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Socio-demographic and behavioral correlates for HIV and syphilis infections among migrant men who have sex with men in Beijing, China

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Migrant men who have sex with men (MSM) may be particularly vulnerable to sexually transmitted infections (STIs) including HIV. This study examines the rates of HIV and syphilis infections and associated socio-demographic and behavioral factors among migrant MSM in China. Data from 307 migrant MSM were collected in Beijing, China. Blood specimens were collected to test for HIV and syphilis infections. HIV and syphilis rates were 5.9% and 20.2%, respectively. Multivariate logistic regression analyses showed that having ever been married, living a longer period in Beijing, having more sexual partners, and having a foreign MSM friend were significantly associated with HIV infection. Migrating from a rural area, experiencing one's sexual debut at an older age, having a male as first sexual partner, having more sexual partners, and being recruited from peer outreach and social network were associated with syphilis infection. Migrant MSM in China are at high risk for HIV and syphilis infections. HIV prevention programs targeting rural migrant MSM who have been married are needed.

Keywords: China; men who have sex with men; HIV; syphilis; unprotected anal intercourse; sexual partners

Introduction

A robust literature indicates that men who have sex with men (MSM) are disproportionately affected by HIV and rates of HIV infections among MSM have been increasing in many countries in recent years (UNAIDS, 2010; van Griensven, de Lind van Wijngaarden, Baral, & Grulich, 2009). In China, the MSM population is at high risk for HIV infection. The proportion of newly reported HIV infections that were attributable to MSM increased from 12.2% in 2007 to 32.5% in 2009 (MOH, 2010). HIV prevalence has increased rapidly among MSM in China with an average HIV sero-prevalence of 5% among MSM in large cities (Bao, Zhang, Zhao, Sun, & Tan, 2009).

A few studies report high levels of unprotected sexual practices and high prevalence of sexually transmitted infections (STIs) among MSM (Choi, Gibson, Han, & Guo, 2004; Hong et al., 2009; Zhang & Chu, 2005). High syphilis infection rates have been observed among MSM in Beijing (19.8%), Shanghai (13.5%), and Chengdu (28.1%) (Choi, Ning, Gregorich, & Pan, 2007; Feng et al., 2010; Ruan, Luo, et al., 2009). Studies suggest a high level of bisexual behavior among MSM in China, with about one-quarter of MSM being married to a woman and about half reported having had sex with women (Liu, Liu, Cai, Rhodes, & Hong, 2009; Ruan et al., 2008).

Therefore, MSM may play a significant role in spreading HIV/STIs acquired through high-risk male sexual partners to lower risk female partners (Choi et al., 2004; Lau et al., 2010).

A number of studies in western countries have investigated risk factors for HIV infection. These studies have shown that large numbers of male sex partners, episodes of unprotected anal intercourse, drug use, and sex under the influence of alcohol are associated with HIV infection (Koblin et al., 2006; Plankey et al., 2007). Data from China suggest that lower levels of education, alcohol use, seeking male sex partners at bathhouses/public washroom/parks, prior episodes of STIs (Ruan, Luo, et al., 2009), being married (Xu et al., 2010), and having sex with a foreign MSM (He et al., 2006) are associated with increased risk of syphilis infection among MSM. Factors that were found to be associated with HIV infection include older age, lower levels of education, employment at bathhouses/saunas, multiple male sex partnership, unprotected anal intercourse, and prior diagnoses of syphilis or other STIs (Choi et al., 2003; Li, Jia, Ding, Liu, & Xiao, 2009).

Men who have sex with men compared to the other most-at-risk groups in China (including injection drug users and female sex workers) are inadequately studied (Guo, Li, & Stanton, 2011). The lack of research regarding Chinese MSM may reflect the strong stigmatization of homosexuality in China

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(Ma et al., 2007). Many MSM hide their sexual orientation, making it difficult to reach and study this group (Choi, Diehl, Guo, Qu, & Mandel, 2002). The limited data available on migrant MSM suggest that many migrant MSM provide sexual services for money and are more likely to engage in unprotected anal intercourse (Ruan et al., 2008). A study in Jinan reported that migrant MSM had relatively higher rates of HIV infection than non-migrant MSM (4.3% vs. 1.1%) (Ruan, Yang, et al., 2009). Thus, migrant MSM may be particularly vulnerable to HIV/STI infections and need special focus.

Although a growing body of research has explored HIV/STI risk behaviors among MSM in China in recent years, very few studies focused on migrant MSM. To address this literature gap, in the current study we assess the prevalence of HIV and syphilis infections and examine socio-demographic and behavioral risk factors for HIV and syphilis infection among a community-based sample of migrant MSM in Beijing, China. These socio-demographic and behavioral correlates were identified based on the existing literature. The data regarding risk factors for HIV and syphilis infections are essential to inform prevention interventions and research among migrant MSM in China.

Methods

Study site

Data for the current study came from the baseline assessment of an HIV intervention study among migrant MSM in Beijing, the national capital of China. Beijing has a population of 17 million including about 5 million migrants (Yi et al., 2010). Sexual transmission has become the dominant mode of HIV transmission in recent years in Beijing, accounting for 58% of the new cases in 2008 and 69% in 2009 (Jia, 2009). Beijing is believed to be the home of the largest MSM population and is the most popular migration destination in China (Choi et al., 2003). The proportion of MSM among newly reported cases in Beijing has increased from 29% in 2008 to 44% in 2009 (Jia, 2009).

Participants and sampling methods

The eligibility criteria for participation in the study included: (1) MSM, (2) 18–29 years of age, (3) migrants (without permanent Beijing residency registration), and (4) willingness to provide blood specimens for HIV/STI testing. Participants were recruited through four sampling methods: (1) Peer outreach. Three MSM were hired and trained by a local Center

for Disease Control and Prevention (CDC) as peer outreach workers to approach MSM based on their personal connections and knowledge of the MSM population in Beijing; (2) Informal social networks. The eligible MSM who agreed to participate were asked to refer their friends to participate in the study; (3) The Internet. The local research team distributed announcements via local gay websites to reach potential participants; and (4) Venue-based sampling. MSM-frequented venues were identified and owners or managers of these venues were asked to distribute the study information to their members and encourage them to participate (Guo et al., 2011). When a potential participant was referred or identified through one of the recruitment methods, local research team members would verify his eligibility, and then explain to the participant the research design and potential risks and benefits of participating in the study. All participants were assured of the confidentiality of their participation. A total of 307 MSM consented to participate in the study and completed the questionnaire. The research protocol, including consenting procedure, was approved by the Institutional Review Boards at both Wayne State University in the USA and Beijing Normal University in China.

Survey and HIV/STD testing procedure

Participants completed a self-administered survey in privacy at either a local CDC or a community medical center in Beijing. Interviewers were faculty members and graduate students in psychology from a local university as well as health workers from a local CDC. Prior to the survey, all interviewers received extensive training on research ethics and assessment methodology. When necessary, interviewers were available to answer and clarify any questions during the survey. On average, it took about 45 minutes to complete the questionnaire. Participants were compensated a small monetary incentive (equivalent to US \$2) for their time and received reimbursement for their transportation expenses (up to US \$5) upon the completion of the survey.

All participants provided blood specimens for testing of HIV and Syphilis. HIV infection was tested using an enzyme-linked immunosorbent assay (ELISA) (Beijing Wantai Biological Medicine Company, China) and confirmed with a HIV-1/2 Western blot immune assay (HIV Blot 2.2 WBTM, Genelabs Diagnostics, Singapore). Syphilis infection was screened using an ELISA (Beijing Wantai Biological Medicine Company, China) and confirmed with a passive particle agglutination test for detection

of antibodies to *Treponema pallidum* (TPPATM, OMEGA, UK).

Measures

Demographic characteristics

Data on participants' age, ethnicity, education level, marital status, and sexual orientation were collected. Information was also collected regarding monthly income, type of original residence before migration, and living arrangement. Participants were queried about the total years of their migratory experience in Beijing. For the purpose of data analysis, education, marital status, and type of original residence were grouped into two categories (high school or below vs. college or above; never married vs. ever married; and urban vs. rural).

Sexual risk behaviors

Participants were asked to recall their first sexual experience and their sexual behaviors. Information was collected regarding number of male and female sexual partners in the last week and during their lifetime, networks of MSM friends/acquaintances, condom use with sexual partners during their lifetime, and condom use in anal sex. In addition, participants were asked whether they had been involved in commercial sex in the past 6 months, and whether they or their sexual partner(s) had consumed alcohol or used drugs before having sex. Number of sexual partners in the last week was collapsed into three categories (0, 1–2, and ≥ 3 partners) because of highly positive skewed distributions. Likewise, categories for number of lifetime sexual partners were created (1–5, 6–19, and ≥ 20 partners).

Statistical analyses

First, descriptive statistics (mean and standard deviation for continuous variables and relative frequency for categorical variables) were calculated for socio-demographic variables, sexual risk behaviors, and HIV and syphilis infections. Second, bivariate associations of socio-demographic and behavioral factors with HIV and syphilis infections were examined using Chi-square (for nominal variables), Cochran–Mantel–Haenszel Chi-square (for ordinal variables) and Student's *t*-test (for continuous variables).

Third, two multiple logistic regression analyses were performed to examine the multivariate associations of socio-demographic and behavioral variables with HIV and syphilis infections. The dependent variables of logistic regression analyses were whether participants had been tested positive for HIV (yes/no)

or syphilis (yes/no). Only variables identified as significantly associated with the dependent variables at $p < 0.05$ in the bivariate analyses were included in the model. Adjusted odds ratios (ORs) and their 95% confidence intervals (95% CIs) were calculated. All the statistical analyses were performed using SAS 9.2 statistical software package (SAS Institute Inc., Cary, NC, USA).

Results

Characteristics of study sample

As shown in Table 1, participants were predominantly ethnic Han. The mean age of the sample was 23.7 years. Approximately one-half of the participants had completed a college education. The vast majority of the participants (94%) had never been married. About 60% self-identified as homosexual while 31% self-reported being bisexual. The participants had an average of 3 years of migratory experience in Beijing. Their average monthly income was 2208 Yuan (an equivalent of US \$315). About 42% percent of the participants lived alone; 22% and 18% lived with coworker and partner or spouse, respectively. Among the 307 MSM, 78 (25%) were recruited through peer outreach, 69 (23%) through social network, 102 (33%) through the Internet, and 58 (19%) through venue-based sampling approach. About 6% of the participants tested positive for HIV and 20% for syphilis infection.

Sexual experience and sexual risk behaviors

As shown in Table 2, 40% reported having their first sexual intercourse at an age 18 years or younger; 69% reported a male as their first sexual partner; 42% had twenty or more male sexual partners in their lifetime; and 14% reported having three or more male partners in the past week. Approximately 17% of the participants reported having had sex with three or more female sexual partners in their lifetime, with 9% having engaged in sex with a female partner in the past week. The most common method for finding sex partners was through the Internet (69%). Participants also met their sexual partners at public parks or lavatories (20%) and entertainment establishments (e.g., bar, dancing hall, and massage parlor, 30%). Approximately one-quarter of the participants reported having 50 or more MSM friends and 17% reported having foreign MSM friends. Substantial proportions of the participants reported engaging in various risky sexual behaviors including insertive anal sex (83%), receptive anal sex (67%), and group sex (10%).

Table 1. Socio-demographic characteristics and HIV and syphilis infections among migrant MSM in Beijing, China (%).

Variables	Overall	HIV		χ^2	Syphilis		χ^2
		Yes	No		Yes	No	
Sample size (<i>n</i>)	307	18	289		62	245	
Mean age (year) ^a	23.7 (2.9)	24.2 (3.1)	23.7 (2.9)	0.66	24.7 (2.7)	23.5 (2.8)	3.05**
Ethnicity							
Han	91.9	94.4	91.7	0.17	90.3	92.2	0.24
Non-Han	8.1	5.6	8.3		9.7	7.8	
Education							
Junior high school or less	16.6	33.3	15.6	6.96**	17.7	16.3	2.61
Senior high school	39.4	50.0	38.7		30.7	41.6	
College or above	44.0	16.7	45.7		51.6	42.0	
Marital status							
Never married	93.5	77.8	94.5	7.75**	88.7	94.7	2.91
Married or divorced	6.5	22.2	5.5		11.3	5.3	
Sexual orientation							
Homosexual	59.9	66.7	59.5	0.70	62.9	59.2	0.30
Bisexual	30.9	22.2	31.5		29.0	31.4	
Other/uncertain	9.1	11.1	9.0		8.1	9.4	
Average monthly income (Yuan) ^a	2208.1 (1680.0)	1494.4 (965.6)	2252.6 (1705.8)	3.05**	2361.3 (1460.9)	2169.4 (1731.6)	0.80
Hometown							
Urban	53.7	33.3	55.0	3.20	41.9	56.7	4.36*
Rural	46.3	66.7	45.0		58.1	43.3	
Living arrangements							
Alone	41.8	66.7	40.3	5.26	50.0	39.7	7.25
Coworker(s)	21.9	16.7	22.2		16.1	23.4	
Partner or spouse	18.3	5.6	19.1		9.7	20.5	
Other (parents, siblings, children)	18.0	11.1	18.4		24.2	16.4	
Years of being a migrant worker in Beijing ^a	3.0 (2.3)	4.6 (3.2)	2.9 (2.2)	2.19*	3.6 (2.6)	2.9 (2.1)	2.10*
Methods of recruitment							
Peer outreach	25.4	22.2	25.6	1.41	27.4	24.9	17.11***
Social network	22.5	22.2	22.5		40.3	18.0	
Internet	33.2	44.4	32.5		19.4	36.7	
Venue-based sampling	18.9	11.1	19.4		12.9	20.4	

Note: Numbers in parentheses are estimated standard deviations.

^aStudent's *t*-test.

p* < 0.05; *p* < 0.01; ****p* < 0.001.

Other HIV-related risk behaviors (Table 3) included selling sex to men (18%), purchasing sex from men (10%), engaging in commercial sex with women (6%) in the past 6 months, drinking alcohol before having sex (39%), and using drugs before having sex (3%). About half of the participants reported inconsistent condom use during their lifetime with 9% never or rarely used condoms. Nearly 30% reported inconsistent condom use in the three previous episodes of anal intercourse; 5% reported that they had not used a condom during any one of the three recent episodes. About half of the participants reported that they always put on a condom before sex. Only 28% had been previously tested for HIV.

Bivariate analyses of factors associated with HIV and syphilis infections

Socio-demographic correlates

Bivariate associations of socio-demographic variables with HIV and syphilis infections are displayed in Table 1. Six socio-demographic characteristics (age, education, marital status, income, hometown, and duration of being a migrant worker in Beijing) were significantly associated with HIV or syphilis infection. Lower education, lower income, having ever been married, and longer duration in Beijing were positively associated with HIV infection. Older age, growing up in a rural area, and longer duration in Beijing were

Table 2. Number of sexual partners and sexual activities among migrant MSM in Beijing, China (%).

Variables	Overall	HIV		χ^2	Syphilis		χ^2
		Yes	No		Yes	No	
Age at first sexual intercourse (years) ^a	19.3 (2.5)	19.4 (2.5)	19.2 (2.5)	0.23	20.1 (2.2)	19.0 (2.6)	2.93**
Sex of first sexual partner							
Female	30.6	50.0	29.4	3.38	16.1	34.3	7.68**
Male	69.4	50.0	70.6		83.9	65.7	
No. male sex partners, last week							
0	23.1	22.2	23.2	0.02	21.0	23.7	1.20
1–2	62.9	66.7	62.6		59.7	63.7	
≥ 3	14.0	11.1	14.2		19.3	12.6	
Having sex with female partner, last week	8.5	0.0	9.0		6.5	9.0	0.41
No. male sex partners, lifetime							
1–5	27.4	5.6	28.7	4.74*	12.9	31.0	8.57**
6–19	30.6	33.3	30.5		32.3	30.2	
≥ 20	42.0	61.1	40.8		54.8	38.8	
No. female sex partners, lifetime							
0	54.1	44.4	54.7	0.78	66.1	51.0	4.13*
1–2	29.3	33.3	29.1		22.6	31.0	
≥ 3	16.6	22.2	16.3		11.3	18.0	
Places meeting their sexual partners							
Internet	69.4	83.3	68.5	1.75	72.6	68.6	0.37
Public park/lavatory	20.2	44.4	18.7	6.98**	16.1	21.2	0.80
Bar/dancing hall/tea house	16.3	16.7	16.3	0.01	17.7	15.9	0.12
Bathhouse/sauna/massage parlor	12.7	22.2	12.1	1.56	11.3	13.1	0.14
Gay bar	9.1	5.6	9.3	0.29	8.1	9.4	0.10
No. MSM friends/acquaintances							
1–5	19.9	5.6	20.8	4.02*	12.9	21.6	7.75**
6–19	28.0	27.8	28.0		21.0	29.8	
20–49	27.7	22.2	28.0		29.0	27.4	
≥ 50	24.4	44.4	23.2		37.1	21.2	
Having foreign MSM acquaintances	17.3	38.9	15.9	6.26*	22.6	15.9	1.54
Sexual behavior/activities							
Group sex	9.5	5.6	9.7	0.34	8.1	9.8	0.17
Oral sex	77.9	72.2	78.2	0.35	82.3	76.7	0.88
Insertive anal sex	83.1	77.8	83.4	0.38	90.3	81.2	2.91
Receptive anal sex	67.1	66.7	67.1	0.01	79.0	64.1	5.01*
Masturbation	72.0	77.8	71.6	0.32	75.8	71.0	0.56

^aStudent's *t*-test.**p* < 0.05; ***p* < 0.01.

positively associated with syphilis infection. In addition, participants recruited through peer outreach and social network had higher syphilis infection rates than those recruited through other means (Table 1).

Behavioral correlates

A number of behavioral factors were significantly associated with HIV or syphilis infection. Having a larger number of lifetime male sexual partners, meeting sexual partners at public parks or lavatories, having a larger number of MSM friends, having foreign MSM friends, using drugs before having sex, and not always

putting a condom on before penetration were significantly associated HIV infection. Initiating sex at an older age, engaging in sex for the first time with a male partner, having a larger number of lifetime male sexual partners, a larger number of MSM friends, and engaging in receptive anal intercourse were significantly associated with syphilis infection (Tables 2 and 3).

Multivariate analyses of factors associated with HIV and syphilis infections

Separate multiple logistic regression analyses were conducted for HIV and syphilis infection to determine

Table 3. HIV-related risk behaviors among migrant MSM in Beijing, China (%).

Variables	Overall	HIV		χ^2	Syphilis		χ^2
		Yes	No		Yes	No	
Sold sex to men in the past 6 months	18.2	5.6	19.0	2.06	21.0	17.5	0.39
Bought sex from men in the past 6 months	9.5	0.0	10.0	1.99	14.5	8.2	2.33
Sex trade with women in the past 6 months	6.2	5.6	6.2	0.01	4.8	6.5	0.24
Had been previously tested for HIV	27.7	16.7	28.4	1.16	19.4	29.8	2.69
Drinking alcohol before having sex	39.1	27.8	39.8	1.03	45.2	37.6	1.20
Using drugs before having sex	2.9	16.7	2.1	12.68***	3.2	2.9	0.02
Condom use, lifetime							
Never or rarely	8.5	11.1	8.4	0.38	4.8	9.5	2.18
Sometime or frequently	40.5	44.4	40.2		37.1	41.3	
Always	51.0	44.4	51.4		58.1	49.2	
Condom use in the last three anal intercourses							
Never	4.6	11.1	4.2	0.66	6.4	4.1	0.06
1 or 2 times	24.8	22.2	25.0		22.6	25.4	
3 times	70.6	66.7	70.8		71.0	70.5	
Putting condom on before penetration							
Never or rarely	8.5	16.7	8.0	3.99*	8.1	8.6	0.14
Sometime or frequently	36.8	50.0	36.0		40.3	35.9	
Always	54.7	33.3	56.1		51.6	55.5	

* $p < 0.05$; *** $p < 0.001$.

which of these factors continued to be significant predictors of HIV and syphilis infection (Table 4). In multivariate analysis of HIV infection, two demographic variables (having ever been married and having spent a longer period in Beijing) remained significantly associated with HIV infection. With regard to sexual risk behaviors, men reporting 20 or more lifetime sexual partners and having foreign MSM friends were at increased risk of HIV infection. Five demographic and behavioral variables were predictive of syphilis infection, including: migrating from a rural area, having initiated sex at an older age, having a male as one's first sexual partner, having had 20 or more lifetime sexual partners, and being recruited from peer outreach and social network were significantly associated with syphilis infection.

Discussion

Our study found high rates of HIV and syphilis infections among migrant MSM in Beijing, consistent with previous studies which found that the HIV prevalence among MSM populations in large and medium cities has been increasing, having reached an average of 5% (Bao et al., 2009). Because syphilis infection can increase the risk of acquiring HIV (Røttingen, Cameron, & Garnett, 2001), the high rate of syphilis in the present study may suggest an increasing rate of HIV among Chinese MSM in the near future.

Our analysis of behavioral correlates of HIV/syphilis infections revealed several significant relationships. Being married (including divorced) as a risk factor for HIV infection is consistent with a recent study among MSM in Mumbai, India (Kumta et al., 2010). The study found that MSM who were married were three times more likely to be infected with HIV than those who had never been married. This study suggests that growing up in a rural area may be a risk factor for syphilis infection. This finding may reflect a lack of knowledge about STIs among rural migrant MSM including a lack of awareness regarding risk and vulnerability to HIV and syphilis (Wong et al., 2008). While the current study suggests that sexual debut at an *older* age is a risk factor for syphilis infection, this result is inconsistent with previous research among MSM in the US that has shown early sexual debut to be associated with high-risk sexual behaviors (Outlaw et al., 2011). Future studies need to validate the finding that later sexual debut is a risk factor for HIV/STI infection among Chinese MSM and investigate factors associated with sexual debut among MSM.

Although there are differences in risk factors for HIV and syphilis infection, there are also similarities in the risk factors for these two infections. Number of sexual partners is positively associated with increased risk for both HIV and syphilis infections; this finding is consistent with previous studies (Koblin et al., 2006; Ruan, Luo, et al., 2009). Being recruited from peer outreach networks and social networks and

Table 4. Odd ratios from multiple logistic regression analysis showing predictive factors for HIV and syphilis infections among migrant MSM in Beijing, China.

Characteristics	HIV		Syphilis	
	aOR	95% CI	aOR	95% CI
Age (years)	0.83	0.63–1.08	1.09	0.93–1.29
Education				
College or above (ref: \leq high school)	0.67	0.15–2.96	1.45	0.86–2.44
Marital status			1.00	
Married or divorced (ref: never married)	5.62	1.10–28.65	2.43	0.65–9.18
Monthly income	0.93	0.84–1.02	1.00	0.96–1.04
Hometown				
Rural (ref: urban)	1.13	0.33–3.93	2.86	1.36–6.02
Years of being a migrant worker in Beijing	1.36	1.06–1.73	0.96	0.82–1.12
Age at first sexual intercourse			1.21	1.03–1.41
Sex of first sexual partner				
Male (ref: female)			2.56	1.11–5.89
Number of sexual partners, lifetime				
≥ 20 (ref: < 20)	4.55	1.03–20.15	2.47	1.17–5.22
Meeting their sexual partners at a public park or lavatory	2.64	0.68–10.30		
Number of MSM acquaintances				
≥ 50 (ref: < 50)	0.68	0.16–2.95	1.84	0.84–4.02
Having foreign MSM acquaintances	3.65	1.01–13.26		
Using drugs before having sex	6.64	0.81–54.39		
Receptive anal sex intercourse			1.83	0.86–3.89
Putting condom on before penetration	0.31	0.08–1.08		
Method of recruitment				
Internet			1.00	
Peer outreach			3.86	1.47–10.17
Social network			4.92	2.02–11.98
Venue-based sampling			1.56	0.52–4.68

Note: CI, confidence interval; OR, odds ratio; ref, reference group.

having a foreign MSM as part of the social network (or potential sexual network) are risk factors for HIV and syphilis infection among Chinese MSM. These findings support the notion that social network factors are significantly linked to HIV and STI (Tobin & Latkin, 2008). Future studies are needed to further examine the role of social network among young migrant MSM in HIV and syphilis infection.

Although alcohol and drug use have been shown to increase unprotected sexual behaviors and the risk of acquiring HIV and other STIs (Koblin et al., 2006; Ruan, Luo, et al., 2009), no association was found between alcohol use and HIV/syphilis infections in this study. In the bivariate analysis, drug use before having sex was associated with high risk of HIV infection; however, few participants (3%) reported drug use and drug use was not associated with HIV infection in the multivariate model when controlling for other factors. Similarly, venues where participants seek male sex partners (i.e., public washrooms and parks) were associated with the high risk of HIV infection in bivariate analysis, but not in multivariate analysis.

Many migrant MSM engaged in commercial sex with men and women in the past 6 months. Being separated from their family and away from the social constraints of home, young migrant men who are unable to find a source of income in urban areas may exchange sex for money (Wong et al., 2008). MSM who engage in commercial sex may be particularly vulnerable for HIV because of their higher levels of unprotected anal intercourse (He et al., 2006). Nearly one-quarter of MSM had both male and female sex partners and one-third self-identified as bisexual in this study, potentially accelerating the spread of HIV epidemic in China.

There are several potential limitations in this study. First, despite the efforts to recruit participants across a broad range of the migrant MSM population using four different sampling methods (i.e., peer outreach, social network, Internet, and venue-based sampling), the study sample remains a convenience sample which limits the generalizability of findings from this study to other MSM populations. Second, the use of retrospective self-report data was subject to

recall bias, and the sensitive nature of the questions may have led to socially desirable answers. Third, the cross-sectional data precludes causal interpretations of our findings. Finally, our sample size is relatively small. Future studies with larger sample sizes and a longitudinal design will be required to validate these findings. Despite these limitations, this study provides important data on rates HIV and syphilis infections and associated risk factors among migrant MSM who have a markedly high risk of HIV infection.

Findings of our study have several implications for behavioral HIV prevention and intervention efforts among MSM in China. First, the high rates of HIV and syphilis infections among migrant MSM suggest that migrant MSM may be at particularly high risk for HIV infection. Prevention efforts such as condom promotion and STI screening and treatment (especially syphilis control) should be targeting this high risk group. Second, the low reported HIV testing rate may reflect structural constraints in accessing medical services resulting from rural migrant status and/or psychological barriers due to sexual orientation (Song et al., 2011). Confidential HIV testing should be promoted among migrant MSM. Third, migrants, especially rural-to-urban migrants, are socio-economically disadvantaged in urban destinations and such disadvantages may increase their risk and vulnerability of HIV and other STI. Therefore, future intervention efforts engaging migrant MSM need to incorporate strategies that can potentially empower these migrant men. Finally, as a high proportion of migrant MSM reported drinking alcohol prior to engaging in sex, future interventions targeting MSM should specifically address this risky dyad of behaviors.

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