

covered by medical insurance programs, which are equally applied to both private and public institutions in Japan. Important characteristics of the STI cases in the present study are shared with other studies. Among the 16 patients with STIs in the previous year who were excluded from the control population in the analysis, 9 (56.3%) reported to have paid for sex in the previous year. These patients are younger, more likely to be unmarried, and more educated than the general population sample. A high prevalence of paid sex was also observed in our nationwide sexual behavior survey among national university students in 1999 (n=13100). In that survey, 7 (43.8%) out of 16 male students who ever had a STI reported that they had paid for sex in the previous year (unpublished observation). A case series study from a public hospital in Japan also reported that 52% of 98 gonococcal or non-gonococcal urethritis male patients were identified to be infected through paid sex (19). Such a high prevalence of paid sex among STI patients may reflect the fact that more than 10% of males reported to have paid for sex in the previous year in our national general population survey, compared with less than 0.5% in the National Health and Social Life Survey in the US (27). Such a high proportion of paid sex among men (6-16%) has been also observed from the surveys or surveillances of general population in other Asian countries around 1999-2003 (28), suggesting that STD epidemiology in Japan may share more with other Asian countries than other industrialized nations. Among control subjects, although the response rate of our survey (71.2%) was similar to other general population sexual behavior surveys (29-33), our samples

could have been biased in that the highly sexually active subpopulation may have avoided the survey. However, our experience with a nationwide survey of students from 30 universities in 1999 using a similar questionnaire showed little association between the answers to the questions related to sexual behaviors and the response rates that ranged between 16.4-100% (34). Finally, although the present study strongly suggests that oral sex may play an important role in the STI epidemic, it is possible that oral sex may be a marker related to sexual networks or other risks that were not captured in the present study.

Despite these limitations, the results of this study are important in showing that STI patients have diverse occupational backgrounds and are highly educated in Japan. It is also important to note that STI risk is universal, present not only in paid partnerships but also in casual and regular partnerships. Oral sex was just as much of a risk factor as vaginal sex. These findings should be translated into a socially and culturally appropriate STI/HIV prevention program in Japan. A particular focus of prevention should be placed on oral sex, as an oral sex industry has markedly proliferated in Japan during the last decade. This change may further spread STIs and thereby pave the way to an HIV epidemic in Japan. Finally it should be noted that 1999 is the middle of the period when Japan has experienced a dramatic increase in the sexual experience rate among teenagers, a sharp decline of domestic condom sales and the increases in STI and HIV infections (35). It is therefore possible that importance of the risk factors identified in the present study might have been intensified.

REFERENCE

1. Kumamoto Y, Tsukamoto T, Kagabe T, et al. Epidemiological survey of sexually transmitted diseases prevalence in Japan -sentinel surveillance of STDs in 2000 (in Japanese). *Jpn J Sex Transm Dis* 2001;12:32-67.
2. Watts J. "Japanese face reality about sexually transmitted diseases."(Article). *Lancet* 1999;354:2059.
3. National Institute of Infectious Diseases. The topic of this month: Genital chlamydia trachomatis infection 1999-2003 (in Japanese). *Infectious Agents Surveillance Report* 2004;25:198-9.
4. Aral SO. Determinants of STD epidemics: implications for phase appropriate intervention strategies. *Sex Transm Infect* 2002;78(Suppl 1):i3-13.
5. Zaba B, Slaymaker E, Urassa M, et al. The role of behavioral data in HIV surveillance. *AIDS* 2005;19(Suppl 2):S39-52.
6. Ono-Kihara M, Kihara M. The first nationwide sexual behavioral survey in Japan. the results of "HIV & Sex in Japan" survey 1999. *J Asian Sexology* 2001;2:65-7.
7. National Statistics Bureau. The 2000 Population census (in Japanese). 2000 (<http://www.stat.go.jp/english/data/kokusei/index.htm>)
8. National Institute of Infectious Diseases. 1999 files of Annual data summary

- 1999-2004 (in Japanese). (<http://idsc.nih.go.jp/idwr/ydata/index-e.html>)
9. Johnson AM, Wadsworth J, Wellings K, Field J. Who goes to sexually transmitted disease clinics? Results from a national population survey. *Genitourin Med* 1996;72:197-202.
 10. Fenton KA, Mercer CH, Johnson AM, et al. Reported sexually transmitted disease clinic attendance and sexually transmitted infections in Britain: prevalence, risk factors, and proportionate population burden. *J Infect Dis* 2005;191(Suppl 1):S127-38.
 11. Grgic-Vitek M, Svab I, Klavs I. Prevalence of and risk factors for self-reported sexually transmitted infections in Slovenia in 2000. *Croat Med J* 2006;47:722-729.
 12. Parish WL, Laumann EO, Cohen MS, et al. Population-based study of chlamydial infection in China: a hidden epidemic. *JAMA* 2003;289:1265-73.
 13. National Center for Health Statistics. Plan and Operation of the Third National Health and Nutrition Examination Survey, 1988-94. *Vital Health Statistics* 1994; 1: 1-62.
 14. Manhart LE, Aral SO, Holmes KK, et al. Influence of study population on the identification of risk factors for sexually transmitted diseases using a case-control design: the example of gonorrhoea. *Am J Epidemiol* 2004;160:393-402.
 15. Catchpole M, Connor N, Brady A, et al. Behavioural and demographic characteristics of attenders at two genitourinary medicine clinics in England. *Genitourin Med* 1997;73:457-61.
 16. Rice RJ, Roberts PL, Handsfield HH, et al. Sociodemographic distribution of

gonorrhea incidence: Implications for prevention and behavioral research. *Am J Public Health* 1991;81:1252-8.

17. Shi H-J, Nakamura K, Takano T. Health values and health-information-seeking in relation to positive change of health practice among middle-aged urban men. *Prev Med* 2004;39:1164-71.

18. Aral SO and Wasserheit JN. Social and behavioral correlates of pelvic inflammatory disease. *Sex Transm Dis* 1998;25:378-85.

19. Komeda H, Fujimoto Y, Uno M, et al. Clinical study of male urethritis in Oogaki Municipal Hospital(in Japanese). *Hinyokika Kiyo* 2005;51:57-60.

20. Koroku M, Tanda H, Katoh S, et al. Questionnaire survey on sexual behavior of Japanese males infected with sexually transmitted diseases (in Japanese). *Hinyokika Kiyo* 2002;48:333-6.

21. Bradshaw CS, Tabrizi SN, Read TR, et al. Etiologies of nongonococcal urethritis: bacteria, viruses, and the association with orogenital exposure. *J Infect Dis* 2006;193:336-45.

22. Edwards S, Carne C. Oral sex and the transmission of viral STIs. *Sex Transm Infect* 1998;74:6-10.

23. Edwards S, Carne C. Oral sex and transmission of non-viral STIs. *Sex Transm Infect* 1998;74:95-100.

24. National Police Agency. The police white paper 2007 (in Japanese).

(<http://www.npa.go.jp/hakusyo/h19/index.html>)

25. Kihara M, Ono-Kihara M, Uchino H, et al. HIV and sex in Japan survey 1999 (in Japanese). Annual Report of Japanese Study Group on HIV Epidemiology and Prevention. Ministry of Health, Labour and Welfare, 2000:565-83.
26. Koroku M, Tanda H, Katoh S, et al. Clinical evaluation and antimicrobial susceptibilities of cases of gonococcal urethritis treated in our hospital (in Japanese). *Hinyokika Kiyo* 2007;53:293-6.
27. Laumann EO, Gagnon JH, Michael RT, Michaels S. The social organization of sexuality: sexual practices in the United States. Chicago: University of Chicago Press, 1994:402
28. Monitoring the AIDS Pandemic Network (MAP). AIDS in Asia: Face the facts-a comprehensive analysis of the AIDS epidemic in Asia. Geneva: MAP, 2004:38
(http://www.fhi.org/en/HIVAIDS/pub/survreports/aids_in_asia.htm)
29. Fenton KA, Korovessis C, Johnson AM, et al. Sexual behaviour in Britain: reported sexually transmitted infections and prevalent genital Chlamydia trachomatis infection. *Lancet* 2001;358:1851-4.
30. Hubert M, Bajos N, Sandfort T, editors. Sexual behaviour and HIV/AIDS in Europe. London: UCL Press, 1998:16
31. Johnson AM, Mercer CH, Erens B, et al. Sexual behaviour in Britain: partnerships,

practices, and HIV risk behaviours. *Lancet* 2001;358:1835-42.

32. ACSF investigators. AIDS and sexual behaviour in France. *Nature* 1992;360:407-9.

33. Mosher WD, Chandra A, Jones J. Sexual behavior and selected health measures: men and women 15-44 years of age, United States, 2002. Advance data from vital and health statistics;no 362. Hyattsville, MD: National Center for Health Statistics. 2005.

34. Ono-Kihara M, Kihara M, Amano K, et al. Sexual behavior survey among students of national universities (in Japanese). Annual Report of Japanese Study Group on HIV Epidemiology and Prevention. Ministry of Health, Labour and Welfare, 2000:584-93.

35. Ono-Kihara M. Sexual behavior of teenagers and contemporary Japan (in Japanese). Kyoto: Minervashobo, 2006.

Table 1. Comparison of socio-demographic characteristics and HIV/sexually transmitted infection (STI)-related knowledge between male STI patients at 21 STI clinics and male controls who were sexually active in the previous year taken from a randomized general population sexual behavior survey

Characteristic	STI*patients (n = 765)		General population controls (n = 1,167)		p value†
	No.	%	No.	%	
Age at survey (years)					<0.001§
18-19	29	3.8	16	1.4	
20-29	324	42.4	194	16.6	
30-39	274	35.8	266	22.8	
40-49	103	13.5	341	29.2	
50-59	35	4.6	350	30.0	
Mean(SD*)		31.8(8.8)		41.6(11.0)	
Median		30		43	
Employment					<0.001
Self-employed	100	13.1	206	17.7	
Management	20	2.6	36	3.1	
Employee	554	72.4	856	73.4	
Unemployed or fulltime student	74	9.7	49	4.2	
Missing	17	2.2	20	1.7	
Marital status					<0.001
Married	259	33.9	919	78.7	
Not married	504	65.9	238	20.4	
Missing	2	0.3	10	0.9	
Educational level					<0.001
High school or below	269	35.2	630	54.0	
College/university or above	494	64.6	529	45.3	
Missing	2	0.3	8	0.7	
HIV*-related knowledge score‡					<0.001§
Mean(SD)		7.4(2.2)		6.3(2.4)	
Median		8		7	
STI-related knowledge score¶					<0.001§
Mean(SD)		5.2(1.7)		3.9(2.0)	
Median		6		4	

* STI, sexually transmitted infection; SD, standard deviation

† p values for chi-square test unless otherwise mentioned.

‡ Score for HIV-related knowledge is the total number of 11 HIV-related knowledge questions answered correctly.

§ p values for Student's t test

¶ Score for STI-related knowledge is the total number of 7 STI-related questions answered correctly.

Table 2. Comparison of sexual behaviors between male STI patients at 21 STI clinics and male controls who were sexually active in the previous year taken from a randomized general population sexual behavior survey

Characteristic	STI* patients (n = 765)		General population controls (n = 1,167)		p value†
	No.	%	No.	%	
Age at first sexual intercourse (years)					<0.001
<19	427	55.8	420	36.0	
19 or more	327	42.7	639	54.8	
Missing	11	1.4	108	9.3	
Mean(SD*)		18.4(2.8)		20.0(3.5)	
Median		18.0		19.0	
No. of partners (previous year)					<0.001
1	111	14.5	895	76.7	
2-3	231	30.2	181	15.5	
4 or more	408	53.3	71	6.1	
Missing	15	2.0	20	1.7	
Type of sex partner(s) (previous year)					
Regular partner(s)					<0.001
Yes	604	79.0	1068	91.5	
No	159	20.8	92	7.9	
Missing	2	0.3	7	0.6	
Casual partner(s)					<0.001
Yes	408	53.3	117	10.0	
No	351	45.9	1015	87.0	
Missing	6	0.8	35	3.0	
Paid partner(s)					<0.001
Yes	474	62.0	122	10.5	
No	283	37.0	1012	86.7	
Missing	8	1.0	33	2.8	
Sex with regular partners (previous year)					
Had unprotected vaginal sex					0.882
Yes	484	63.3	741	63.5	
No	251	32.8	390	33.4	
Missing	30	3.9	36	3.1	
Had unprotected oral sex					0.012
Yes	423	55.3	574	49.2	
No	273	35.7	475	40.7	
Missing	69	9.0	118	10.1	
Had unprotected anal sex					0.890
Yes	29	3.8	42	3.6	
No	696	91.0	1043	89.4	
Missing	40	5.2	82	7.0	
Sex with casual partners (previous year)					
Had unprotected vaginal sex					<0.001
Yes	284	37.1	73	6.3	
No	449	58.7	1056	90.5	
Missing	32	4.2	38	3.3	
Had unprotected oral sex					<0.001
Yes	286	37.4	74	6.3	
No	418	54.6	1050	90.0	
Missing	61	8.0	43	3.7	
Had unprotected anal sex					<0.001
Yes	18	2.4	6	0.5	
No	702	91.8	1122	96.1	
Missing	45	5.9	39	3.3	
Sex with paid partners (previous year)					
Had unprotected vaginal sex					<0.001
Yes	199	26.0	29	2.5	
No	551	72.0	1103	94.5	
Missing	15	2.0	35	3.0	
Had unprotected oral sex					<0.001
Yes	372	48.6	69	5.9	
No	346	45.2	1058	90.7	
Missing	47	6.1	40	3.4	
Had unprotected anal sex					0.004
Yes	14	1.8	6	0.5	
No	712	93.1	1125	96.4	
Missing	39	5.1	36	3.1	
Gender of sexual partners‡					0.003
Only women	728	95.2	1120	96.0	
Only men	17	2.2	6	0.5	
Both men and women	8	1.0	8	0.7	
Missing	12	1.6	33	2.8	

* STI, sexually transmitted infection; SD, standard deviation

† p values for chi-square test unless otherwise mentioned.

‡ Asked for the previous year for STI patients and for the lifetime for general population.

Table 3. Factors associated with sexually transmitted infection (STI) in a case-control study using male STI patients at 21 STI clinics compared to male controls who were sexually active in the previous year taken from a randomized general population sexual behavior survey

Characteristics	Crude OR*	95% CI*	Adjusted OR†	95% CI
Socio-demographic factors				
Age (years)				
18-39	13.2	9.12, 19.0	3.94	2.17, 7.15
40-49	3.02	2.00, 4.56	1.76	0.93, 3.30
50-59	1.00		1.00	
Employment				
Self-employed	0.32	0.29, 0.50	1.15	0.57, 2.30
Management	0.37	0.19, 0.71	1.00	0.31, 3.19
Employee	0.43	0.29, 0.62	0.95	0.54, 1.70
Unemployed or fulltime student	1.00		1.00	
College/university education or above (referred to high school or less)	2.19	1.81, 2.64	2.03	1.45, 2.83
Unmarried (referred to married)	7.51	6.11, 9.24	2.65	1.80, 3.91
Behavioral factors				
First sexual experience at ≤18 years-old (referred to >18 year-old)	1.99	1.64, 2.40	0.99	0.71, 1.39
Number of sexual partners in the previous year				
1	1.00		1.00	
2-3	10.3	7.80, 13.6	3.33	2.20, 5.05
≥4	46.3	33.6, 63.8	6.29	3.81, 10.4
Sex with regular partners in the previous year				
Had unprotected vaginal sex (referred to no)	1.02	0.84, 1.23	2.70	1.75, 4.17
Had unprotected oral sex (referred to no)	1.28	1.06, 1.56	0.70	0.48, 1.01
Had unprotected anal sex (referred to no)	1.04	0.64, 1.68	0.93	0.40, 2.17
Sex with casual partners in the previous year				
Had unprotected vaginal and/or oral sex (referred to no)	10.9	8.34, 14.1	2.14	1.40, 3.26
Sex with paid partners in the previous year				
Had unprotected vaginal sex (referred to no)	13.7	9.18, 20.6	2.64	1.46, 4.80
Had unprotected oral sex (referred to no)	16.5	12.4, 21.9	4.72	3.04, 7.32

*OR, odds ratio; CI, confidence interval

†Odds ratio was adjusted by multiple logistic regression analysis for districts (Hokkaido, Tohoku, Kanto-Koshinetsu, Kinki, Chugoku and Kyushu)

Research article

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The characterisation of sexual behaviour in Chinese male university students who have sex with other men: A cross-sectional studyLiming Cong¹, Masako Ono-Kihara², Guozhang Xu³, Qiaoqin Ma^{*1,2}, Xiaohong Pan¹, Dandan Zhang³, Takayuki Homma⁴ and Masahiro Kihara²

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Abstract

Background: The risks for Chinese male university students who have sex with other men (MSM) have not been compared with those for non-MSM students. This information is important for the development of targeted HIV prevention programmes for this population.

Methods: Sexually active MSM and non-MSM students were compared for demographic characteristics, sexual behaviour, and related psychosocial variables using bivariate analyses. The data were a subset drawn from a large-scale cross-sectional questionnaire survey of sexually active male students conducted at two universities in a large city in Zhejiang Province, China, in 2003.

Results: Of 1824 sexually active male students, 68 (3.7%) reported having had sex with a man at least once; 33.8% of these 68 men had also had female partners. Compared with non-MSM students, MSM students were 3–6.5 times more likely to have had sexual encounters with casual or commercial sex partners and were three times less likely to have protected sex in the past year or during their lifetime. They were three to five times more likely to have had multiple partners and 15 times more likely to have had a sexually transmitted disease (STD). In addition, the MSM students knew half as much about HIV and had less condom-decision than did non-MSM students and were two times more accepting of commercial sex. However, the MSM students were twice as aware of the risks for HIV infection.

Conclusion: MSM composed 3–4% of the male sexually active university student population studied and was found to be at greater risk than non-MSM students for STD/HIV infection. There is an urgent need for STD/HIV programmes in university health services that take into consideration the sexuality and psychosocial issues of MSM students.

Background

China, the most populous nation in the world, is experi-

encing an increase in HIV/AIDS. National sentinel surveillance data indicate that from 1996 or 1997 to 2004, HIV

prevalence rose from 1.95 to 6.48% in injection drug users, from 0.02 to 0.93% in female sex workers, and from 0 to 0.26% in pregnant women [1,2]. Although injection drug use and sexual contact are currently the predominant modes of HIV transmission, sexual transmission is on the rise and is estimated to have increased from 30% in 2003 to 44% in 2005 and 57% in 2007 [1-4].

Recent reports indicate that there is an HIV epidemic among men who have sex with men (MSM) in Asian countries. MSM constitute 15-45% of all HIV infections in Taiwan and Hong Kong [5,6], and studies conducted in Cambodia and Thailand indicate that the prevalence of HIV in MSM is 15 and 17%, respectively [7,8]. Since the first MSM sexually transmitted HIV case was detected in Beijing in 1989 [9], several studies have shown that an HIV epidemic is emerging in Chinese MSM. A serial survey conducted between 1998 and 2001 found that the prevalence of HIV in MSM was 2.5-17.1% [10]. In Shenzhen, the prevalence of HIV in MSM increased from 0.9% in 2002 to 2.7% in 2005 [11], and in Beijing it increased from 0.5% in 2004 to 5% in 2006 [12]. Estimates by China's Health Ministry and the Joint United Nations Programme on HIV/AIDS indicate that MSM accounted for 7% of HIV infections in China through 2005 [2] and for 12.2% of the cases in 2007 [4].

Several studies performed in China suggest that MSM are vulnerable to sexually transmitted disease (STD) and HIV [13-17] because they have unprotected sexual intercourse. For example, only 23-31% of MSM reported always using a condom during insertive anal sex, 28-34% during receptive anal sex in Jinan and Nanchang during the previous 6 months [16,17], and 32% reported always using a condom during anal sex in a six-city study in 2004 [15]. However, the interpretation of these data is limited by the fact that most of the data were derived from convenience samples collected in gay bars, bathhouses, parks, on the Internet, and from voluntary counselling and testing centres without non-MSM controls. They do not represent the entire MSM population and it is difficult to evaluate if and how their sexual behaviour is more at risk compared to non-MSM population.

In 2003, we conducted a large-scale survey of university students with a response rate of 76.5%. This provided us with the opportunity to determine the proportion of MSM in sexually active student population and to characterise the history, practice, and psychosocial aspects of their sexual behaviour and compare it with that of non-MSM students.

Methods

Setting and participants

We obtained data from a large cross-sectional survey administered in 2003 with a sample of 22,493 students (response rate of 76.5%) from two universities located in a large Chinese coastal city in Zhejiang province [18]. The city contains only two universities. Because both universities participated in the study, opportunity was given to sample entire university student population in the city. Of the 22,493 participants, 17.6% (1981 of 11,255) of the males and 8.6% (963 of 11,238) of the females were sexually active.

Data collection

The questionnaire was developed based on literature reviews, qualitative research, a pilot study, and a test-retest reliability study, as described previously [18]. The final version of the questionnaire included questions on: sociodemographic characteristics (15 items); knowledge about HIV, STD, and contraception (37 items); attitude towards an HIV-positive person and the perception of risk for HIV (5 items); exposure to sexual information and experience in having a boyfriend or girlfriend (7 items); sexual behaviours during the first, lifetime, past year, and most recent sexual contact (31 items); ability to reject unwilling sex (1 item); comfort with obtaining and using condoms (3 items); attitude towards sex (13 items); self-evaluation (2 items); and comments on sex education (4 items). The variables included in this paper were selected among these questions.

All students in Years 1-4 at the two universities were asked to fill out the self-administered survey. Trained staff distributed and collected the questionnaire. The local education board, the two universities involved, and the institutional review body of the Zhejiang Provincial Centre for Disease Prevention and Control reviewed the research protocol and instrument, and approved its use. As a process of informed consent, all participants were informed of the study's purpose, and invited to the study being explained how, when and where the survey was to be conducted. They are also told that non-participation would cause no disadvantage to them, and the survey was anonymous and the data was to be presented only in an aggregated manner, therefore the participants' privacy and confidentiality would be firmly protected. All these policies were also printed in the front cover of the questionnaire.

Statistical analysis

In addition to the sociodemographic and sexual behaviour variables, our study created two psychosocial scales for statistical analysis: HIV knowledge and condom-decision. The HIV-knowledge scale consisted of 10 statements with a Cronbach's alpha coefficient of .667. The 10 state-

ments required a response of "correct," "incorrect," or "do not know," including HIV can be transmitted through (1) sex without protection, (2) syringe or needle sharing, (3) mother-to-child contact, (4) blood transfusion, (5) working together; (6) STD infection increases HIV transmission; condom use can prevent (7) HIV and (8) other STDs; (9) China has a rapidly growing HIV epidemic; and (10) sexual transmission of HIV is a major factor in the HIV epidemic in China. The condom-decision scale consisted of three statements that were designed to determine whether the students make the decision to use a condom prior to sex, if they use a condom when having sex with a partner who is important to them, and whether they are comfortable buying a condom for themselves or their partner. The Cronbach's alpha coefficient for this scale was .514. The condom-decision scales were measured using a 3- to 5-point Likert-type scale, respectively, ranging from positive to negative responses. Participants were categorised into low- and high-score groups based on the median distribution of the total scores for each scale.

The data were analysed using SPSS for Windows (version 12.01; SPSS Inc., Chicago, IL). A bivariate analysis was performed to identify variables that were significantly associated with MSM status and was expressed as an odds ratio (OR) with a corresponding 95% confidence interval (CI). Statistical significance was set at $p < 0.05$.

Results

Sexually active male students who had had oral, anal, or vaginal sex and reported the gender of their sexual partner were included in the study. The sample size was 1824 students. Of these, students who reported that their partners were male or both male and female were identified as MSM; those whose sexual partners were exclusively female were identified as heterosexual, or non-MSM.

Of all sexually active male students, 68 (3.7%) reported having had sex with men, of which 23 (33.8%) reported also having had sex with women. There was no difference between MSM and non-MSM students in demographic or lifestyle variables, including the frequency of dancing, cigarette smoking, and karaoke singing (Table 1). However, the MSM group drank less frequently than did the non-MSM group ($p = 0.041$).

Sexual behaviours

There was no difference between groups in the age at which they first had sex. The first sexual encounter for MSM students was more likely to have been with a casual partner (25.0 vs. 10.9%; OR: 3.15) or commercial partner (8.8 vs. 1.9%; OR: 6.24), and they were more likely than non-MSM students to experience unwilling sex (11.8 vs. 2.4%; OR: 6.17) or coerced sex (7.4 vs. 0.3%; OR: 27.0; Table 2). MSM students had a tendency not to use a con-

Table 1: Sociodemographic characteristics of the respondents

	MSM (n = 68)		Non-MSM (n = 1756)	
	n	%*	n	%*
University				
A	42	61.8	981	55.9
B	26	38.2	775	44.1
Age				
≤ 19	7	10.3	249	14.2
> 19	58	85.3	1498	85.3
Year of study				
I	10	14.7	399	22.7
II	21	30.9	480	27.3
III	28	41.2	617	35.1
IV	9	13.2	260	14.8
Hometown area				
Rural	17	25.0	417	23.7
Town/city	51	75.0	1333	75.9
family's economic status				
Rich	13	19.1	217	12.4
Between	48	70.6	1418	80.8
Poor	7	10.3	117	6.7

* The percentage of respondents may not add up to 100% due to non-response for some items.

dom during the first sexual encounter, but it was not statistically significant (OR: 1.78, 95% CI: 0.97–3.29). MSM students had significantly more partners during their lifetime than did non-MSM students (55.9 vs. 33.3%; OR: 5.32), but 61.8% of MSM students never or rarely used condoms compared to 34.9% of non-MSM students (OR: 3.29). MSM students were significantly more likely to have had a history of STD than were non-MSM students, at 12 and 1%, respectively (OR: 15.25).

Of all of the participants in each group, 49 (72.1%) MSM and 1354 (77.1%) non-MSM students had been sexually active during the past 12 months. During this period, MSM students were more likely to have had at least one casual partner (28.6 vs. 11.1%; OR: 3.94) and/or to have been with at least one commercial partner (12.2 vs. 3.0%; OR: 6.33), and were more likely to have had multiple partners (36.7 vs. 20.6%; OR: 2.80). MSM students were less likely to use a condom, with 61.2% reporting that they never or rarely used a condom compared to 37.3% in the non-MSM group (OR: 2.72).

Psychosocial characteristics

Awareness of the risk for contracting HIV was low in both groups. However, MSM students were significantly more aware of the risks than were non-MSM students (32.4 vs. 20.1%; OR: 1.93; Table 3). MSM students were significantly more likely than non-MSM students to approve of commercial sex (50.0 vs. 33.8%; OR: 2.38), and they

Table 2: Sexual behaviours of men who have sex with men (MSM) versus heterosexual men (non-MSM) among sexually active male students, China

	MSM (n = 68)		Non-MSM (n = 1756)		Crude OR(95%CI) ^b	P Value
	n	% ^a	n	% ^a		
First sex						
Partner type in first sex						
Regular	43	63.2	1521	86.6	1	
Casual	17	25.0	191	10.9	3.15(1.76-5.63)	0.000
Commercial	6	8.8	34	1.9	6.24(2.49-15.65)	0.000
Condom use in first sex						
Yes	13	19.1	530	30.2	1	
No/not sure	53	77.9	1215	69.2	1.78(0.97-3.29)	0.067
Consent at first sex						
Willing	52	76.5	1685	96.0	1.0	
Unwilling	8	11.8	42	2.4	6.17(2.76-13.80)	0.000
Being coerced	5	7.4	6	0.3	27.00(7.98-91.32)	0.000
Sex in lifetime						
Partner number lifetime						
1	13	19.1	1062	60.5	1	
≥ 2	38	55.9	584	33.3	5.32(2.81-10.06)	0.000
Condom use life time						
Always/often/sometimes	23	33.8	1113	63.4	1	
Rarely/Never	42	61.8	612	34.9	3.29(1.96-5.53)	0.000
STD diagnosed lifetime						
No	51	75.0	1653	94.1	1	
Yes	8	11.8	17	1.0	15.25(6.29-36.97)	0.000
Sex in the last year						
Partner type in the last year ^c						
Regular only	27	55.1	1139	84.1	1	
Ever casual ^d	14	28.6	150	11.1	3.94(2.02-7.68)	0.000
Ever commercial ^e	6	12.2	40	3.0	6.33(2.47-16.19)	0.000
Partner number in the last year ^c						
1	24	49.0	1040	76.8	1	
≥ 2	18	36.7	279	20.6	2.80(1.50-5.22)	0.001
Condom use in the last year ^c						
Always/often/sometimes	18	36.7	820	60.8	1.0	
Rarely/Never	30	61.2	503	37.3	2.72(1.50-4.93)	0.000

^a The percentage of respondents may not add up to 100% due to non-response for some items.

^b OR, odds ratio; CI, confidence interval.

^c Male students who were sexually active in the last year, n = 49 for MSM, and 1354 for non-MSM.

^d Including those who had had a casual partner at least and those who had had both casual and regular partners.

^e Including those who had had a commercial partner at least.

knew less about HIV (45.6 vs. 28.1%; OR: 2.28) and had lower condom-decision (55.9 vs. 41.2%; OR: 2.04).

Discussion

This is the first study in China to report the proportion of MSM in a male sexually active university student population and to characterise MSM psychosocial factors and sexual behaviour and compare them to those of non-MSM students. Of the sexually active male university students studied, 3.7% had had sex with a man at least once. Previous studies of 15-49-year-old men in 10 Western countries found that 0.9-13.4% (median: 5.0%) had had sex

with a man [19]. Our lower estimate might be due to underreporting by respondents for fear of stigmatisation or to the lower age range of our survey. However, our findings on sexual behaviours are consistent with other recent surveys in China. One-third of MSM reported having had sex with both men and women; this agrees with previous research that indicates that Chinese MSM are commonly bisexual [13-17]; thus the reported MSM data in this paper are on mixed population of MSM having sex only with men and those having sex with both men and women. Recent reports on condom use indicated that in the previous 6 months only 24-27% of MSM always used

Table 3: Psychosocial characteristics of men who have sex with men (MSM) versus heterosexual men (non-MSM) among sexually active male students, China

	MSM (n = 68)		Non-MSM (n = 1756)		Crude OR(95%CI) ^b	P Value
	n	% ^a	n	% ^a		
Risk awareness for HIV						
No/low possible	43	63.2	1333	75.9	1	
Some-high possible/not sure	22	32.4	353	20.1	1.93(1.14-3.27)	0.014
Approve of commercial sex						
Disapprove/not sure	25	36.8	1038	59.1	1	
Approve	34	50.0	593	33.8	2.38(1.41-4.03)	0.001
HIV knowledge scale						
High(9-10)	34	50.0	1231	70.1	1	
Low(0-8)	31	45.6	493	28.1	2.28(1.38-3.75)	0.001
Condom-decision scale						
High(10-12)	23	33.8	895	51.0	1	
Low(3-9)	38	55.9	724	41.2	2.04(1.21-3.46)	0.008

^aThe percentage of respondents may not add up to 100% due to non-response for some items.

^bOR, odds ratio; CI, confidence interval.

a condom with a female partner and 23-34% always used a condom during anal sex with a male partner [15-17]; we found that in the previous 12 months, only 7.7% of the MSM respondents always used a condom.

The MSM participants reported frequent encounters with sexual partners, especially with casual or commercial sex partners. This finding agrees with previous studies in China [16,20]. Our finding that 12% of MSM students had had at least one STD is similar to data reported in previous studies of Chinese MSM [13-16,20,21]. Our data indicate that MSM students studied engaged in the same level of risky sexual behaviour shown by MSM in previous studies, suggesting that they are likely to become part of the HIV epidemic that is emerging in MSM in China.

We quantified the increased sexual risk of MSM students compared to non-MSM students. MSM students studied had 3-6.5 times more sexual encounters with casual or commercial sex partners, were three times less likely to use a condom, were three to five times more likely to have multiple partners, and were 15 times more likely to contract an STD during the previous year or during their lifetime. In addition, MSM students studied were half as informed about HIV and had less condom-decision than did non-MSM students, and were two times more accepting of commercial sex. However, MSM students were twice as aware of the risk for HIV infection. Reason of the lower HIV-related knowledge but higher awareness for the risk of HIV infection among MSM university students studied is unclear but it may be due to the confounding of demographic variables because association of lower HIV-related knowledge but not risk awareness for HIV with MSM status disappeared in multivariate analysis (data not shown), or it may be that MSM students studied had min-

imum knowledge that unprotected sex may place them at risk for HIV infection but lack broader knowledge on HIV because of their limited access to HIV-related information.

These results clearly demonstrate that MSM university students studied are at particular sexual risk. In view of the fact that STD, which increases susceptibility to HIV infection, is already prevalent in MSM students, prevention, STD/HIV testing, treatment, and counselling and support programmes for MSM university students must be a high priority for university health services. Homosexuality is highly stigmatised in Chinese society [22,23], and MSM students face complex psychosocial issues regarding sex and STD. This is indicated by the high incidence of coerced sex, which is associated with unprotected sex, multiple partnerships [24-26], limited understanding of HIV, and low condom-decision. However, MSM students studied had a liberal attitude towards sex and a high awareness of the risk for HIV infection. University STD/HIV prevention programmes that pay particular attention to MSM students' sexuality and their complex psychosocial situation need to be developed.

Our study has some limitations. First, it was restricted to two universities in one city, and the sample may not be representative of MSM university students across China. Second, the cross-sectional nature of the study makes it difficult to determine causal relationships. Third, the data may be biased because the questionnaire was self-reported; there was a relatively large amount of missing data for some variables, and 23.5% of the students did not respond to the survey. Fourth, the questions were not designed specifically for MSM students, and important information such as roles in sex (insertive or receptive),

the use of cruising spots, and various psychological aspects were missing or incomplete. Thus, the data may not fully describe the sexual and psychosocial characteristics of MSM students. Further studies with larger sample size are clearly needed to make deep insight into the psychosocial needs, characteristics of MSM student's sexual behaviour and its context, and to explore the differences between MSM students with different level of risk taking behaviour. Such information may provide the basis for culturally appropriate STD/HIV prevention programmes for this subpopulation in China.

Conclusion

MSM practices were reported by 3.7% of male students from two universities in one coastal city in China. The sexual practices of these students was as risky as that reported by MSM in other studies and much more risky than that reported by non-MSM university students. In fact, > 10% of MSM students experienced STD infection. In view of the emerging HIV epidemic in MSM in China, there is an urgent need for STD/HIV programmes in university health services that take into consideration the issues of MSM students.

Abbreviations

MSM: Men Who Have Sex with Men; STD: Sexually Transmitted Disease; HIV: Human Immunodeficiency Virus; AIDS: Acquired Immune Deficiency Syndrome.

Competing interests

The authors declare that they have no competing interests.

Authors' contributions

All authors contributed to the design of this research. LC and QM performed the statistical analysis and drafted the manuscript; LC and GX coordinated the study in field; QM, XP, and DZ played a major role in the field survey; TH helped analyze the data; MO-K and MK supervised the research, statistical analysis and revised the manuscript. All the authors of the manuscript have read and agreed to its content.

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References

- State Council AIDS Working Committee Office and UN Theme Group on HIV/AIDS in China: *A Joint Assessment of HIV/AIDS Prevention, Treatment and Care in China (2004)*. Beijing 2004.
- Ministry of Health, Joint United Nations Programme on HIV/AIDS, World Health Organization: *2005 update on the HIV/AIDS epidemic and response in China*. Beijing 2006.
- Zhang KL, Ma S, Xia D: **Epidemiology of HIV and sexually transmitted infections in China**. *Sex Health* 2004, **16**:39-46.
- State Council AIDS Working Committee Office, Ministry of Health, and Joint United Nations Programme on HIV/AIDS: *A Joint Assessment of HIV/AIDS Prevention, Treatment and Care in China (2007)*. Beijing 2007.
- Chan R, Kavi AR, Carl G, Khan S, Oetomo D, Tan ML, Brown T: **HIV and men who have sex with men: perspectives from selected Asian countries**. *AIDS* 1998, **12**(Suppl B):S59-65. S67-8
- TCCD: **Updated HIV/AIDS Statistics in Taiwan**. Taipei 2005.
- Monitoring the AIDS Pandemic (MAP): **The status and trends of HIV/AIDS/STI epidemics in Asia and the Pacific**. Washington 2001.
- van Griensven F, Thanprasertsuk S, Jommaroeng R, Mansergh G, Naorat S, Jenkins RA, Ungchusak K, Phanuphak P, Tappero JW, Bangkok MSM Study Group: **Evidence of a previously undocumented epidemic of HIV infection among men who have sex with men in Bangkok, Thailand**. *AIDS* 2005, **19**:521-526.
- Zhong Q, Lu F: **The characteristics and HIV/AIDS epidemic among men who have sex with men in China**. *Chin J AIDS STD (in Chinese)* 2006, **23**:484-6.
- Zhang B, Li X, Shi T, Yang L, Zhang J: **Primary estimation on population size and HIV prevalence of gay men and bisexual men**. *Chin J AIDS STD (in Chinese)* 2002, **8**:197-9.
- Zheng H, Qin Y, Ye B, Zhang R, Ling A, Cai W: **Survey of infectious status of HIV/AIDS in male homosexuals in Shenzhen city**. *China Tropical Medicine (in Chinese)* 2006, **6**:1686-8.
- The program office for China-Bill & Melinda Gates Foundation: **Working frame for China-Bill & Melinda Gates Foundation Program (pilot)**. Beijing 2007.
- Lu C, Yuan F, Shi Z, Yang J, Li XY, Gao L, Li X, Hu S: **The study of HIV infection KABP about AIDS among the MSM in Guiyang city**. *Guizhou Medical Journal (in Chinese)* 2006, **30**:202-4.
- Wang C, Jiang M, Lu J, Guo B: **HIV epidemic spread between male homosexual in the city of Chengdu**. *China Journal of Health Education (in Chinese)* 2007, **17**:883-4.
- Zhang BC, Zeng Y, Xu H, Li XF, Zhou SJ, Li H, Liao LM, Zhang XM: **Study on 1389 men who have sex with men regarding their HIV high-risk behaviors and associated factors in Mainland China in 2004**. *Zhonghua Liu Xing Bing Xue Za Zhi* 2007, **28**:32-6.
- Zhu Y, Ruan S, Yang H, Wang M, Zhang C, Jia Z, Shi Z, Zhang M: **Investigation on AIDS related knowledge, risk behavior and HIV infection in MSM in Jinan city**. *Pre Med Trib (in Chinese)* 2007, **13**:490-2.
- Hu Q, Lu F, Gong J, Li Y, Li G, Liu J, Ch H, Liao Q: **Knowledge, attitudes, and Practice about STD/AIDS among the men who have sex with men in Nanchang city, Jiangxi Province**. *China Journal of Health Education (in Chinese)* 2006, **22**:647-9.
- Ma Q, Ono-Kihara M, Cong L, Xu G, Zamani S, Ravari SM, Kihara M: **Sexual behavior and awareness of Chinese university students in transition with implied risk of sexually transmitted diseases and HIV infection: A cross-sectional study**. *BMC Public Health* 2006, **6**:232.
- Sandfort TL: **Homosexual and bisexual behaviour in European countries**. In *Sexual behaviour and HIV/AIDS in Europe* Edited by: Hubert M, Bajos N, Sandfort T. London: UCL Press; 1998:68-105.
- He Q, Wang Y, Lin P, Liu Y, Yang F, Fu X, Li Y, Sun B, Li J, Zhao X, Mandel J, Jain S, McFarland W: **Potential bridges for HIV infection to men who have sex with men in Guangzhou, China**. *AIDS Behav* 2006, **10**(4 Suppl):S17-23.
- Jiang J, Cao N, Zhang J, Xia Q, Gong X, Xue H, Yang H, Zhang G, Shao C: **High prevalence of sexually transmitted diseases among men who have sex with men in Jiangsu Province, China**. *Sex Transm Dis* 2006, **33**:118-23.
- Zhang BC, Chu Qs: **MSM and HIV/AIDS in China**. *Cell Research* 2005, **15**:858-864.
- Zhang BC, Joan K: **The rights of people with same sex sexual behavior, recent progress and continuing challenges in China**. In *Sexuality, gender and rights* 1st edition. Edited by: Geertanjali M, Radhika C. New Delhi, Sage Publications India Pvt Ltd; 2005:113-130.
- Bartholow BN, Doll LS, Joy D, Douglas JM Jr, Bolan G, Harrison JS, Moss PM, McKirnan D: **Emotional, behavioral, and HIV risks associated with sexual abuse among adult homosexual and bisexual men**. *Child Abuse Negl* 1994, **18**:747-61.

25. Carballo-Dieguez A, Dolezal C: Association between history of childhood sexual abuse and adult HIV-risk sexual behavior in Puerto Rican men who have sex with men. *Child Abuse Negl* 1995, 19:595-605.
26. Strathdee SA, Hogg RS, Martindale SL, Cornelisse PG, Craib KJ, Montaner JS, O'Shaughnessy MV, Schechter MT: Determinants of sexual risk-taking among young HIV-negative gay and bisexual men. *J Acquir Immune Defic Syndr Hum Retroviral* 1998, 19:61-6.

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Needle and Syringe Sharing Practices Among Injecting Drug Users in Tehran: A Comparison of Two Neighborhoods, One with and One Without a Needle and Syringe Program

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Abstract This study was conducted to compare needle and syringe sharing practices among injecting drug users (IDUs) in two neighborhoods, one with and one without a needle and syringe program (NSP). In 2005, 419 street-based IDUs were interviewed at specific locations in two neighborhoods where IDUs are known to congregate. We compared self-reported needle and syringe access and use between IDUs from a neighborhood with an active NSP to IDUs from a neighborhood without such an intervention. A significantly smaller proportion of IDUs from the former neighborhood reported having used a shared needle/syringe over a 1-month period (21.0%) compared to IDUs from the latter neighborhood (39.9%; adjusted odds ratio, 0.24; 95% confidence interval, 0.13–0.45). These findings indicate that access to an NSP may reduce needle and syringe sharing practices. Therefore, these programs should be intensified in settings with concentrated HIV epidemics among IDUs in Iran.

Keywords Substance abuse, intravenous · Needle-exchange programs · HIV · Iran

Introduction

The Islamic Republic of Iran faces a growing HIV epidemic among its large population of injecting drug users (IDUs). To date, shared drug injection has been the primary manner of HIV transmission in Iran. Among the new cases reported to the Ministry of Health in 2005, 77% have occurred in IDUs (Center for Disease Management 2006). In addition, HIV infection rates have reached epidemic levels, with greater than 20% prevalence among street-based IDUs in Tehran (Zamani et al. 2006).

Although research indicates that many IDUs in Tehran may have contracted HIV through shared drug injection in prison (Zamani et al. 2005, 2006), concerns have been raised over the possibility of HIV transmission from ex-prisoner IDUs to community-based drug injecting and sexual networks in Tehran. This situation is particularly troubling considering the high rates of recidivism among the prison population in Iran. As reported by the Iran Prison Organization (2006), there was an average of 135 000 prisoners at any point in time in the 230 prisons and correctional settings in Iran; 45% of this population were convicted of drug-related offences. Although the average number of prisoners has decreased in recent years, the data show that as many as 600 000 individuals entered and exited prisons during the 2004–2005 Iranian fiscal year (Iran Prison Organization 2006). Recently, more prisons in Iran have initiated HIV prevention programs, including extensive educational activities and methadone maintenance therapy (Iran Prison Organization 2006); however, much more effort is needed to increase the coverage of

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HIV prevention programs among incarcerated drug users, as well as former prisoners in the community.

In response to the dangers of HIV infection among IDUs, Iranian health policy makers have adopted a harm reduction approach, and have initiated a number of interventions to control HIV transmission among the large IDU population (Vazirian 2003; Vazirian et al. 2006; Iran Prison Organization 2006; Razzaghi et al. 2006a). Notably, triangular clinics (health clinics that provide integrated services to IDUs, people living with HIV/AIDS and other sexually transmitted infections; WHO 2004) have been expanding across the country. Methadone maintenance therapy is increasing in community and correctional settings, integrated biobehavioral HIV surveillance has been set up for IDUs, and non-governmental organizations (NGOs) are participating to a greater degree in HIV prevention among IDUs with initiatives that include the provision of needle and syringe programs (NSPs) through drop-in centers and outreach activities (Vazirian 2003; UNAIDS 2007).

One of the first community-based programs for IDUs in Tehran was designed by the Iranian Ministry of Health and implemented by the Persepolis Society in 2003. This NGO has been providing a range of services for drug users, including the NSP, through its drop-in centers and mobile services in south central Tehran, which has dense communities of drug users (Vazirian et al. 2005; Razzaghi et al. 2006b). In October 2004, our research teams recruited a sample of drug users at the drop-in center and surrounding areas. Among those who had been exposed to the NSP, IDUs who had received ≥ 7 sterile syringes per week reported less frequent sharing of needles/syringes in the previous month as compared to IDUs who had not (Vazirian et al. 2005).

Very little research-based evidence is available regarding the effectiveness of NSPs in Iran (Vazirian et al. 2005), which is a significant gap in our knowledge, given that an estimated 200 000 IDUs live in Iran. In addition, many new community-based programs, including NSPs, are now available for IDUs. However, these programs have not been evaluated comprehensively, which makes it difficult to assess their overall effectiveness and hinders further improvements to prevention interventions for IDUs in Iran.

We evaluated the effectiveness of an NSP in Tehran by comparing needle and syringe sharing practices among IDUs in two neighborhoods, one with and one without an NSP. The findings of this study should help to improve harm reduction programs for drug users in Iran.

Methods

Setting

One of the first organized programs providing sterile needles and syringes for community-based IDUs in

Tehran began around 2003. Since then, increasing numbers of NGOs have become involved in providing NSPs for IDUs in their respective catchment areas. This gradual expansion of NSPs in Tehran allowed us, at the time of the study, to locate several neighborhoods with NSPs, as well as many others lacking such programs.

Between September and October 2005, three neighborhoods near two major public railways in south central Tehran were selected, based on their geographical proximity to each other as well as access to an NSP provided by the Persepolis Society. Two of these neighborhoods had active NSPs, whereas the third lacked any kind of HIV prevention activities for IDUs.

Locations where IDUs congregate (parks, vacant buildings, and out-of-sight areas along railways) were selected through intensive fieldwork in each neighborhood and then coded numerically. After adding a time component (day of a week) to each coded location, a list of time and location units was developed and a sample of these units was randomly selected.

Injecting drug users recruited from one of the neighborhoods with an active NSP (the intervention zone) were compared to those recruited from an area without an intervention program (the non-intervention zone). The selection of these two neighborhoods for this report was based on evidence gained after completing a simple descriptive analysis of the risk behaviors of IDUs in each neighborhood that showed that IDUs from these two areas had a similar lifetime rate of using shared needle/syringes (about 70% in each neighborhood).

Participants and Measures

Three teams, each consisting of two male outreach workers from the Persepolis Society and one male interviewer, were posted at the selected locations in each neighborhood during the same time interval. An outreach worker, who was also an ex-drug user, invited the IDUs who visited the location during the fixed time interval to participate in a confidential one-to-one interview. After being screened by the interviewer, active IDUs (those who reported injecting a drug in the previous month) were interviewed, but no biological specimen was collected. The interviews were conducted using a structured questionnaire to gather socio-demographic data, information about past incarcerations, drug use characteristics (including shared use of injection tools), and access to sterile needles and syringes. The main outcome for comparing IDUs from the two neighborhoods was whether the participants injected drugs using someone else's used needle or syringe in the previous month.

Ethical Considerations

All research contacts were provided with refreshments, regardless of participation, but no monetary incentive was offered. Non-participants and interviewees were given a pamphlet discussing the prevention of HIV and other blood-borne infections, along with information about local harm reduction services. The interviewer or outreach workers also explained the information verbally.

Data Analyses

Statistical analysis was performed using SPSS for Windows 13.0 (SPSS, Chicago, IL, USA). Multiple logistic regression analysis was performed to examine the association between a history of shared needle or syringe use (receptive needle or syringe sharing) in the previous month and the recruitment neighborhood, simultaneously adjusting for socio-demographic data and drug use characteristics. Variables related to age, ethnicity, level of

education, marital status, homelessness, length of drug injection, ever having used a shared needle/syringe for drug injection, ever having been treated to stop drug use, ever having shared drug injection utensils inside prison, number of drug injections, and size of drug injecting network in the past month were entered into this model, as they were associated with the recruitment neighborhood ($p \leq 0.10$) or they were considered epidemiologically important. The final model, which included all of the above-mentioned variables, was used to estimate the adjusted odds ratios (ORs) and 95% confidence intervals (CIs) for the association between a history of shared needle or syringe use in the previous month and the recruitment neighborhood.

Results

Sample Characteristics

As shown in Table 1, a total of 419 male IDUs from two neighborhoods consented to participate in the study. Six

Table 1 Socio-demographic data and characteristics related to drug injection among male injecting drug users (IDUs) recruited from two neighborhoods, one with and one without a needle and syringe program, in Tehran ($n = 419$)

Characteristics	Neighborhood without NSP (ref) number (%)	Neighborhood with NSP number (%)	OR	95% CI	Adjusted OR	95% CI
Overall	213	206	—	—	—	—
Mean age (SD) (years)	30.8 (9.3)	33.1 (8.3)	1.03**	(1.01–1.05)	1.05**	(1.01–1.09)
Fars ethnicity	116 (54.5)	81 (39.3)	0.54**	(0.37–0.80)	0.71	(0.44–1.16)
Education (elementary or less)	71 (33.3)	86 (41.7)	1.43	(0.96–2.13)	0.99	(0.59–1.68)
Ever married	118 (55.4)	133 (64.6)	1.47	(0.99–2.17)	1.28	(0.72–2.28)
Homeless	38 (17.8)	122 (59.2)	6.69**	(4.27–10.46)	7.36**	(4.26–12.72)
Mean length of time of drug injection (SD) (years)	4.9 (4.4)	4.8 (5.6)	0.99	(0.96–1.03)	0.93*	(0.88–0.99)
Ever used a shared needle/syringe	148 (69.5)	145 (70.7)	1.06	(0.70–1.61)	1.18	(0.63–2.20)
Ever treated by a physician to stop drug use	62 (29.1)	61 (29.6)	1.03	(0.67–1.56)	1.01	(0.60–1.71)
Ever shared drug injection in prison	79 (37.1)	61 (29.9)	0.72	(0.48–1.09)	0.48*	(0.26–0.88)
Mean number of drug injections in the previous month (SD)	92.6 (47.2)	110.3 (48.4)	1.01**	(1.00–1.01)	1.01**	(1.00–1.02)
Mean size of drug injecting network in the previous month (SD)	2.1 (0.9)	2.6 (2.3)	1.23**	(1.07–1.41)	1.19	(1.00–1.42)
Used a shared needle/syringe in the previous month	85 (39.9)	42 (21.0)	0.40**	(0.26–0.62)	0.24**	(0.13–0.45)
<i>Access to sterile needles/syringes</i>						
Received needles/syringes from an NSP in the previous month	0 (0.0)	139 (67.5)	—	—	—	—
Received needle/syringe primarily from reliable sources ^a in the previous month	149 (70.0)	199 (96.6)	12.21**	(5.44–27.41)	—	—
Perceived access to sterile needles/syringes as “easy” in the previous month	106 (51.0)	185 (90.2)	8.90**	(5.21–15.21)	—	—
Obtained needles/syringes regularly	122 (57.5)	198 (96.1)	18.26**	(8.56–38.94)	—	—

CI, confidence interval; NSP, needle and syringe program; OR, odds ratio; ref, reference

^a Pharmacy or needle and syringe program

* $p < 0.05$; ** $p < 0.01$