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<https://escholarship.org/uc/item/9v7510qm>

Journal

JAIDS Journal of Acquired Immune Deficiency Syndromes, 71(3)

ISSN

1525-4135

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Publication Date

2016-03-01

DOI

10.1097/qai.0000000000000833

Peer reviewed

Male Clients of Male Sex Workers in China: An Ignored High-Risk Population

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Background: There is a high prevalence of HIV/syphilis among male sex workers, but no formal study has ever been conducted focusing on male clients of male sex workers (MCM). A detailed investigation was thus called for, to determine the burden and sociobehavioral determinants of HIV and syphilis among these MCM in China.

Methods: As part of a multicenter cross-sectional study, using respondent-driven and snowball sampling, 2958 consenting adult men who have sex with men (MSM) were recruited, interviewed, and tested for HIV and syphilis between 2008 and 2009. The distributions of sociodemographic characteristics, risk behaviors, and HIV/syphilis prevalence were determined and compared between MCM and other MSM.

Results: Among recruited MSM, 5.0% (n = 148) were MCM. HIV prevalences for MCM and other MSM were 7.4% and 7.7%, whereas 18.9% and 14.0% were positive for syphilis, respectively. Condomless anal intercourse (CAI) was reported by 59.5% of MCM and 48.2% of MSM. Multiple logistic regression revealed that compared with other MSM, MCM were more likely to have less education [for ≤elementary level, adjusted odds ratio (aOR) = 3.13, 95% confidence interval (95% CI): 1.42 to 6.90], higher income (for >500 US Dollars per month, aOR = 2.97, 95% CI: 1.53 to 5.77), more often found partners at parks/restrooms (aOR = 4.01, 95% CI: 2.34 to 6.85), reported CAI (aOR = 1.49, 95% CI: 1.05 to 2.10), reported a larger sexual network (for ≥10, aOR = 2.70, 95% CI: 1.44 to 5.07), and higher odds of syphilis (aOR = 1.54, 95% CI: 1.00 to 2.38).

Conclusions: The greater frequency of risk behaviors and high prevalence of HIV and syphilis indicated that HIV/syphilis prevention

programs in China need to pay special attention to MCM as a distinct subgroup, which was completely ignored until date.

Key Words: clients, male sex workers, men who have sex with men, HIV, syphilis

(*J Acquir Immune Defic Syndr* 2016;71:316–322)

INTRODUCTION

High prevalence of HIV and syphilis among men who have sex with men (MSM) and male sex workers (MSWs) has long been considered as a major public health concern worldwide and China is not an exception.^{1,2} HIV prevalence has recently crossed 15% among MSM in sub-Saharan Africa and North America, while worldwide, in seven countries, the reported proportions of HIV seropositivity have reached 20% or more in this hard-to-reach population.² Among MSM in China, the integrated surveillance revealed a HIV prevalence of 6.0% and recent studies estimated the prevalence of syphilis to be 14% or more.^{3–5} In some of the Chinese cities, incidence among MSM was around 13/100 person-years for HIV and ranged between 7 and 13/person-years for syphilis.^{3,4} According to a meta-analysis published in 2012, during 2004–2011, HIV and syphilis prevalences among MSWs in this country ranged between 4.2%–8.5% and 9.9%–15.3%, respectively.⁶

These studies indicated that there is a dual epidemic of these two diseases concentrated among MSM and MSWs in China, raising concern about the high potential for the acquisition of these STIs among the adult male clients of MSWs (MCM). Despite being suspected as a substantially high-risk population regarding HIV and syphilis infection, MCM have rarely been studied. Neither the national surveillance programs nor the high-risk population-specific surveys generated data regarding this subpopulation. This dearth of information reflects a lack of coverage in terms of intervention, promotion of testing for HIV, and other sexual transmitted infections (STIs) and risk reduction counseling targeting this population.^{7,8} It is also suspected that a large proportion of MCM engage in condomless anal intercourse (CAI, either receptive or insertive) and condomless vaginal intercourse (CVI). A systematic review conducted in China reported that a median of 55.1% of MSM had CAI with men in the past 3 or 6 months.⁹ One study involving MSWs from 2 cities of China reported that only 53.1% and 70.7% of MCM used condom when engaged in insertive and receptive anal intercourse with MSWs in the last 3 months, respectively.¹⁰

Received for publication April 28, 2015; accepted August 4, 2015.

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Supported by NIH program 1D43TW009532-01, NIH Fogarty International Center (5R25TW009340), and National Natural Science Foundation of China (Grant No. 81373125).

The authors have no conflicts of interest to disclose.

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Another study from Vietnam reported that approximately 45% of MCM did not use condom consistently during anal intercourse (receptive or insertive) with MSWs.¹¹

However, these reports were generated by the general population of MSM or MSWs instead of the MCM themselves. Hence, it was unclear to public health policy makers of China, whether MCM here needed specific attention as a distinct sentinel group or not. The absence of the first-hand data suggested that an investigation should be undertaken to study the sociodemographics, risk behaviors, HIV, and syphilis prevalence among MCM and compare this population with other MSM in this country regarding these factors.

METHODS

Study Design and Sampling Methods

A cross-sectional analysis of the available data collected between 2008 and 2009 from a nation-wide survey by Chinese Center for Disease Control and Prevention (CDC) was conducted. In the original survey, MSM from seven cities of China were recruited, 5 (Nanjing, Chongqing, Jinan, Haerbin, and Guangzhou) through respondent-driven sampling, and 2 (Suzhou and Yangzhou) by snowballing. Detailed description of the sampling strategy and recruitment has been reported elsewhere.³ Men aged 18 years or more, who engaged in oral/anal sex with men in the past 12 months were recruited for the study after providing written informed consent.

Measures

A structured questionnaire was used to collect information regarding sociodemographic characteristics, sexual behaviors, access and utilization of HIV/STI prevention-related services, and HIV-related knowledge, through face-to-face interviews conducted by trained personnel.

Sociodemographic information included age in years (continuous and further categorized into <20, 20–29, 30–39, or 40 and above), marital status (never married or ever married), residence (in cities under study, other cities in the same province, or cities in other provinces), ethnicity (Han or others), city (Nanjing, Suzhou, Yangzhou, Chongqing, Guangzhou, Haerbin, or Jinan), education level (illiterate or elementary school, junior or senior high school, and college or higher), monthly income [0, 1–500, and above 500 US Dollars per month (USD/Mth)], main venues to look for male partners (pub/club, spa/bathhouse, park/public restroom, internet, and others), and social network size (continuous and further categorized into ≤ 2 , 3–9, 10, and above). Self-identified sexual orientation of the participants (homosexual, heterosexual, bisexual, and not sure) was also inquired. Social network size was measured by asking how many MSM the participants knew (knew the person by face and name/nickname, had his contact info, and could get in touch with him within the next month).

Behavioral Measures

The behavioral measures included sexual behavior with men (whether engaged in anal sex with men in past 6 months, number of different male partners in past 6 months, and condom use during last anal sex), commercial sex with men (bought or

sold sex to other men in last 6 months and condom use during commercial sex with men in last 6 months), and sex with women (having sex with a woman in the last 6 months and condom use during the last sex). CAI in last 6 months was defined as not consistently using a condom during anal intercourse in past 6 months with all male partners. CVI was defined as not consistently using condom during vaginal intercourse with all female partners in last 6 months. MSWs were defined as the participants who sold anal sex to men in past 6 months, either for goods or money. MCM were defined as men who paid for male sex to MSWs during the last 6 months.

Besides demographic information and behaviors of the participants, we also collected information on their knowledge regarding HIV and its prevention (participants who provided correct answer to at least 6 out of the 8 relevant questions were defined as MSM having correct knowledge), and whether they had received any HIV-related services during the last year.

Serological Measures

For HIV and syphilis testing, 5 mL of intravenous blood was collected from each participant. A rapid screening test (Acon Biotech Co. Ltd., Hangzhou, China) was performed to detect HIV antibodies and confirmed by Western Blot method (HIVBLOT 2.2; Genelabs Diagnostics, Singapore). For syphilis, the initial screening test for antibody detection was rapid plasma reagin test (Beijing Wantai Biological Pharmacy Enterprise Co. Ltd., Beijing, China) followed by Treponema pallidum particle agglutination assay (Livzon Group Reagent Factory, Zhuhai, China) to confirm. Only the participants having a positive result with both rapid plasma reagin and Treponema pallidum particle agglutination assay were considered as syphilis positive.

Statistical Methods

Software EpiData 3.0 was used for the double entry of data, and all analyses were performed using SAS statistical software version 9.3 (SAS Institute, Cary, NC). Descriptive analysis was used to describe the demographic and socioeconomic characteristics, risk behaviors, HIV, and syphilis prevalence among MCM and other MSM. To further compare MCM with other MSM, bivariate analyses [to determine odds ratios (ORs) and corresponding 95% confidence intervals (CIs)] were conducted using simple logistic regressions to measure the strength of association between sociobehavioral factors and the likelihood of being MCM with reference to other MSM. In addition, multiple logistic regressions were performed to determine the aforementioned strengths of association [in terms of adjusted odds ratios (aORs) and corresponding 95% CIs] adjusted for age (continuous), marital status, nationality, sampling city, and residence were to control for potential confounders in the multiple regression model. In these models, participants' type (MCM or MSM, dichotomous) was treated as dependent variable, whereas other variables were treated as independent variables.

Ethics Statement

The study content was approved by the Ethics Committee at China CDC.¹² Signed informed consent was obtained from each of the participants before interview, blood

TABLE 1. Demographic Characteristics, Sexual Behaviors, and HIV and Syphilis Prevalence of Clients of MSWs Recruited Between 2008 and 2009 in China (N = 2958)

	Clients (n = 148)			Non-Clients (n = 2810)			Total (N = 2958)	
	Frequency	Percent	95% CI	Frequency	Percent	95% CI	Frequency	Percent
Age								
<20	8	5.41	1.72 to 9.09	170	6.05	5.17 to 6.93	178	6.02
20 ≤ age < 30	77	52.03	43.89 to 60.17	1622	57.72	55.89 to 59.55	1699	57.44
30 ≤ age < 40	34	22.97	16.12 to 29.83	574	20.43	18.94 to 21.92	608	20.55
≥40	29	19.59	13.12 to 26.06	444	15.80	14.45 to 17.15	473	15.99
Marital status								
Never married	114	77.03	70.17 to 83.88	2048	72.91	71.26 to 74.55	2162	73.09
Ever married	34	22.97	16.12 to 29.83	762	27.12	25.47 to 28.76	796	26.91
Residence								
Sampling city	67	45.27	37.16 to 53.38	1457	51.87	50.02 to 53.72	1524	51.54
Other cities at sampling province	44	29.73	22.28 to 37.18	646	23.00	21.44 to 24.55	690	23.33
Other provinces	37	25.00	17.94 to 32.06	706	25.13	23.53 to 26.74	743	25.13
Education								
Elementary school or below	10	6.76	2.67 to 10.85	58	2.06	1.54 to 2.59	68	2.30
Junior or Senior high school	81	54.73	46.62 to 62.84	1398	49.77	47.92 to 51.62	1479	50.02
College or higher	57	38.51	30.58 to 46.45	1353	48.17	46.32 to 50.02	1410	47.68
Monthly income								
No income	14	9.46	4.69 to 14.23	454	16.16	14.80 to 17.52	468	15.83
1–500 USD	91	61.49	53.55 to 69.42	1876	66.78	65.04 to 68.53	1967	66.52
>500 USD	43	29.05	21.65 to 36.45	479	17.05	15.66 to 18.44	522	17.65
City								
Nanjing	20	13.51	7.94 to 19.09	411	14.63	13.32 to 15.93	431	14.57
Suzhou	32	21.62	14.91 to 28.33	248	8.83	7.78 to 9.88	280	9.47
Yangzhou	19	12.84	7.39 to 18.29	281	10.00	8.89 to 11.11	300	10.14
Chongqing	17	11.49	6.29 to 16.68	600	21.35	19.84 to 22.87	617	20.86
Guangzhou	10	6.76	2.67 to 10.85	369	13.13	11.88 to 14.38	379	12.81
Ha'erbín	14	9.46	4.69 to 14.23	437	15.55	14.21 to 16.89	451	15.25
Jinan	36	24.32	17.33 to 31.32	464	16.51	15.14 to 17.89	500	16.90
Knowledge								
Unknown	37	25.00	17.94 to 32.06	568	20.21	18.73 to 21.70	605	20.45
Known	111	75.00	67.94 to 82.06	2242	79.79	78.30 to 81.27	2353	79.55
Coverage								
No	45	30.41	22.91 to 37.90	885	31.49	29.78 to 33.21	930	31.44
Yes	103	69.59	62.10 to 77.09	1925	68.51	66.79 to 70.22	2028	68.56
Venue								
Pub, disco, or tearoom	48	32.43	24.80 to 40.06	388	13.81	12.54 to 15.09	436	14.74
Spa or bathhouse	14	9.46	4.69 to 14.23	347	12.35	11.14 to 13.57	361	12.21
Park, public restroom	34	22.97	16.12 to 29.83	289	10.29	9.16 to 11.41	323	10.92
Internet	47	31.76	24.17 to 39.34	1563	55.64	53.80 to 57.48	1610	54.45
Other	5	3.38	0.43 to 6.32	222	7.90	6.90 to 8.90	227	7.68
Sexual orientation								
Homosexual	85	57.43	49.37 to 65.49	1541	54.86	53.02 to 56.70	1626	54.99
Heterosexual	1	0.68	0 to 2.01	42	1.50	1.05 to 1.94	43	1.45
Bisexual	54	36.49	28.64 to 44.33	1076	38.31	36.51 to 40.10	1130	38.21
Not sure	8	5.41	1.72 to 9.09	150	5.34	4.51 to 6.17	158	5.34
Social network size								
≤2	14	9.46	4.69 to 14.23	370	13.17	11.92 to 14.42	384	12.98
2 ~ 10	56	37.84	29.93 to 45.74	1080	38.43	36.63 to 40.23	1136	38.40
≥10	78	52.70	44.56 to 60.84	1360	48.40	46.55 to 50.25	1438	48.61

TABLE 1. (Continued) Demographic Characteristics, Sexual Behaviors, and HIV and Syphilis Prevalence of Clients of MSWs Recruited Between 2008 and 2009 in China (N = 2958)

	Clients (n = 148)			Non-Clients (n = 2810)			Total (N = 2958)	
	Frequency	Percent	95% CI	Frequency	Percent	95% CI	Frequency	Percent
HIV								
Positive	11	7.43	3.16 to 11.71	217	7.72	6.73 to 8.71	228	7.71
Negative	137	92.57	88.29 to 96.84	2593	92.28	91.29 to 93.27	2730	92.29
Syphilis								
Positive	28	18.92	12.54 to 25.30	394	14.02	12.74 to 15.31	422	14.27
Negative	120	81.08	74.70 to 87.47	2416	85.98	84.69 to 87.26	2536	85.73
CVI								
Yes	34	22.97	16.12 to 29.83	529	18.83	17.38 to 20.27	563	19.03
No	114	77.03	70.17 to 83.88	2281	81.17	79.73 to 82.62	2395	80.97
CAI								
Yes	88	59.46	51.46 to 67.46	1353	48.15	46.30 to 50.00	1441	48.72
No	60	40.54	32.54 to 48.54	1457	51.85	50.00 to 53.70	1517	51.28

CAI, condomless anal intercourse.

collection, and intervention. Each of the participants had the ability to decline from this survey at any step. The questionnaires and written consent document were separately kept in locked cupboards at the study sites, and unauthorized access to them was not possible.

RESULTS

Demographic Characteristics

More than half of the participants (57.4%) were aged between 20 and 30 years, 73.1% were never married and 51.5% were residents of the same cities, where from they were recruited. Among the participating MSM, 47.7% had college or above level of education, 66.5% had monthly income between 1 and 500 USD, and 79.6% had correct knowledge regarding HIV and its prevention, whereas 68.6% had received at least one of the 6 listed HIV-related services during the last year (Table 1).

Behavioral Characteristics

Among 2958 recruited MSM, 148 (5.0%) were MCM. A total of 1626 (55.0%) participants self-identified themselves as gay, whereas another 1130 (38.2%) were self-identified as bisexual. More than half of (54.4%) the subjects mainly found their sexual partners through internet, and 48.6% had social network size of more than 10 (Table 1).

About half (48.7%) of the participants reported that they had engaged in CAI in last 6 months. This proportion for MCM and other MSM were 59.5% and 48.2%, respectively. In addition, 19.0% of participants engaged in CVI in last 6 months (23.0% for MCM and 18.8% for other MSM) (Table 1).

HIV and Syphilis Prevalence

The HIV prevalence for MCM and other MSM were 7.4% and 7.7%, whereas syphilis prevalences for the 2 groups were 18.9% and 14.0%, respectively. The HIV and syphilis prevalences among all respondents were 7.7% and 14.3%,

respectively (Table 1). Distribution of sociobehavioral characteristics of MCM and other MSM are also presented in Table 1.

Bivariate and Multiple Logistic Regressions to Measure the Strength of Associations

The results of bivariate analysis indicated that compared with participants who had college or above level of education, the participants who only attended elementary school or below were more likely to be MCM (ref = other MSM), with crude OR of 4.09 (95% CI: 1.99 to 8.42). Participants who had monthly income of 500 USD or more had higher odds of buying sex from MSWs, with crude OR of 2.91 (95% CI: 1.57 to 5.39). In comparison with the participants who usually met partners online, participants who usually met partners at pub/disco/tearoom and park/public restroom had higher likelihood of purchasing commercial sex, with crude ORs of 4.11 (95% CI: 2.71 to 6.24) and 3.91 (95% CI: 2.47 to 6.19), respectively. MCM were also more likely to engage in CAI with other men in last 6 months (crude OR = 1.58, 95% CI: 1.13 to 2.21) (Table 2).

After adjustment for age, marital status, nationality, sampling city, and residence in the multiple regression model, the direction of the aforementioned associations remained the same and the magnitude of the odds ratios did not change much.

Multiple logistic regression also revealed that MCM were more likely to have syphilis (aOR = 1.54, 95% CI: 1.00 to 2.38), although the HIV prevalence remained similar between the 2 groups (in both bivariate and multiple regression models). After adjustment for potential confounders, the participants who had larger social network sizes (more than two) had higher odds of being MCM, with aORs for social network size between 3 and 9 being 1.91 (95% CI: 1.92 to 3.57), and social network size equal to 10 or higher being 2.70 (95% CI: 1.44 to 5.07).

DISCUSSION

Globally, unsafe commercial sex plays an important role in the transmission of HIV and other STIs including syphilis,

TABLE 2. Factors Correlated With Participants Who Engaged in Sex With Commercial MSWs Between 2008 and 2009 in China (N = 2958)

Variable	Crude Model			Adjusted Model*		
	OR	95% CI	P	aOR	95% CI	P
Education						
College or higher	Ref			Ref		
Elementary school or below	4.09	1.99 to 8.42	<0.001	3.13	1.42 to 6.90	0.005
Junior or senior high school	1.38	0.97 to 1.95	0.07	1.44	0.99 to 2.09	0.06
Monthly income						
No income	Ref			Ref		
1–500 USD	1.57	0.89 to 2.79	0.12	1.64	0.90 to 3.01	0.11
>500 USD	2.91	1.57 to 5.39	<0.001	2.97	1.53 to 5.77	0.001
Venue						
Internet	Ref			Ref		
Pub, disco, tearoom, or club	4.11	2.71 to 6.24	<0.001	3.89	2.49 to 6.08	<0.001
Spa or bathhouse	1.34	0.73 to 2.46	0.34	1.42	0.73 to 2.76	0.62
Park or public restroom	3.91	2.47 to 6.19	<0.001	4.01	2.34 to 6.85	<0.001
Other	0.75	0.30 to 1.90	0.54	0.77	0.30 to 1.98	0.59
Sexual orientation						
Homosexual	Ref			Ref		
Heterosexual	0.43	0.06 to 3.17	0.41	0.34	0.04 to 2.54	0.29
Bisexual	0.91	0.64 to 1.29	0.60	0.88	0.61 to 1.28	0.50
Not decided	0.97	0.46 to 2.04	0.93	0.95	0.44 to 2.04	0.90
Knowledge						
Unknown	Ref			Ref		
Known	0.76	0.52 to 1.12	0.16	0.72	0.48 to 1.08	0.11
Coverage						
No	Ref			Ref		
Yes	1.05	0.74 to 1.51	0.78	1.21	0.83 to 1.76	0.32
Social network						
≤2	Ref			Ref		
3 ~ 9	1.37	0.75 to 2.49	0.30	1.91	1.02 to 3.57	0.04
≥10	1.52	0.85 to 2.71	0.16	2.70	1.44 to 5.07	0.002
HIV						
Negative	Ref			Ref		
Positive	0.96	0.51 to 1.80	0.90	1.14	0.60 to 2.19	0.69
Syphilis						
Negative	Ref			Ref		
Positive	1.43	0.94 to 2.19	0.10	1.54	1.00 to 2.38	0.05
CVI						
No	Ref			Ref		
Yes	1.29	0.87 to 1.91	0.21	1.38	0.88 to 2.16	0.16
CAI						
No	Ref			Ref		
Yes	1.58	1.13 to 2.21	0.01	1.49	1.05 to 2.10	0.02

*Models were adjusted for age (continuous), marital status (never married and ever married), nationality (Han and others), sampling city (7 sampling cities), and residence (sampling city, other cities at sampling province, and other provinces).

not only for women¹³ but also for men.² Although much research did focus on straight commercial sex until date, there was less focus on gay commercial sex. Clients of commercial sex workers (women or men) also have a higher chance of having STIs including HIV, as these subjects usually engage in high-risk behaviors with commercial sex workers.^{10,14} Several studies were conducted among male clients of FSWs,^{15,16} whereas few studies focused on MCM. Our study adds to

the literature by providing information regarding demographic characteristics, high-risk behaviors, and burden of HIV and syphilis among MCM in several cities in China. We further compared MCM with general MSM, to see whether these 2 populations were different regarding demographic characteristics, high-risk behaviors, and HIV and syphilis prevalence.

The results from this multicenter cross-sectional study suggest that the prevalence of HIV was similarly high

between both MCM and MSM. The observed HIV prevalence was much lower than the HIV prevalence among MSWs in Thailand,¹⁷ Côte D'Ivoire,¹⁸ and India.¹⁹ However, it was similar to that among Chinese MSWs⁶ and a bit higher than the corresponding proportion among Chinese MSM.⁵

Our study also indicated that after adjusting for potential confounders, MCM had marginally higher syphilis prevalence than other MSMs in China.²⁰ This high syphilis prevalence among clients of MSWs might well facilitate the spread of HIV within and from this high-risk population, as syphilis was a known factor for increasing the likelihood of transmission of HIV infection.²¹ However, the reasons for the similarities in HIV prevalences and disparity in the syphilis prevalences between MCM and MSM are still unknown. To explore the reasons behind this phenomenon, further studies that specifically targeting MCM are called for.

Our study also found that compared with general MSM, more MCM engaged in CAI in last 6 months (either with MSWs or other MSM). This CAI rate was higher than the CAI proportion reported by MSWs in Vietnam,¹¹ it was also higher than the CAI rate reported by MSWs recruited from 2 cities of China.¹⁰ However, our study did not differentiate CAI with MSWs and general male partners. In addition, we did not collect CAI proportion during receptive and insertive intercourse. In one of our previous study, we observed that CAI was associated with higher prevalence of HIV and syphilis.²² Thus high CAI proportion among clients of MSWs might result in further upsurge of the HIV and syphilis epidemic among them.

It was further suggested by our findings that participants who belonged to larger network were more likely to engage in commercial sex, and this likelihood increased with an increase in the size of the social network. Usually, the larger the social network size the participants had, the stronger their network ties to other MSM they have.²³ Thus, social network size plays an important role in the spread of HIV and syphilis.²⁴ Usually, MSM tend to use their social network to find potential male partners, and the scenario must be similar for MCM. This might be the explanation behind the observation that participants having larger social network size in our study had higher odds of engaging in commercial sex.

In addition, participants who mainly found partners from pubs/bars and park/public restrooms also had higher likelihood of buying commercial sex. The potential reason behind this circumstance included the fact that these venues were mainly the working places of MSWs,²⁵ and MCM were more likely to visit these venues and find available MSWs.

Our study further indicated that participants who received less education and had higher monthly income were more likely to be MCM. This result was not surprising as the studies involving clients of FSWs found that participants who received limited education were also less aware regarding prevention of STIs including HIV and were more likely to engage in commercial sex.²⁶ This could also be the case for the MCM participating in our study. Also, participants who had higher income could afford the cost of purchasing commercial sex, as the price for having sex with MSWs is relatively high in China.

The strength of our study included involving several cities, a large sample size (although only 148 participants

reported they were MCM), and use of respondent-driven sampling and snowball sampling for the recruitment of subjects. Being an observational study, our study had certain limitations. First, because of our cross-sectional design, a lack of temporality prevented us from drawing any causal inferences. Second, as the data were collected through self-report and face-to-face interviews, our study might have had the problem of social desirability bias, which, in turn, might have lead to exposure or confounder misclassifications. In this study, within the city-specific samples of MCM, MCM were self-identified. Thus any extrapolation of the findings among MCM in general should be performed with caution. Third, selection bias due to nonresponse might also be a threat to the validity of our study. In our study, we could not collect data regarding the response rate from each site, whereas only return rate of distributed coupons was available from some sites.²⁷ The low return rate of the distributed coupons (ie, 30% in Nanjing²⁷) might have reflected this potential for selection bias. In addition, when we measured condomless sex behaviors of the participants, we could not separate condomless sexual behaviors between the insertive and receptive partners, whereas the HIV transmission rates were different between these 2 different behaviors. Last but not the least, even we adjusted for age, sampling sites, and other variables in the multivariate analysis models, our study might still have residual confounding due to the remaining unknown or unadjusted confounders.

In conclusion, our study compared MCM with other MSM in China. We found that MCM had relatively lower education, higher monthly income, larger social network size, and higher syphilis prevalence. Results of our study indicate that MCM were ignored in China, future intervention and surveillance programs should consider this population as a distinct risk group that should be targeted for controlling the spread of HIV and syphilis, especially as more than one-third of them considered they to be bisexual and almost 20% of whom reported vaginal sex without a condom.

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