment.

2.2. Measures

2.2.1. Socio-demographics

Participants were asked their sex, current age, educational level, employment status, and current relationship status.

2.2.2. History of alcohol use and binge drinking

Participants were asked if they had a history of alcohol use in their lifetime, for which the two response options were no or yes. Participants were asked how often they had engaged in binge drinking (5 or more drinks of alcohol within a 2 -h period; Courtney and Polich, 2009) in the previous 6 months, for which the response options were: more than once per day, once per day, once per 2-to-3 days, once per week, once per 2 weeks, once per month, once per 2-to-3 months, once per 6 months, no, and unwilling to respond. We categorized the MSM who reported binge drinking once per week or more as *current frequent binge drinkers*, MSM who reported less than once per week as *current infrequent binge drinkers*, and those without binge drinking episodes in the previous 6 months as *current non-binge drinkers*.

2.2.3. Sexual identity

Self-disclosed sexual identity was assessed with the question, "Which of the following best describes you?" Response options were gay, bisexual, heterosexual, and other.

2.2.4. Sexual behavior and condom use

Sexual behavior was assessed by asking participants to report the number of male and female sexual partners they had during the previous 6 months. They were also asked to report the number of male and female sexual partners with which they did not use a condom in the previous 6 months.

2.2.5. Drug use

Participants were asked if they had used rush poppers, marijuana, crystal methamphetamine, MDMA, ketamine, cocaine, or crack cocaine in the previous 6 months.

2.2.6. History of STIs

History of STIs was assessed by asking participants if they had ever had an STI diagnosis, including syphilis, human papillomavirus, gonorrhoea, genital herpes, or chlamydia.

2.2.7. HIV status

HIV status was assessed by asking participants to report their current status, with options including HIV-positive, unsure of HIV status, and HIV-negative.

2.2.8. Outness

Outness with regard to one's sexual orientation was assessed using one question: "What is the extent to which you have disclosed your sexual orientation to others?", with three response options: never disclosed, partially disclosed, and fully disclosed.

2.2.9. Homosexual stigma

Anticipated homosexual discrimination and stigma was assessed using the Stigma Consciousness Scale (Pinel, 1999). This scale has 10 items that evaluate the notion of homosexual-related stereotype threat, or the feeling that occurs when situations instill in targets the fear of confirming stereotypes about the homosexual community. Items were rated on a 7-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree), with a possible scale score of 10–70. Items were reverse-coded and summed so that higher scores indicated increased anticipated homosexual discrimination and stigma. The scale was translated into Chinese and then back-translated by three English professionals. Cronbach's α for the scale in this study was 0.76.

2.2.10. Internalized homophobia

Internalized homophobia was measured using the Internalized Homophobia Scale (Meyer, 1995). This measure has 9 items that assess the extent to which sexual minority individuals reject their sexual orientation, feel uneasy about their same-sex desires, and seek to avoid same-sex interactions and sexual feelings. Responses are given on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree), with higher scores indicating higher levels of internalized homophobia (possible scale score range from 9 to 45). The Chinese version of the scale was translated using the same procedure as the aforementioned Stigma Consciousness Scale. Cronbach's α for the scale in this study was 0.89.

2.2.11. Sexual sensation seeking

Sexual sensation seeking was assessed via the Sexual Sensation Seeking Scale (Kalichman and Rompa, 1995). This measure has 11 items that evaluate a person's propensity to seek out novel or risky sexual stimulation. Items were rated on a 4-point Likert scale ranging from 1 (strongly disagree) to 4 (strongly agree), with lower scores indicating a lower degree of sensation seeking (possible scale score range from 11 to 44). In a previous study utilizing this scale in China, an internal reliability assessment yielded a Cronbach's α of 0.87 (Xu et al., 2016). Cronbach's α for the scale in this study was 0.88.

2.2.12. Sexual compulsivity

Sexual compulsivity was measured via the Sexual Compulsivity Scale (Kalichman and Rompa, 1995). This measure contains 10 items that assess compulsive urges to perform specific sexual acts. Items were rated on a 4-point Likert scale ranging from 1 (strongly disagree) to 4 (strongly agree), with higher scores indicating a higher degree of compulsivity (possible scale score range from 10 to 40). In a previous study utilizing this scale in China, an internal reliability assessment yielded a Cronbach's α of 0.91 (Xu et al., 2016). Cronbach's α for the scale in this study was 0.92.

2.3. Statistical analyses

Descriptive analyses were conducted to explore the prevalence of a history of alcohol use and different types of current binge drinking (both frequent and infrequent). Bivariate analyses were used to test for socio-demographic differences by history of alcohol use and frequency of current binge drinking. The homosexual stigma, internalized homophobia, sexual sensation seeking, and sexual compulsivity scales were all dichotomised at their medians, as recommended in a previous study (Kalichman and Cain, 2004).

Univariable logistic regressions were performed for each variable and both outcomes. To explore the relationship between psychological and risky behavior variables such as HIV-related risk, minority stress, and individual traits with alcohol use/misuse (including history of alcohol use and current binge drinking), multivariable logistic regression analysis was performed using the history of alcohol use as the dependent variable (no history of alcohol use group as the reference category); additionally, multinomial logistic regression analysis was performed using current binge drinking as the dependent variable (the non-binge drinkers as the reference category; see Saha et al., 2018). To determine potential confounders, variables with a p-value < .20 in the univariable logistic regression analyses were included in the adjusted logistic models (Phillips et al., 2014). Stepwise methods were subsequently utilized to build models that best fit the data until all correlates had a p-value < .05.

3. Results

3.1. Descriptive statistics

Tables 1 and 2 present the socio-demographic data for the sample. The mean age was 24.79 years old (SD = 6.10); most participants self-identified as gay or bisexual (88.9%), reported being single (61.6%), and had education at the college level or higher (70.6%). Overall, 62.1% (n = 683) reported a history of alcohol use in their lifetime. Nearly 44.3% (n = 483) reported binge drinking in the past 6 months;

Table 1
Socio-demographic characteristics by history of alcohol use among a national sample of Chinese men who have sex with men (MSM; N = 1,100).

	Ever used alcohol		
	No (417; 37.9%)	Yes (683; 62.1%)	Statistics (p)
Socio-demographics			
Region			11.04 (.026)
Central China	94 (22.5)	162 (23.7)	
East China	99 (23.7)	109 (16.0)	
South China	47 (11.3)	78 (11.4)	
West China	150 (36.0)	277 (40.6)	
North China	27 (6.5)	57 (8.3)	
Age			1.18 (.278)
18–25 years	234 (56.1)	406 (59.4)	
> 25 years	183 (43.9)	277 (40.6)	
Educational level			1.36 (.243)
High school or less	131 (31.4)	192 (28.1)	
College or more	286 (68.6)	491 (71.9)	
Occupation			0.97 (.617)
Student	140 (33.6)	210 (30.7)	
Employed	249 (59.7)	424 (62.1)	
Unemployed	28 (6.7)	49 (7.2)	
Current relationship status			2.33 (.313)
With a woman	62 (14.9)	80 (11.7)	
With a man	105 (25.2)	175 (25.6)	
Single	250 (60.0)	428 (62.7)	

Table 2
Socio-demographic characteristics by frequency of current binge drinking among a national sample of Chinese MSM (N = 1,092).

	Frequency of binge drinking			
	No (609; 55.8%)	Infrequent (335; 30.7%)	Frequent (148; 13.6%)	Statistics (p)
Socio-demographics				
Region				17.67 (.024)
Central China	136 (22.3)	75 (22.4)	44 (29.7)	
East China	135 (22.2)	52 (15.5)	19 (12.8)	
South China	71 (11.7)	39 (11.6)	14 (9.5)	
West China	228 (37.4)	142 (42.4)	54 (36.5)	
North China	39 (6.4)	27 (8.1)	17 (11.5)	
Age				12.43 (.002)
18–25 years	347 (57.0)	218 (65.1)	72 (48.6)	
> 25 years	262 (43.0)	117 (34.9)	76 (51.4)	
Educational level				13.02 (.001)
High school or less	196 (32.2)	73 (21.8)	50 (33.8)	
College or more	413 (67.8)	262 (78.2)	98 (66.2)	
Occupation				14.83 (.005)
Student	194 (31.9)	123 (36.7)	30 (20.3)	
Employed	372 (61.1)	195 (58.2)	103 (69.6)	
Unemployed	43 (7.1)	17 (5.1)	15 (10.1)	
Current relationship status				21.34 (< .001)
With a woman	78 (12.8)	28 (8.4)	34 (23.0)	
With a man	154 (25.3)	96 (28.7)	28 (18.9)	
Single	377 (61.9)	211 (63.0)	86 (58.1)	

Table 3
Descriptive statistics of the history of alcohol use and the frequency of current binge drinking on minority stress, personality traits and HIV-related risks.

	Ever used alcohol		Frequency of current binge drinking		
	No (417; 37.9%)	Yes (683; 62.1%)	No (609; 55.8%)	Infrequent (335; 30.7%)	Frequent (148; 13.6%)
Sexual identity					
Gay	275 (65.9)	464 (67.9)	409 (67.2)	228 (68.1)	95 (64.2)
Bisexual	93 (22.3)	146 (21.4)	126 (20.7)	74 (22.1)	38 (25.7)
Heterosexual/Other	49 (11.8)	73 (10.7)	74 (12.2)	33 (9.9)	15 (10.1)
Sexual behavior					
Number of male partners					
< 2	175 (42.0)	283 (41.4)	260 (42.7)	137 (40.9)	56 (37.8)
2–3	122 (29.3)	184 (26.9)	177 (29.1)	85 (25.4)	43 (29.1)
≥ 4	120 (28.8)	216 (31.6)	172 (28.2)	113 (33.7)	49 (33.1)
Number of female partners					
0	339 (81.3)	560 (82.0)	504 (82.8)	290 (86.6)	100 (67.6)
≥ 1	78 (18.7)	123 (18.0)	105 (17.2)	45 (13.4)	48 (32.4)
Condom use					
Condomless male partner					
0	238 (57.1)	341 (49.9)	320 (52.5)	181 (54.0)	73 (49.3)
≥ 1	179 (42.9)	342 (50.1)	289 (47.5)	154 (46.0)	75 (50.7)
Condomless female partner					
0	372 (89.2)	618 (90.5)	552 (90.6)	308 (91.9)	125 (84.5)
≥ 1	45 (10.8)	65 (9.5)	57 (9.4)	27 (8.1)	23 (15.5)
Drug use					
No	314 (75.3)	435 (63.7)	451 (74.1)	209 (62.4)	87 (58.8)
Yes	103 (24.7)	248 (36.3)	158 (25.9)	126 (37.6)	61 (41.2)
History of STIs					
No	367 (88.0)	621 (90.9)	551 (90.5)	298 (89.0)	132 (89.2)
Yes	50 (12.0)	62 (9.1)	58 (9.5)	37 (11.0)	16 (10.8)
HIV infection					
No	338 (81.1)	581 (85.1)	502 (82.4)	280 (83.6)	130 (87.8)
Unsure	62 (14.9)	83 (12.2)	89 (14.6)	44 (13.1)	11 (7.4)
Yes	17 (4.1)	19 (2.8)	18 (3.0)	11 (3.3)	7 (4.7)
Homosexual stigma *M* (*SD*)	44.98 (10.2)	45.47 (10.1)	44.94 (9.83)	44.90 (9.82)	47.43 (11.5)
Internalized homophobia *M* (*SD*)	24.64 (8.03)	24.81 (8.49)	24.79 (8.09)	24.57 (8.41)	24.73 (8.93)
Outness					
No	282 (67.6)	412 (60.3)	401 (65.8)	198 (59.1)	89 (60.1)
Partial/Full	135 (32.4)	271 (39.7)	208 (34.2)	137 (40.9)	59 (39.9)
Sexual sensation seeking *M* (*SD*)	24.73 (6.44)	25.39 (6.66)	24.75 (6.68)	25.12 (6.37)	26.61 (6.40)
Sexual compulsivity *M* (*SD*)	21.99 (6.56)	22.11 (6.41)	22.02 (6.45)	22.07 (6.39)	21.90 (6.59)

Note: STIs means sexually transmitted infections; HIV means human immunodeficiency virus; M = mean; SD = standard deviation.

Table 4
Univariable and multivariable logistic regression models: factors associated with ever drinking alcohol.

	Ever used alcohol (Ref. Never used)			
	OR (95% CI)	*p*	AOR (95% CI)	*p*
Socio-demographics				
Region (Ref. East China)				
Central China	1.57 (1.08,2.27)	.018	1.36 (0.93,1.99)	.112
South China	1.51 (0.96,2.37)	.076	1.44 (0.91,2.28)	.122
West China	1.68 (1.20,2.35)	.003	1.57 (1.12,2.22)	.010
North China	1.92 (1.13,3.27)	.017	1.78 (1.04,3.06)	.037
Age (> 25 years)	0.87 (0.68,1.12)	.278		
Educational level (College or more)	1.17 (0.90,1.53)	.243		
Occupation (Employed)	1.14 (0.87,1.48)	.348		
Occupation (Unemployed)	1.17 (0.70,1.95)	.555		
Current relationship (With a woman)	0.75 (0.52,1.09)	.130	–	–
Current relationship (With a man)	0.97 (0.73,1.30)	.855	–	–
Sexual identity (Gay)	1.13 (0.77,1.68)	.533		
Sexual identity (Bisexual)	1.05 (0.68,1.65)	.818		
Sexual behavior				
Number of male partners (2–3)	0.93 (0.69,1.25)	.645		
Number of male partners (≥ 4)	1.11 (0.83,1.49)	.472		
Number of female partners (≥ 1)	0.96 (0.70,1.31)	.772		
Condom use				
Condomless male partner (≥ 1)	1.33 (1.04,1.70)	.021	1.29 (1.01,1.66)	.052
Condomless female partner (≥ 1)	0.87 (0.58,1.30)	.494		
Drug use (Yes)	1.74 (1.32,2.28)	< .001	1.67 (1.26,2.20)	.001
STIs and HIV status				
History of STIs (Yes)	0.73 (0.49,1.09)	.643		
HIV infection (Unsure)	0.78 (0.55,1.11)	.168	–	–
HIV infection (Yes)	0.65 (0.33,1.27)	.207	–	–
Minority stress				
Homosexual stigma (Higher score)	1.00 (0.79,1.28)	.974		
Internalized homophobia (Higher score)	1.36 (1.06,1.73)	.015	1.49 (1.15,1.94)	.003
Outness (Partial/Full)	1.37 (1.06,1.78)	.015	1.46 (1.11,1.93)	.007
Personality traits				
Sexual sensation seeking (Higher score)	1.08 (0.84,1.37)	.563		
Sexual compulsivity (Higher score)	1.07 (0.84,1.36)	.602		

Note: OR means odds ratio; AOR means adjusted odds ratio.

specifically, 30.7% were *infrequent binge drinkers* (episodes of binge drinking less than once per week), and 13.6% were *frequent binge drinkers* (episodes of binge drinking at least once per week). Table 3 presents psychological and public health variables by alcohol use/misuse.

3.2. Bivariate analyses

Tables 1 and 2 also present bivariate analyses between alcohol use/misuse and socio-demographic variables. For history of alcohol use, no differences were found between the two groups with respect to age, educational level, occupation, and current relationship status. For current binge drinking, differences were found between the frequency of current binge drinking and participants' geographic location, age, educational level, occupation, and current relationship status.

3.3. Univariable and multivariable logistic analyses

To identify psychological and public health predictors of history of alcohol use, we conducted univariable and multivariable logistic regression analyses (shown in Table 4) with variables of interest. In the adjusted models, drug use in the previous 6 months (AOR = 1.67; 95% CI:1.26–2.20; $p = .001$), higher levels of internalized homophobia (AOR = 1.49; 95% CI:1.15–1.94; $p = .003$), and partially or fully disclosing their sexual orientation to others (AOR = 1.46; 95% CI:1.11–1.93; $p = .007$) were significantly associated with a history of alcohol use. Condomless sex with male partners in the previous 6 months approached significance (AOR = 1.29; 95% CI: 1.01–1.66; $p = .052$).

To identify psychological and public health predictors of binge drinking, univariable and multinomial logistic analyses were performed (shown in Table 5). In the previous 6 months, MSM who reported sex with one or more female partners (AOR = 2.04; 95% CI:1.31–3.16; $p = .002$) and drug use (AOR = 1.61; 95% CI:1.08–2.39; $p = .019$) were significantly more likely to report current frequent binge drinking. Compared to *non-binge drinkers*, *frequent binge drinkers* had significantly higher levels of homosexual stigma (AOR = 1.69; 95% CI:1.15–2.47; $p = .007$) and sexual sensation seeking (AOR = 1.68; 95% CI:1.15–2.47; $p = .008$). MSM who were unsure of their HIV status were less likely to be frequent binge drinkers (AOR = 0.46; 95% CI:0.23–0.90; $p = .022$), compared to MSM who were HIV-negative. Additionally, *infrequent binge drinkers* were significantly more likely to have used drugs in the previous 6 months (AOR = 1.79; 95% CI:1.33–2.41; $p < .001$) compared to *non-binge drinkers*.

4. Discussion

This study provides information regarding the prevalence of alcohol use and binge drinking with a large sample of MSM in China. Nearly 62% of participants reported a history of alcohol use. This rate is slightly higher than that reported in previous studies with Chinese MSM: 56% reported alcohol use in the past 3 months (Liu et al., 2016), and 58% reported alcohol use in the past year (Lu et al., 2013). This is also higher than use in the general male population in China, where prevalence of alcohol use within the past year was found to be 55.6% (Li et al., 2011). Additionally, nearly 44% of this sample reported binge drinking in the previous 6 months. The high prevalence of binge drinking among MSM observed in the present study is consistent with literature from other countries and settings (Newcomb et al., 2014; Luchters et al., 2011; Marshall et al., 2015; Santos et al., 2015; Herrera

Table 5
Univariable and adjusted multinomial logistic regression models: factors associated with current binge drinking (non-binge drinkers as the reference).

	Infrequent binge drinking				Frequent binge drinking			
	OR (95% CI)	*p*	AOR (95% CI)	*p*	OR (95% CI)	*p*	AOR (95% CI)	*p*
Socio-demographics								
Region (Ref. East China)								
Central China	1.43 (0.94,2.19)	.099	1.33 (0.86,2.05)	.207	2.30 (1.28,4.14)	.006	2.13 (1.16,3.90)	.015
South China	1.43 (0.86,2.36)	.168	1.47 (0.88,2.46)	.141	1.40 (0.66,2.96)	.377	1.50 (0.70,3.21)	.302
West China	1.62 (1.10,2.37)	.014	1.53 (1.04,2.27)	.032	1.68 (0.96,2.96)	.071	1.88 (1.05,3.35)	.033
North China	1.80 (1.00,3.23)	.050	1.77 (0.97,3.21)	.062	3.10 (1.47,6.52)	.003	3.08 (1.43,6.65)	.004
Age (> 25 years)	0.71 (0.54,0.94)	.015	0.67 (0.50,0.89)	.007	1.40 (0.98,2.00)	.068	1.02 (0.69,1.51)	.926
Educational level (College or more)	1.70 (1.25,2.32)	.001	1.70 (1.24,2.33)	.001	0.93 (0.64,1.36)	.709	0.92 (0.62,1.38)	.696
Occupation (Employed)	1.60 (0.88,2.94)	.126	–	–	0.44 (0.22,0.90)	.023	–	–
Occupation (Unemployed)	1.33 (0.74,2.39)	.134	–	–	0.79 (0.42,1.49)	.470	–	–
Current relationship (With a woman)	0.64 (0.40,1.02)	.060	–	–	1.91 (1.20,3.05)	.006	–	–
Current relationship (With a man)	1.11 (0.82,1.51)	.489	–	–	0.80 (0.50,1.27)	.341	–	–
Sexual identity (Gay)	1.25 (0.80,1.94)	.321			1.15 (0.63,2.08)	.655		
Sexual identity (Bisexual)	1.32 (0.80,2.17)	.281			1.49 (0.77,2.89)	.240		
Sexual behavior								
Number of male partners (2–3)	0.91 (0.65,1.27)	.583	–	–	1.13 (0.73,1.75)	.591	–	–
Number of male partners (≥ 4)	1.25 (0.91,1.71)	.170	–	–	1.32 (0.86,2.03)	.201	–	–
Number of female partners (≥ 1)	0.75 (0.51,1.09)	.127	0.83 (0.56,1.25)	.374	2.30 (1.54,3.49)	< .001	2.04 (1.31,3.16)	.002
Condom use								
Condomless male partner (≥ 1)	0.94 (0.72,1.23)	.662			1.14 (0.79,1.63)	.482		
Condomless female partner (≥ 1)	0.85 (0.53,1.37)	.502	–	–	1.78 (1.06,3.00)	.030	–	–
Drug use (Yes)	1.72 (1.29,2.29)	< .001	1.79 (1.33,2.41)	< .001	2.00 (1.38,2.91)	< .001	1.61 (1.08,2.39)	.019
STIs and HIV status								
History of STIs (Yes)	1.18 (0.76,1.82)	.458			1.15 (0.64,2.07)	.637		
HIV infection (Unsure)	0.89 (0.60,1.31)	.544	0.89 (0.60,1.33)	.566	0.48 (0.25,0.92)	.027	0.46 (0.23,0.90)	.022
HIV infection (Yes)	1.10 (0.51,2.35)	.815	1.06 (0.49,2.33)	.878	1.50 (0.61,3.67)	.373	1.28 (0.51,3.25)	.597
Minority stress								
Homosexual stigma (Higher score)	1.07 (0.82,1.39)	.631	1.04 (0.79,1.38)	.760	1.81 (1.25,2.61)	.002	1.69 (1.15,2.47)	.007
Internalized homophobia (Higher score)	0.94 (0.72,1.22)	.631			1.10 (0.77,1.58)	.608		
Outness (Partial/Full)	1.33 (1.01,1.76)	.040	–	–	1.28 (0.88,1.85)	.193	–	–
Personality traits								
Sexual sensation seeking (Higher score)	1.11 (0.85,1.45)	.455	1.08 (0.82,1.43)	.581	2.00 (1.39,2.90)	< .001	1.68 (1.15,2.47)	.008
Sexual compulsivity (Higher score)	0.95 (0.73,1.25)	.730			1.02 (0.71,1.46)	.932		

Note: OR means odds ratio; AOR means adjusted odds ratio.

et al., 2017). However, it is much higher than the 32% prevalence of binge drinking that has been found in the general male population in China (Li et al., 2011). Several factors may contribute to the high prevalence of alcohol consumption, such as an increase in the number of industries that produce and provide alcohol, the reliance on gay bars to socialize with other gay men (Liu et al., 2016), the need to cope with minority stress and the lack of other coping mechanisms (Martinez et al., 2016), and the encouragement of social drinking in Chinese cultural norms (Lu et al., 2013).

We found that MSM who were both current frequent and infrequent binge drinkers were more likely than non-binge drinkers to report drug use in the previous 6 months. Additionally, MSM who had a history of alcohol use were more likely to report drug use compared to non-alcohol users. One possible explanation was that many MSM utilize alcohol and drugs as a coping mechanism to mitigate stress from discrimination (Meyer, 2003; Martinez et al., 2016). Additionally, common gathering places for MSM, such as gay bars and nightclubs, may facilitate drinking, binge drinking, and the use of other substances.

Compared to non-binge drinkers, current frequent binge drinkers were more likely to have at least one female sexual partner, which is consistent with research conducted elsewhere that found MSM who also have sex with women encounter greater psychosocial vulnerabilities, including substance use, compared to MSM who engage with male partners exclusively (Dyer et al., 2013). The present study did not explore the mechanisms by which this association exists, but some scholars have argued it may be a coping response to biphobia (Friedman and Dodge, 2016) or to the emotional and identity conflict experienced as a result of engaging in unwanted sexual contact with women to reflect heteronormativity (Wilson, 2008). The finding that current frequent binge drinkers were more likely to have a female sexual partner also indicates that MSM could potentially play a bridging role in spreading HIV and STIs to either their male or female sexual partners. Having condomless sex with males was shown to be associated with a history of alcohol use, and alcohol consumption may lead to social disinhibition, increasing the possibility of unprotected anal sex with men and the acquisition of STIs. Those MSM with female sexual partners would then be at risk of transmitting such STIs to their female partners but could also be at risk for transmitting STIs to other male partners. However, this link should be further examined because we did not find associations between binge drinking and condomless sex among the MSM participants. Interestingly, our study found HIV status to be a predictor of frequency of binge drinking, with being unsure of one's status serving as a protective factor against frequent binge drinking. Perhaps those MSM who do not know their HIV status are more circumspect about engaging in potentially risky behaviors such as alcohol use/misuse. However, more research is needed to determine the mechanism(s) by which this association exists.

Compared to non-binge drinkers, frequent binge drinkers were more likely to report a higher level of homosexual stigma. Chinese social attitudes toward sexual minority men remain negative (Liao et al., 2014). Members of sexual minority communities experience excess stress due to stigma and discrimination, which may trigger coping and other behaviors in opposition to dominant norms including those related to alcohol use (Meyer, 2003; Gilbert and Zemore, 2016). We also found that MSM who had partially or fully disclosed their sexual orientation to others (compared to non-disclosing MSM) and who had higher levels of internalized homophobia were significantly more likely to report a history of alcohol use. Although many MSM who had disclosed may have received acceptance and support from their parents and friends, some may have alternatively encountered intolerance or

rejection, including victimization in school, verbal abuse, and threats (D'Augelli et al., 1998). Experiencing such rejection upon coming out, combined with pervasive societal stigma related to same-sex behavior and the already high degree of internalized homophobia found among MSM (Xu et al., 2017a) may drive MSM in China to develop alcohol use/misuse behaviors as a coping mechanism. Research focusing on minority stress and alcohol use/misuse in the Chinese context should be prioritized to improve MSM's mental health and harmful health behaviors.

In addition to the aforementioned findings, the adjusted model showed that frequent binge drinkers compared to non-binge drinkers were more likely to report higher levels of sexual sensation seeking, which is consistent with previous findings (Lang et al., 2012). People high in sexual sensation seeking have the tendency to prefer exciting, novel, and optimal levels of stimulation or arousal while being less concerned with the consequences of behaviors such as binge drinking (Ashenhurst et al., 2015). These findings may have implications for research and intervention development that target personality traits as a means of addressing alcohol use/misuse among MSM in China.

5. Limitations

There are some limitations in the current study. First, online sampling was used. As such, this sample may not be truly generalizable to the MSM population, despite the fact that a majority (92%) of young individuals in China access the Internet and smartphones for social interaction (Jing et al., 2012). Second, this study did not clarify drinkers but non-binge drinkers or high-intensity binge drinkers such as those who meet the standard 10 drinks cutoff. While high-intensity binge drinking is on the rise, measurement for binge drinking of 5 or more drinks for men may mask the prevalence and consequences of high-quantity alcohol consumption (Fish et al., 2018). Third, the cross-sectional nature of the data does not allow us to infer causality. Finally, we did not sample non-MSM, and therefore cannot make a valid comparison between MSM and non-MSM drinkers. Future research should use longitudinal samples to examine predictors and consequences of alcohol use, the co-occurrence of substance use, and other psychological and physical health-related outcomes, including assessing ways to reduce alcohol misuse in this population.

6. Implications

Our findings suggest a need for multilevel strategies to confront both the striking increase in HIV incidence and excessive alcohol use behaviors among MSM in China. The most practical strategies may exist at the community and institutional level. For example, alcohol use/misuse psychoeducation and reduction/prevention counseling could be included in standard HIV testing and counseling services, as well as primary care practice. Physicians, nurses, HIV testers/counselors, and others working with this population can be trained to provide a quick assessment of alcohol misuse, via tools such as the AUDIT (Babor et al., 2001), and to deliver a brief intervention tailored to the level of misuse. Community-level interventions could involve building partnerships between MSM-serving community-based organizations and gay bars to create alcohol-free spaces and/or alcohol-free hours of operation, develop and distribute messaging regarding alcohol use and HIV risk, and make information regarding alcohol treatment and HIV services readily available in the facilities of each type of establishment.

7. Conclusions

This study provides important information on the high prevalence of past and present alcohol use/misuse in a large Chinese MSM sample. This study examined the associations between a history of alcohol use and binge drinking with psychological and public health issues from the Chinese perspective. These results may be valuable in guiding alcohol use reduction and prevention strategies, contributing to HIV prevention and intervention efforts, and motivating a more robust approach to addressing minority stress issues for MSM in China.

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Contributors

Wenjian Xu conceived the study, participated in its design, oversaw data collection, performed the statistical analysis, and drafted the manuscript. Yong Zheng and Michelle R. Kaufman participated in the design of the study and contributed to writing the manuscript. John Mark Wiginton contributed to writing the manuscript. All authors read and approved the final manuscript.

Conflict of interest

None.

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