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Sex Transm Infect 2010 86: 15-20 originally published online October 22, 2009
doi: 10.1136/sti.2009.037440

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Accepted 14 August 2009
Published Online First 22 October 2009

ABSTRACT

Background HIV transmission among men who have sex with men has recently become a major concern in China. Little is known, however, about HIV transmission among male sex workers (MSW). This study aimed to investigate HIV infection prevalence and risk factors among MSW in Shenzhen, China.

Materials and methods Following formative research, a cross-sectional study was conducted using time—location sampling among MSW in Shenzhen, from April to July 2008. Behavioural and serological data on HIV and syphilis were collected. The risk factors for HIV infection were analysed using a logistic regression model.

Results In total, 394 MSW were recruited for the survey. The prevalence of HIV and syphilis among these workers was 5.3% and 14.3%, respectively. Only a quarter of the MSW self-identified as homosexual. More than 70% had sex with both men and women. HIV-related knowledge levels were high regardless of HIV serostatus. Consistent condom use was low (37.1%) and varied by type of sexual partner. Factors including more non-commercial male partners, working in small home-based family clubs, being drunk before sexual intercourse, having a history of HIV tests, syphilis infection and a short period of residence in Shenzhen were associated with an increased risk of HIV infection.

Conclusions High-risk sexual practices were common among MSW regardless of their high level of HIV awareness. The working venues were associated with HIV infection and a recent test for HIV was a potential predictor of HIV infection. The time—location sampling method was found to be an appropriate way of recruiting MSW for this study, especially those without fixed working places.

Reports from several Asian countries, including China, Thailand, India, Vietnam and Japan indicate a rapid spread of HIV among men who have sex with men (MSM) in recent years.[1–6] According to official estimates, there were approximately 700 000 HIV/AIDS cases in China in 2007.[7] Injection drug users and former plasma donors have been the major contributors to the HIV epidemic in the country. However, recent data have suggested that the major transmission route may have shifted from injection drug use practices to sexual transmission. The national report of HIV-positive cases in 2007 has estimated that the infection was transmitted via heterosexual contact in 44.7% of cases, and via homosexual contact in 12.2% of cases.[7] In some cities, HIV prevalence has been reported to range from 0.5% to 12.5% among MSM in the past 2 years.[8–13] A dramatic increase in HIV prevalence has been found among MSM in Beijing, from 0.4% in 2004 to 5.8% in 2006.[10] Those studies also showed that the prevalence of other sexually transmitted infections was high among MSM in China.[8–13]

Thus far, there has been little information about the prevalence of HIV and risk factors among male sex workers (MSW), also known as 'money boys',[14–20] especially in China.[21–23] Few reports have targeted MSW as study subjects and no biological data are available to address the issue.[24–26]

Shenzhen, a thriving city in southern Guangdong province, just north of Hong Kong, is an ideal place in China for analysing the HIV-related risk factors among MSW. As the first and most successful special economic zone in China, Shenzhen has more than 12 million internal migrants. These migrants account for 87.0% of the total population, and have a mean age of 26 years. In addition, more than 210 000 travellers cross between Shenzhen and Hong Kong every day.[28] Consequently, the MSM population, including MSW, has grown rapidly over the past two decades in Shenzhen.[24] Most of the MSW work at venues such as clubs and bars, while some work on their own, finding clients in public areas such as parks or through the internet. The prevalence of HIV and syphilis among MSM has increased from 0.9% and 9.4% in 2002 to 2.7% and 15.8% in 2005,[27] and to 3.7% and 18.2% in 2008.[9] However, no information is available for the MSW population. The present study was conducted to investigate the scale and severity of HIV infection among Shenzhen MSW. The primary objective was to determine the prevalence of HIV and selected sexually transmitted infections among MSW in Shenzhen. At the same time, the opportunity was taken to assess HIV awareness, attitudes and sexual practices among this population.

SUBJECTS AND METHODS

Study design

Formative research, consisting of focus group discussions, individual in-depth interviews and field observations, was first conducted to select the MSW venues and to determine the most productive times for conducting the survey at these venues. We approached key informants from the community, leaders of MSM non-governmental

organisations, MSW representatives and local MSM experts. On the basis of what we learnt from our informants, we compiled a complete list of venues, including bars/massage centres, private clubs and public areas, such as parks, and busy day time periods for each venue. Only those venues with at least eight eligible MSW were selected and included in this study. As internet-based MSW account for only a small proportion of this community, time–location sampling (TLS) was more suitable than respondent-driven sampling for recruiting peers and was therefore used. TLS, also known as venue–day–time (VDT) sampling, was used to recruit survey participants. MSW were eligible to participate if they were 18 years or older; had been living in Shenzhen for more than 1 month at the time of the survey and had ever sold sex (oral or anal) to another man in Shenzhen during the previous month.

The busiest operating hours at each venue were divided into 2-h periods over the course of a week (VDT) and then sampled systematically. Sixteen venues were randomly selected each month. One 2-h time slot for each venue was then randomly chosen using a random numbers table. Sampling was repeated for three consecutive months until the sample size was met (the estimated sample size was 400). At the selected venues, potentially eligible MSW were approached and asked a number of screening questions. Eligible individuals identified through screening were invited to join the study, completed a behavioural questionnaire and gave blood samples for HIV and syphilis tests. Participants were informed of negative results over the phone. Participants with positive results were asked to come to the Shenzhen Centers for Disease Control and Prevention (CDC) for a confirmatory test. HIV or syphilis-positive cases were referred to the relevant treatment and healthcare services. The study was approved by the Medical Ethics Committee of Shenzhen CDC. Informed consent was obtained from all participants.

Questionnaires and HIV testing

The information collected from the questionnaires included demographic information, commercial and non-commercial sexual behaviour, drug use, history of sexually transmitted disease infection, access to HIV services, HIV awareness and condom use knowledge. The number of MSW who were enumerated, intercepted and recruited in the study was also documented for statistical adjustment of the results.

HIV and syphilis testing were performed according to standardised laboratory procedures provided by the National Center for Disease Control and Prevention of China. Syphilis was tested with rapid plasma reagin (Rongsheng Biotech Inc, Shanghai, China) for qualitative screening and *Treponema pallidum* particle agglutination assay (Fujirebio Inc, Japan) for confirmation. HIV was tested using a rapid test (Determine HIV-1/2/O; Abbott Laboratories, Illinois, USA) and ELISA (Wantai Biotech Inc, Beijing) for screening and Western blot (Genlabs Diagnostics, Singapore) for confirmation.

Data analysis

Descriptive analyses were carried out to examine subjects' demographic characteristics, sexual behaviour patterns, commercial sex work and condom use. Pearson's χ^2 tests and logistic regression analyses (univariates) were performed to identify factors potentially associated with HIV infection. Multivariate logistic regression was then undertaken to assess risk factors while controlling for confounding factors. The selected variables in the multivariate model were based on the results of univariate analysis. A weighting scheme was used to adjust for the results, which considered the probability of the inclusion of homogeneity of individuals sampled in each VDT.[29] The analysis was performed using SPSS 17.0.

RESULTS

Participants were recruited from April to July 2008 in 32 venue–date–times randomly selected from a total of 43 active venues. Among 494 potentially eligible men identified, 456 (92.3%) agreed to participate in the HIV and syphilis screening. A total of 394 (86.4%) participants completed both the questionnaire and the biological test. Reasons provided for unwillingness to participate in the study included having been tested for HIV recently, not having enough time for the survey, being afraid of giving blood samples and not feeling comfortable with participating in a study related to HIV risk and drug use.

Table 1 describes the demographic characteristics of the study subjects. Twenty-one MSW were HIV seropositive, for an HIV prevalence of 5.3% (95% CI 2.9 to 7.2%). The average age of the subjects was 22.8 years (18–49 years) and approximately half were younger than 22 years. Most of the MSW had received at least a middle school education (over 9 years). Only 3.3% had official residence cards (*hukou*) in Shenzhen. Most of the MSW originally came from elsewhere in China, such as the inland provinces of Hunan, Sichuan, Henan and Shandong; 12.9% came from elsewhere in Guangdong province. Approximately two-thirds of the subjects had been living in Shenzhen for less than 1 year. Over two-thirds lived in Luohu district, one of the most economically vibrant districts of Shenzhen and a commercially developed area that was most attractive to people from Hong Kong for business and entertainment. Over 80% of the MSW earned more than 1000 renminbi (RMB; approximately US$147) per month, and more than a third earned more than 3000 RMB (approximately US$441).

Table 2 shows sexual practice and behaviour patterns. Of the 394 subjects, 40 were recruited from public areas such as parks, 119 from family clubs (small home-based brothels, where they worked as call boys for a pimp or manager who provided housing) and 235 from entertainment venues (bars and massage centres). Only 24.4% of the participants self-identified as gay or homosexual, whereas 37.6% described themselves as bisexual. A quarter of the participants identified themselves as heterosexual. More than 71% had had sexual contact with female partners in the past 6 months. The number of non-commercial partners during the previous 6 months was on average three, whereas the number of commercial partners during the previous 1 month was nine; 39.6% of the MSW reported that they had engaged in unprotected male-to-male anal sex within the past 6 months, including 30.1% who reported unprotected commercial male sex within the previous 1 month. Fifty-four participants tested positive for syphilis, with an adjusted prevalence of 14.2% (95% CI 10.7% to 17.6%).

Table 3 represents potential risk factors for HIV infection among MSW. In univariate analyses, self-identifying as gay (odds ratio (OR) 7.0, 95% CI 1.8 to 28.0), working in family clubs (OR 4.4, 95% CI 1.8 to 11.0), never having had sex with a woman (OR 3.4, 95% CI 1.4 to 8.5), having non-commercial male anal sex partners (OR 3.1, 95% CI 1.0 to 9.7), only selling sex to men (OR 4.6, 95% CI 1.0 to 20.5), ever testing for HIV (OR 3.1, 95% CI 1.2 to 8.3), having their last HIV test within 6 months (OR 4.7, 95% CI 1.9 to 12.0) and testing positive for syphilis (OR 4.8, 95% CI 1.9 to 12.3) were positively associated with HIV infection. Working in bars (0/87, χ^2=6.95, p=0.008), and having clients mainly from Hong Kong (Fisher's exact test, p=0.026) were factors negatively associated with HIV infection.

Table 1 Demographic characteristics for MSW in Shenzhen, 2008

Variable	Total n (%)	HIV-positive n (%)	Adjusted HIV %*	p Value*
Overall	394 (100)	21 (5.3)		
Age, years				
≤20	91 (23.1)	2 (2.2)	2.2	0.332
21–25	241 (61.2)	15 (6.2)	6.2	
>25	62 (15.7)	4 (6.5)	6.3	
Education level				
Primary or less	7 (1.8)	0 (0)	0	0.881
Middle school	114 (29.0)	6 (5.3)	5.3	
High school	220 (56.0)	13 (5.9)	5.5	
College or higher	52 (13.2)	2 (3.8)	3.6	
Residence card held				
Shenzhen	12 (3.0)	1 (8.3)	7.1	0.078
Guangdong province	38 (9.6)	5 (13.2)	12.8	
Others	344 (87.3)	15 (4.4)	4.4	
Area of residence				
Luohu	276 (70.1)	12 (4.3)	4.0	0.158
Other districts	118 (29.9)	9 (7.6)	7.4	
Length of stay in Shenzhen				
≤3 months	136 (34.5)	9 (6.6)	6.2	0.497
3–12 months	124 (31.5)	8 (6.5)	6.5	
>1 year	132 (33.5)	4 (3.0)	3.5	
Employment status				
Full time	204 (51.8)	14 (6.9)	6.9	0.085
Others	190 (48.2)	7 (3.7)	3.1	
Occupation				
Commercial services	312 (79.2)	13 (4.2)	4.0	0.075
Others	82 (20.8)	8 (9.8)	8.6	
Living situation				
Alone	101 (25.6)	6 (5.9)	5.7	0.140
With other MSW	240 (60.9)	9 (3.8)	3.9	
Other	53 (13.5)	6 (11.3)	10.3	
Monthly income, RMB				
≤1000	75 (19.0)	6 (8.0)	7.8	0.629
1001–3000	181 (45.9)	7 (3.9)	3.9	
3001–5000	78 (19.8)	5 (6.4)	5.0	
>5000	59 (15.0)	3 (5.1)	5.4	
Self-identified sexual orientation				
Homosexual/gay	96 (24.4)	12 (12.5)	10.9	0.006
Bisexual	148 (37.6)	6 (4.1)	4.1	
Heterosexual/unsure	150 (38.1)	3 (2.0)	2.0	

*Adjusted for recruitment rate at each event by weighing cases by using percentage of enumeration divided by percentage of actually finishing questionnaire.
MSW, male sex worker; RMB, renminbi.

Table 2 Sexual behaviour patterns for MSW in Shenzhen, 2008

Variable	Total n (%) (N=394)	HIV-positive n (%) (N=21)	Adjusted HIV %*	p Value*
Venue type				
Park	40 (10.2)	3 (7.5)	6.9	0.004
Family club	119 (30.2)	13 (10.9)	11.3	
Massage centre	148 (37.6)	5 (3.4)	3.0	
Bar	87 (22.1)	0 (0)	0.0	
No of non-commercial male partners, past 6 months				
0	153 (38.8)	4 (2.6)	2.7	0.026
1–2	111 (28.2)	4 (3.6)	3.7	
≥3	130 (33)	13 (10)	9.4	
No of commercial male partners, past 1 month				
≤4	176 (44.7)	5 (2.8)	2.8	0.064
>4	218 (55.3)	16 (7.3)	6.9	
No of female vaginal/anal sex partners, past 6 months				
0	145 (36.8)	14 (9.7)	8.6	0.007
1	73 (18.5)	5 (6.8)	7.1	
>1	176 (44.7)	2 (1.1)	1.1	
Sold sex to women, past 6 months				
Yes	126 (32)	2 (1.6)	1.6	0.031
No	268 (68)	19 (7.1)	6.7	
UAI in commercial anal sex				
Yes	116 (30.1)	7 (6.0)	5.7	0.615
No	269 (69.9)	13 (4.8)	4.5	
UAI in non-commercial anal sex				
Yes	111 (28.2)	7 (6.3)	5.8	0.658
No	283 (71.8)	14 (4.9)	4.7	
Consistent condom use				
Not always use	248 (62.9)	15 (6.0)	5.8	0.339
Always use	146 (37.1)	6 (4.1)	3.6	
UAI in non-commercial sex with woman				
Yes	152 (38.6)	7 (4.6)	4.5	0.707
No	242 (61.4)	14 (5.8)	5.4	
UAI in vaginal or anal sex with female clients (123 cases)				
Yes	56 (45.5)	1 (1.8)	1.7	1.000
No	67 (54.5)	1 (1.5)	1.6	
Percentage of male clients from Hong Kong, past 6 months				
<50	267 (67.8)	19 (7.1)	7.1	0.019
≥50	127 (32.2)	2 (1.6)	1.5	
Per encounter payment for selling sex to male clients, RMB				
≤500	241 (61.2)	16 (6.6)	6.2	0.184
>500	153 (38.8)	5 (3.3)	3.2	
Years of selling sex				
≤1	226 (58.5)	9 (4)	3.6	0.104
>1	160 (41.5)	12 (7.5)	7.3	
Exposed to HIV-related services				
Yes	313 (79.4)	16 (5.1)	4.7	0.401
No	81 (20.6)	5 (6.2)	7.4	
Syphilis infection				
Yes	56 (14.2)	8 (14.3)	14.3	0.003
No	338 (85.8)	13 (3.8)	3.5	

*Adjusted for recruitment rate at each event by weighing cases by using percentage of enumeration divided by percentage of actually finishing questionnaire.
MSW, male sex worker; RMB, renminbi; UAI, unprotected anal intercourse.

Multivariate analysis for factors correlated with HIV infection

In multivariate analysis, staying in Shenzhen for less than 1 year, working in family clubs, having more than two non-commercial male sex partners in the previous 6 months, having more than one female sex partner in the previous 6 months, having had an HIV test within the previous 6 months, drinking alcohol before having sex and testing positive for syphilis were independently associated with HIV infection.

DISCUSSION

We investigated the prevalence of HIV infection and related risky behaviour in a mobile and highly vulnerable hidden population. The results showed that HIV prevalence among MSW was not significantly different from prevalence among MSM in Shenzhen (5.1% vs 3.7%[9] and 8.4% in our own findings, data not shown), whereas syphilis infection rates were significantly lower than those in MSM (14.1% vs 18.3%[9] and 21.0% in our study). The findings suggest that although MSW are thought to be at increased risk of sexually transmitted diseases including HIV, there is not enough evidence to demonstrate if they have played a more substantial role in transmitting HIV in China than other MSM. MSW in Shenzhen had higher monthly incomes than common migrant workers (600~800 RMB per month earned by most migrant workers in Shenzhen, approximately US$88~118; Shenzhen Longgang government online, http://www.lg.gov.cn). Engaging in sex work as an occupational choice instead of merely

Table 3 Risk factors for HIV infection among MSM in Shenzhen, 2008

		Univariate		Multivariate	
Variables	**HIV+/total**	**OR* (95% CI)**	**p Value**	**OR* (95% CI)**	**p Value**
Age, years					
≤22	8/207	1		NS	
23–27	10/157	2.02 (0.75 to 5.45)	0.164	NS	
>27	3/30	3.14 (0.77 to 12.76)	0.111	NS	
Education level					
Middle school or less	6/121	1.37 (0.27 to 6.74)	0.717	NS	
High school	13/220	1.50 (0.33 to 6.73)	0.596	NS	
College or higher	2/52	1		NS	
Residency ('Hukou')					
Guangdong province	6/50	2.64 (0.94 to 7.40)	0.065	NS	
Outside	15/344	1		NS	
Length of staying in Shenzhen, years					
≤1	17/260	1.94 (0.67 to 5.61)	0.221	3.76 (1.04 to 13.62)	0.043
>1	4/132	1		1	
Self-identified sexual orientation					
Homosexual	12/96	7.04 (1.77 to 28.00)	0.006	NS	
Bisexual	6/148	2.52 (0.58 to 10.96)	0.217	NS	
Heterosexual/questioning	3/150	1		NS	
Venue type					
Park	4/58	3.73 (0.91 to 15.22)	0.067	1.82 (0.34 to 9.83)	0.002
Family club	12/106	6.67 (2.17 to 20.52)	0.001	9.91 (2.50 to 39.24)	0.487
Bar and massage club	4/232	1		1	0.001
Gender of the first sex partner					
Male	10/109	2.20 (0.89 to 5.44)	0.087	NS	
Female	11/285	1		NS	
No of non-commercial male sex partners, past 6 months					
0	4/153	1		1	0.040
1–2	4/111	1.36 (0.32 to 5.77)	0.681	0.79 (0.12 to 4.78)	0.800
≥3	13/130	3.81 (1.19 to 12.25)	0.025	4.22 (0.88 to 20.26)	0.072
No of male clients, past 1 months					
1–4	5/176	1		NS	
>4	16/218	2.74 (0.96 to 7.81)	0.059	NS	
No of female sex partners, past 6 months					
0	14/145	6.75 (1.67 to 27.30)	0.007	3.63 (0.76 to 17.34)	0.054
1	5/73	5.34 (1.10 to 25.84)	0.037	10.20 (1.55 to 67.23)	0.106
>1	2/176	1		1	0.016
UAI in non-commercial anal sex					
Yes	7/111	1		NS	
No	14/283	0.75 (0.30 to 1.91)	0.547	NS	
UAI in commercial anal sex					
Yes	7/116	1		NS	
No	13/269	0.74 (0.29 to 1.90)	0.526	NS	
UAI with female sex partners					
Yes	7/164	1		NS	
No	14/230	1.33 (0.52 to 3.39)	0.549	NS	
Anal sex roles, in past 6 months					
Insertive	3/47	1		NS	
Receptive	2/46	0.68 (0.119 to 3.92)	0.669	NS	
Both	15/293	0.71 (0.20 to 2.45)	0.584	NS	
Percentage of male clients from Hong Kong, past 6 months					
<50	19/265	12.83 (1.35 to 121.7)	0.026	NS	
≥50	2/129	1		NS	
Average payment received for each encounter, past 1 month, RMB					
≤500	16/241	1.91 (0.69 to 5.30)	0.214	NS	
>500	5/153	1		NS	
Sold sex to women, past 6 months					
Yes	2/126	1		NS	
No	19/268	4.62 (1.04 to 20.51)	0.044	NS	
Years of engaging in male-to-male commercial sex					
≤1	9/226	1		NS	
>1	12/160	1.96 (0.80 to 4.76)	0.139	NS	

Table 3 Continued

Variables	HIV+/total	Univariate OR* (95% CI)	p Value	Multivariate OR* (95% CI)	p Value
History of HIV test					
Never	6/220	1		1	0.031
Before 6 months	2/67	1.14 (0.23 to 5.80)	0.872	1.30 (0.21 to 8.16)	0.777
Within 6 months	15/174	5.09 (1.88 to 13.80)	0.001	5.02 (1.44 to 17.52)	0.011
Ever received STD consulting and treatment					
No	9/258	1		NS	
Yes	12/136	2.43 (0.98 to 5.99)	0.055	NS	
HIV-related knowledge					
Low	5/79	1		NS	
High	16/315	0.87 (0.30 to 2.59)	0.809	NS	
Condom use-related knowledge					
No	4/112	1		NS	
Yes	17/282	1.88 (0.59 to 5.96)	0.285	NS	
Ever had symptoms of STD					
No	18/344	1		NS	
Yes	3/71	1.12 (0.37 to 3.45)	0.84	NS	
Ever used illicit drugs					
No	15/261	1		NS	
Yes	6/133	0.78 (0.29 to 2.05)	0.606	NS	
Alcohol use before having sex, past 6 months					
Yes	17/266	2.39 (0.72 to 7.94)	0.154	6.54 (1.45 to 29.42)	0.014
No	4/128	1		1	
Syphilis					
No	13/338	1		1	
Yes	8/56	4.80 (1.88 to 12.25)	0.001	3.84 (1.20 to 12.28)	0.023

*Odds ratio (OR) was adjusted for recruitment rate at each event by weighing cases by using percentage of enumeration divided by percentage of actually finishing questionnaire.
MSM, men who have sex with men; RMB, renminbi; STD, sexually transmitted disease; UAI, unprotected anal intercourse.

survival sex could partly explain why they exhibit lower levels of risk behaviour and sexually transmitted disease infection.

In our study, only a quarter of MSW self-identified as gay. Most MSW (71%) were either bisexual or heterosexual men engaging in sex with both men and women concurrently. The latter proportion is higher than that reported in other countries.[30–32] Although a lower HIV infection rate was found in those who self-identified as not gay than those who self-identified as homosexual/gay (3.0% vs 12.5%), the high frequency of bisexual behaviour implies that HIV infection could be spread through risky man–man sex into heterosexual networks.[33] Some of our key findings were consistent with those found in western countries[34]—for example, that the prevalence of syphilis infection, the number of male sex partners and having exclusively male sexual partners was positively associated with HIV infection. Although a difference in the prevalence of HIV infection among MSW in different settings has been reported, most of those studies focused on the difference between agency-based and street MSW. Our study revealed a higher HIV prevalence among MSW working in small home-based family clubs (hidden groups of call boys working for a pimp who provided housing) than in those who worked in larger venues (parks and entertainment venues such as bars/massage centres or clubs). This implies that ongoing efforts in community education and condom distribution in large venues appear to have had a beneficial effect in preventing and reducing the rapid spread of HIV among MSW. It also highlights an urgent need for HIV prevention and intervention programmes targeting the subgroup of high-risk populations working in dispersed small venues. This subgroup is usually more difficult to reach.

HIV test history was inversely associated with HIV infection, contrary to previous findings reported in other countries.[14 18 34] Nearly half of the participants had received an HIV test on at least one previous occasion, indicating a higher test rate in Shenzhen than in many other Asian localities.[3 5 8 10 11] Thirteen out of the 21 positive HIV cases identified reported that they had tested negative for HIV at some point in the previous year. This indicates that a significant proportion of the possible cases we detected in this study were recently infected, and that HIV transmission might therefore be on the increase among MSW. In addition, over half of the MSW had been involved in the sex trade for less than 1 year and had lived for less than 6 months in Shenzhen. This subgroup of novices accounts for a significant proportion of those with less experience with HIV testing and also those with lower HIV infection rates. Another possible explanation for the inverse correlation of HIV infection with HIV test history is that, armed as they are with greater HIV risk knowledge, MSW involved in risky sexual practices may well test for HIV more frequently than their counterparts who do not take such risks.

TLS approximates a random cluster sampling method, which gives members of the target population an approximately equal or somewhat known chance of being sampled by randomly selecting the places, days and times where they can be found. Based on the formative research conducted, most MSW need to visit MSM venues in order to advertise their services to particular communities and are reluctant to reveal their MSW status outside the MSM community. Therefore, we selected TLS as our sampling method, while acknowledging that this method might overlook a number of MSW who do not attend such venues.

There are some limitations to the way in which the survey was conducted. First, although we tried to include all MSW venues in this study, we may have omitted some. Choosing the busiest times at venues as VDT did not allow us to sample from times when perhaps different types of MSW frequent venues. Second, what we were told by MSW about their past sexual

Key messages

- This study provides valuable behavioural and biological data for MSW using the TLS method.
- The prevalence of HIV and syphilis among MSW in Shenzhen was 5.3% and 14.3%, respectively.
- High-risk sexual behaviour is common among MSW despite their high level of HIV awareness.
- Higher HIV prevalence was observed among MSW recently tested, indicating the need for good post-test counselling.

behaviour and alcohol and illicit drug use may be subject to reporting bias. We did our best to allow for this possibility by using self-administered questionnaires to elicit self-reported behaviour and beliefs, which may have reduced the under-reporting of sensitive types of behaviour. Finally, unlike MSM, MSW are more difficult to identify. It is possible that some of the survey participants falsely represented themselves as MSW or took part in the survey more than once in order to receive more incentives. In order to minimise this bias, we checked the mobile phone numbers of each participant as well as key variables in an effort to exclude doublets.

To the best of our knowledge, this study is the first published report to describe the prevalence of HIV in MSW in China, using TLS. It is vitally important for the effective formulation of health policy that epidemic trends among MSM, including MSW, are identified early. Shenzhen, as a relatively open mainland Chinese city bordering Hong Kong, was ideally placed for us to investigate MSW, a more sensitive subgroup of MSM, and to obtain a better understanding of HIV transmission among MSM. This study also provides information that can be used in the development of specifically tailored prevention and intervention programmes for this vulnerable population, thereby contributing towards the goal of reducing the spread of HIV among MSM.

Acknowledgements The authors would like thank all study participants, MSM volunteers and peer researchers, and all the staff in the medical key laboratory of Shenzhen for preparing samples. They are also grateful to Dr Marc Bulterys from USCDC-GAP (China) and Dr David Wilmshurst of the Chinese University of Hong Kong for their critical comments on this manuscript.

Contributors W-DC, JZ, J-KZ and LC conceived the study. All authors contributed to the design of the study; W-DC, JZ, Y-XG, Z-RY and YZ contributed to the data collection. JZ, HFR, Y-JF, M-LH and X-RW contributed to the design of the study, analysis and interpretation of data. All authors critically reviewed and contributed to the final draught of the paper and approved the final version for publication.

Funding This study was partly supported by a grant from the Medical Research Fund of Guangdong Province (A2007587), a grant from Shenzhen Technology and Research Fund (200902082) and a special grant from the Medical Key Laboratory of Shenzhen.

Competing interests None.

Ethics approval This study was conducted with the approval of the Medical Ethics Committee of Shenzhen Centers for Disease Control and Prevention.

Patient consent Obtained.

Provenance and peer review Not commissioned; externally peer reviewed.

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