

## Background

Incidence of STD has recently dramatically increased in China. According to the national system of STD surveillance, from 1990–1998, the incidence of the eight STDs increased 3.7 times [1], and in 2004 gonorrhea and syphilis incidence ranked 4<sup>th</sup> and 5<sup>th</sup> among 27 notifiable infectious diseases, respectively [2]. At the same time, since the first case of HIV was identified in 1985, reported HIV/AIDS cases have been rapidly increasing in China, especially since 1997. While the increase in the reported cases of HIV could partly reflect expanded surveillance with improved reporting system, it also mirrors escalation of the HIV epidemic in China as the prevalence of HIV infection has also increased among drug users from 1.95% to 6.48%, and among commercial sex workers from 0.02% to 0.93% between 1996 and 2004 [3]. A Joint Assessment by the Ministry of Health and the United Nations Theme Group on HIV/AIDS in China estimated that as of the end of 2003, 840,000 people were living with HIV/AIDS, with an estimated 0.07% prevalence of HIV infection among the general population [4]. The Chinese HIV epidemic began in many districts among high-risk populations such as injection drug users, sex workers [5], and men who have sex with men [6,7]. Recent evidence has indicated that HIV has started to spread into a broader population through heterosexual transmission [4,5].

Young people are especially vulnerable to HIV. Researchers estimate that in many developing countries, one half or more of all HIV infections occur among young people less than 25 years [8]; this includes China, where about 60% of HIV infections are estimated to occur in young people aged 15–29 [9]. Effective HIV prevention among youth, therefore, is the key to the future course of the HIV epidemic and understanding sexual attitudes and behaviors of youth in terms of HIV/STD risk is critical in this respect.

Some studies have examined the sexual behaviors of university/college students in China. A survey performed in Beijing in 1989 found that 13% of male students and 6% of female students had some sexual experience [10]. In 1992, a study in Shanghai indicated that 18.8% of male students and 16.8% of female students had engaged in premarital sex [11], and a 1997 study showed that 15% of male and 13% of female university students in Beijing had experienced premarital sex [12]. In 2000, a nationwide survey involving over 5000 participants revealed that 11.3% of university students were sexually active [13]. While these studies provided useful information about the sexuality of Chinese university/college students, they were more related to sexology than to HIV/STDs, so they did not assess the risk for HIV/STD infection. The recent emergence of the HIV epidemic in China has made it

urgent for researchers to assess and update the behavioral HIV/STD risk profile of Chinese young people.

This study was conducted to obtain detailed profiles of sexual attitudes and behaviors and associated factors among university students. The study was conducted in one large city in Zhejiang Province. This area has had one of the highest rates of gonorrhea and syphilis among all Chinese provinces, and reported cases of HIV have dramatically increased during recent years [2,14], making the development of effective prevention programs for youth a priority.

## Methods

### Participants and settings

This study was conducted in two large state-owned universities in Ningbo Municipality, Zhejiang Province, China. Ningbo is a key trading port city on the east coast with a population of 5.5 million and is one of the most economically developed areas in China. The city contains only two universities, both of which participated in the study. Both universities cover a wide range of disciplines such as economics, law, management, education, literature, science, engineering, and medicine.

All undergraduate students from grades I to IV in both universities were recruited. Here, grade means an academic year of study. Of the possible 29,409 respondents, 22,940 (78.0%) actually responded, and 447 were eliminated from the analysis due to apparent invalid responses, resulting in a final response rate of 76.5% (n = 22,493).

### Data collection

The questionnaire was developed through a review of Chinese and international literature and then modified using the results of qualitative studies that included in-depth interviews for 11 students (3 males and 3 females from university A and 3 males and 2 females from university B) recruited by university counselors from major faculties of two universities and four focus group interviews (for each gender in each university) among 21 students in total conveniently recruited by university counselors from major faculties of two universities. The revised instrument was pilot-tested among a group of 50 students in one of the two universities randomly selected from varying grades and faculties and from both genders. The instrument reliability was then evaluated in 89 of 160 college students recruited from another city who could be matched between two tests with a one-week interval. More than 70% of the categorical variables were found to have Kappa statistics over 0.4 (all  $P < 0.05$ ) and the coefficients of correlation for discrete variables varied from 0.63 to 0.93 (all  $P < 0.05$ ). For the main survey, students were requested by university staffs and student leaders to come to class rooms at specified times other than lecture hours.

Field teams consisting of trained staff from the local Centers for Disease Control and Prevention and counselors from each university collected data from November-December, 2003.

#### **Ethical considerations**

The institutional review processes of Zhejiang Province's Center for Disease Control and Prevention and the two universities involved in the study reviewed this study's research protocol, including instruments, and approved its use; the Ningbo Education Board also approved it. As a process of informed consent, all students were advised of the study's purpose, and invited to the study being told where and when the survey was to be conducted. They are at the same time explained that non-participation would cause no disadvantage to them, and that participants' privacy and confidentiality would be strictly protected as no personal identifiers were included in the questionnaire and data was to be presented only in an aggregated manner. All these policies were also printed in the front page of the questionnaire.

#### **Statistical methods**

Statistical analyses were performed using Epi-Info (Version 6.0, CDC, Atlanta, GA), SPSS for Windows (Version 12.01; SPSS Inc., Chicago, IL) and SAS for Windows release 8.02 (SAS Institute Inc., Cary, NC, USA). Difference in prevalence across the grades was assessed using a Chi square test for linear trend in proportion without adjusting for multiple testing because the tests were done for exploratory purposes for the subsequent multivariate analyses. Variables that exhibited significant linear trends, being greater in lower- than higher-grade students, were further assessed using multiple logistic regression analysis to adjust possible confounding. Because of the very large sample size, effect sizes less than 5% between the grades in both genders were not considered for multivariate analysis. Adjusted odds ratios and 95% confidence intervals summarizing the association between the selected variables and grades were calculated for each grade category. Contrast statistics were further performed to test the linear trend of odds ratios. Student's *t*-test and Chi square test were used when appropriate. A *P*-value of less than 0.05 was considered statistically significant for these analyses.

## **Results**

### **Socio-demographics**

The 22,493 respondents were almost evenly distributed between genders and universities. Of the students, 70% were aged 20 to 23 years with a mean age of 20.3 [standard deviation (SD) 1.4] (Table 1). Hometowns were roughly equally distributed between rural, towns, and urban areas. The majority of students was living in university dormitories and self-reported as coming from economically mid-level families.

### **Sexual behaviors**

Of all respondents, 17.6% of males and 8.6% of females were sexually active (Table 2) and the proportion of male students who had experienced sex before university was significantly greater in lower- than higher-grade students. The same trend, although involving a smaller proportion, was evident among female students. The mean age of first sexual experience was 19.4 (SD = 1.8) and 19.7 (SD = 1.6) for males and females, respectively ( $t = -3.37, P = 0.001$ ).

Of sexually active respondents, 71.5% of males and 62.2% of females reported having sex in the previous year. Among those who had been sexually active in the previous year, males were significantly more likely to have had non-regular partners, including casual partners and commercial partners ( $\chi^2 = 40.80, P < 0.001$ ) than were females; non-regular partnership was more common for lower than higher-grade students in both gender. Males were also significantly more likely to have had multiple partners than were females ( $\chi^2 = 10.21, P = 0.001$ ); multiple partners per year were more common for lower- than higher-grade male students, but not for female students (Table 2). Condom was never/rarely used by 35% of sexually active students in both genders. Among male students, proportions of those who never or rarely used condom declined from first graders to fourth grade students (*P* value for trend analysis < 0.001). However, no significant trend in condom use was found between high and low grade female students (*P* value for trend analysis = 0.08). About 57% of male and 49% of female students never or rarely used contraceptive pills in the previous year.

Regarding the gender of partners, over 85% of respondents reported only having sex with members of the opposite sex during their lifetime, 3.4% of male and 2.9% of female respondents reported having had homosexual and/or bisexual relationships, with the rest failed to report a clear answer. Pregnancy had been experienced by 9.9% of female students and by 9.8% of male students' female partners over their lifetime; the numbers for induced abortion were almost exactly the same in proportion as pregnancy, among students of both genders. The prevalence of sexually active students during lifetime diagnosed with an STD was around 1.5% for both genders.

### **Awareness of sex, sexual attitudes, and exposure to pornographic media**

Awareness of sex, sexual attitudes, exposure to pornographic media, and using Internet to meet a girl/boy friend are compared between the grades in both genders in Table 3. Students of both genders in lower grades reported becoming aware of sex earlier than did students in higher grades, where males who became aware of sex before high school declined from 65.6% in the first grade

Table 1: Socio-demographic characteristics of respondents by gender\*

	Male % (n = 11,255)	Female % (n = 11,238)	Total % (n = 22,493)
<b>University</b>			
University A	50.8	53.6	52.2
University B	49.2	46.4	47.8
<b>Age (years)</b>			
16-19	23.6	33.8	28.7
20-23	74.6	65.5	70.0
≥24	1.1	0.4	0.8
Mean age ± SD†	20.5 ± 1.4	20.1 ± 1.3	20.3 ± 1.4
<b>Grade</b>			
Grade I	33.1	33.0	33.0
Grade II	29.4	30.0	29.7
Grade III	26.2	25.5	25.9
Grade IV	11.3	11.4	11.4
<b>Residence before university</b>			
Rural	32.3	24.2	28.3
Town	37.9	39.4	38.6
Urban	29.4	36.1	32.7
<b>Current residence</b>			
Dormitory	97.4	98.5	98.0
Other	2.1	1.2	1.7
<b>Perceived family's economic status</b>			
Rich	7.2	8.5	7.8
Intermediate	82.9	86.1	84.5
Poor	9.7	5.2	7.4

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

†Standard deviation.

to 52.5% in the fourth grade students. The corresponding figures for females were 42.3% in the first grade and 26.7% in the fourth grade. The proportion of students who were exposed to each form of pornographic media (books/magazines/videos, and websites) was much greater in males than females and the proportion of male students who were exposed to each form of pornographic media before the age of 17 was significantly greater in lower- than higher-grade students. The Internet was also actively used to find dates; 51.1% of all male respondents and 43.8% of all female respondents reported having found a girl/boy friend over the Internet.

Up to 62% of males and 86% of females disapproved high school students having sex, with higher grade students disapproved it more than lower grade ones. Premarital sex was considered unacceptable by 12.1% of males and 30.8% of females, while commercial sex by 67.3% of males and 84.9% of females.

#### Multiple logistic regression analysis

Multiple logistic regression analyses were performed for variables that showed a significantly greater trend for students in lower grades (exception for disapproval of sex at high school); these were used to assess possible confounding by university, faculty, residential area, and reported family economic status with fourth grade as a reference (Table 4). These analyses confirmed the results of bivariate analyses, showing that lower-grade students are likely to be more sexually active or unprotected, to have become aware of sex earlier, and to have been exposed to pornographic media earlier than the higher-grade students in both genders except for multiple partnerships among female students. Most striking differences between grades (odds ratio > 5) were observed in "having sex before university" among female students and "being exposed to pornographic website ≤ 16 year-old" among male students.

Table 2: Sexual behaviors of respondents by gender and grade

Characteristics	Male (%)					Female (%)					Total	P value*	P value*		
	Grade I	Grade II	Grade III	Grade IV	Total	Grade I	Grade II	Grade III	Grade IV	Total					
<b>Sexual experience†</b>															
Yes	11.7	16.7	23.8	22.6	17.6	5.4	7.7	11.6	13.1	8.6	<0.001				
No	88.3	83.3	76.2	77.4	82.4	94.6	92.3	88.4	86.9	91.4					
<b>Time of first sexual intercourse†</b>															
Before university	8.9	7.2	7.2	2.8	7.3	2.9	1.7	1.7	0.3	1.9	<0.001				
University	2.5	8.9	15.6	19.1	9.7	2.1	5.6	9.4	11.9	6.1					
Not specified	0.3	0.6	1.0	0.7	0.6	0.4	0.4	0.6	0.9	0.5					
<b>Partner type (in previous year)‡</b>															
Ever commercial/casual partner	18.8	16.3	13.1	10.2	14.7	9.2	5.0	3.8	1.7	4.7	0.007				
Regular partner only	79.3	80.2	84.2	88.1	82.7	87.2	90.6	94.8	95.8	92.5					
Missing	1.9	3.5	2.7	1.8	2.6	3.7	4.4	1.4	2.5	2.8					
<b>Number of sexual partners (in previous year)‡</b>															
≥2	22.4	18.5	17.2	10.6	17.6	11.0	13.2	11.8	12.7	12.2	0.85				
1	70.2	70.1	74.1	84.1	73.8	77.1	81.1	82.2	81.4	80.8					
Missing	7.4	11.4	8.8	5.3	8.6	11.9	5.7	6.1	5.9	7.0					
<b>Condom use (in previous year)‡</b>															
Never/Rarely	46.3	35.9	31.0	27.9	35.1	43.1	35.8	31.9	33.1	35.2	0.08				
Sometimes	23.9	15.8	19.9	15.9	19.1	14.7	16.4	19.7	20.3	18.0					
Often/Always	25.6	41.3	41.9	50.0	39.5	32.1	32.7	35.7	35.6	34.2					
Missing	4.2	7.1	7.2	6.2	6.4	10.1	15.1	12.7	11.0	12.5					

Table 2: Sexual behaviors of respondents by gender and grade (Continued)

<b>Pill use (in previous year)†</b>												
Never/Rarely	58.9	53.0	58.1	58.0	56.9	0.81	46.8	47.8	53.1	47.5	49.4	0.63
Sometimes	21.0	19.8	17.0	11.1	17.7		17.4	18.9	14.6	21.2	17.5	
Often/Always	17.5	23.9	21.2	28.3	22.2		30.3	29.6	28.6	28.0	29.0	
Missing	2.6	3.3	3.7	2.7	3.2		5.5	3.8	3.8	3.4	4.0	
<b>Gender of sexual partner (lifetime)¶</b>												
Homosexual/Bisexual	2.3	3.8	4.0	3.1	3.4	0.32	3.5	5.4	1.2	1.8	2.9	0.04
Heterosexual only	91.3	86.8	87.8	90.6	88.7		82.6	83.5	88.3	85.1	85.3	
Missing	6.4	9.4	8.3	6.3	7.9		13.9	11.2	10.5	13.1	11.8	
<b>History of pregnancy of partner or themselves (lifetime)¶¶</b>												
Yes	6.6	9.4	11.0	12.5	9.8	<0.01	8.5	8.8	11.4	10.1	9.9	0.40
No/Don't know	87.0	82.1	81.4	81.9	82.9		77.1	79.6	77.8	78.0	78.2	
Missing	6.4	8.5	7.7	5.6	7.3		14.4	11.5	10.8	11.9	11.9	
<b>History of induced abortion of partner or themselves (lifetime)¶¶</b>												
Yes	6.6	7.8	10.7	12.9	9.3	0.001	9.5	9.2	10.5	10.7	10.0	0.65
No/Don't know	86.5	82.8	81.8	81.5	83.1		75.6	79.6	78.4	77.4	78.0	
Missing	6.9	9.4	7.5	5.6	7.6		14.9	11.2	11.1	11.9	12.0	
<b>History of being diagnosed as having STDs (lifetime)¶¶</b>												
Yes	1.1	1.4	1.3	1.0	1.3	0.88	1.0	1.9	1.8	0.6	1.5	0.80
No	88.6	82.8	87.1	88.9	86.5		80.1	81.5	83.8	81.0	81.9	
Missing	10.3	15.7	11.7	10.1	12.3		18.9	16.5	14.4	18.5	16.6	

\* Chi square test for linear trend in proportion.

† Among all respondents.

‡ Among respondents who had sex in the previous year (n = 309, 368, 513, and 226 for male grade I, II, III and IV students, respectively, and n = 109, 159, 213, and 118 for female grade I, II, III, and IV students, respectively).

¶ Among all sexually active respondents (n = 437, 553, 703, and 287 for male grade I, II, III, and IV students, respectively, and n = 201, 260, 334, and 168 for female grade I, II, III, and IV students, respectively).

Table 3: Period of first awareness of sex, exposure to pornographic media, attitude toward sex by gender and grade

Characteristics	Male (%)					Female (%)					P value*	Total (n = 11255)	P value*	Total (n = 11238)	
	Grade I (n = 3728)	Grade II (n = 3308)	Grade III (n = 2949)	Grade IV (n = 1270)	Grade IV (n = 1270)	Grade I (n = 3708)	Grade II (n = 3375)	Grade III (n = 2869)	Grade IV (n = 1286)	Grade IV (n = 1286)					
<b>Period became aware of sex</b>															
Before high school	65.6	59.0	52.8	52.5	58.8	42.3	32.3	30.0	26.7	34.4	<0.001	58.8	34.4	<0.001	34.4
High school	32.6	36.6	39.3	37.2	36.1	51.9	52.3	45.1	41.4	49.1		4.6	49.1		49.1
University	1.3	3.8	7.4	9.8	4.6	5.5	15.1	24.7	31.4	16.2		0.5	16.2		16.2
Missing	0.4	0.7	0.4	0.6	0.5	0.3	0.3	0.2	0.5	0.3		0.5	0.3		0.3
<b>First exposure to pornographic media†</b>															
Early (≤ 16 year-old)	44.4	31.8	29.8	28.5	35.1	10.0	6.8	5.6	3.4	7.2	<0.001	35.1	7.2	<0.001	7.2
Late (≥ 17 year-old)	27.3	40.4	46.2	52.3	38.9	7.6	13.4	19.9	22.3	14.2		8.3	14.2		14.2
Never	19.1	11.2	8.4	8.3	12.8	80.4	77.5	71.0	70.9	76.0		13.2	76.0		76.0
Age unknown/Missing‡	9.2	16.6	15.6	10.9	13.2	2.0	2.4	3.4	3.3	2.6		0.5	2.6		2.6
<b>First exposure to pornographic website</b>															
Early (≤ 16 year-old)	13.7	7.0	3.2	1.8	7.6	0.9	0.5	0.1	0.2	0.5	<0.001	7.6	0.5	<0.001	0.5
Late (≥ 17 year-old)	42.5	55.0	67.1	75.4	56.3	5.0	8.2	15.4	15.9	9.8		23.6	9.8		9.8
Never	35.7	22.3	14.9	11.5	23.6	93.3	90.1	81.9	81.3	88.1		12.5	88.1		88.1
Age unknown/Missing‡	8.1	15.7	14.9	11.3	12.5	0.9	1.2	2.5	2.6	1.6		0.3	1.6		1.6
<b>Meet a girl/boy friend over the Internet</b>															
Yes	51.3	49.4	52.2	52.2	51.1	42.9	40.6*	47.1	47.0	43.8	0.31	51.1	43.8	<0.001	43.8
No	48.4	50.3	47.5	47.6	48.6	56.9	59.3	52.9	52.9	56.1		48.6	56.1		56.1
Missing	0.3	0.3	0.3	0.2	0.3	0.1	0.1	0.1	0.1	0.1		0.3	0.1		0.1
<b>Approve of sex during high school</b>															
Disapprove	61.1	60.9	61.5	71.1	62.3	84.0	87.3	86.8	88.5	86.2	<0.001	62.3	86.2	<0.001	86.2
Approve/Don't know	37.2	35.4	35.6	27.6	35.2	15.4	12.0	12.3	10.3	13.0		35.2	13.0		13.0
Missing	1.7	3.7	2.9	1.3	2.6	0.6	0.7	0.9	1.2	0.8		2.6	0.8		0.8
<b>Approve of sex before marriage</b>															
Disapprove	14.1	12.0	9.4	12.4	12.1	36.4	29.7	26.7	26.2	30.8	<0.001	12.1	30.8	<0.001	30.8
Approve/Don't know	83.4	83.5	86.6	85.8	84.5	62.6	69.0	71.9	72.2	68.0		84.5	68.0		68.0
Missing	2.5	4.5	4.0	1.7	3.4	1.0	1.3	1.3	1.6	1.2		3.4	1.2		1.2
<b>Approve of commercial sex</b>															
Disapprove	69.9	68.4	63.4	65.3	67.3	86.5	85.4	83.2	83.1	84.9	<0.001	67.3	84.9	<0.001	84.9
Approve/Don't know	28.1	27.8	33.4	32.9	29.9	12.9	13.9	15.8	15.6	14.2		29.9	14.2		14.2
Missing	2.0	3.8	3.2	1.8	2.8	0.7	0.7	1.0	1.2	0.8		2.8	0.8		0.8

\*Chi square test for linear trend in proportion.

† Including pornographic novel, magazine, and/or video.

‡ Missing cases are less than 1% for each grade among both male and female students.

Table 4: Multivariate analysis on the association between risk characteristics and grade, divided by gender

Risk characteristics	Male					Female				
	Grade I	Grade II	Grade III	Grade IV	P value*	Grade I	Grade II	Grade III	Grade IV	P value*
	Odds ratios (95% CI)†					Odds ratios (95% CI)†				
Having first sex before university (referred to never or having first sex at university)	2.08 (1.43-3.02)	1.79 (1.23-2.59)	1.89 (1.31-2.75)	1	< 0.001	7.73 (2.80-21.33)	4.52 (1.63-12.58)	4.82 (1.73-13.44)	1	< 0.001
Ever had sex with a casual and/or commercial sex partner in previous year‡ (referred to having had only regular partner)	1.89 (1.03-3.47)	1.76 (1.01-3.10)	1.33 (0.78-2.29)	1	0.02	2.37 (0.40-14.04)	2.20 (0.42-11.68)	1.89 (0.36-9.92)	1	0.33
Having had ≥ 2 sexual partners in previous year‡ (referred to having had only one partner)	2.08 (1.16-3.72)	1.86 (1.08-3.20)	1.60 (0.96-2.68)	1	0.01	0.56 (0.22-1.42)	0.77 (0.36-1.68)	0.72 (0.34-1.50)	1	0.26
Never or rarely used condom in previous year‡ (referred to sometimes/often/always used)	1.87 (1.20-2.90)	1.39 (0.93-2.08)	1.14 (0.78-1.66)	1	0.003	1.98 (1.04-3.78)	1.43 (0.82-2.51)	1.12 (0.66-1.89)	1	0.03
Became aware of sex before high school (referred to becoming aware of sex in high school/at university)	1.66 (1.45-1.91)	1.27 (1.11-1.46)	0.98 (0.86-1.13)	1	< 0.001	2.11 (1.82-2.45)	1.37 (1.18-1.59)	1.19 (1.03-1.39)	1	< 0.001
Being exposed to pornographic media ≤ 16 year-old§ (referred to never or being exposed ≥ 17 year-old)	1.66 (1.43-1.93)	1.12 (0.96-1.30)	1.02 (0.88-1.19)	1	< 0.001	3.24 (2.33-4.51)	2.09 (1.49-2.92)	1.69 (1.20-2.38)	1	< 0.001
Being exposed to pornographic website ≤ 16 year-old (referred to never or being exposed ≥ 17 year-old)	6.09 (3.94-9.41)	3.29 (2.12-5.13)	1.44 (0.90-2.30)	1	< 0.001	3.66 (1.07-12.58)	2.16 (0.61-7.58)	0.59 (0.13-2.66)	1	< 0.01
Disapproved high school students' sex (referred to approved or did not know)	0.93 (0.80-1.08)	0.91 (0.78-1.06)	0.84 (0.72-0.98)	1	0.09	0.86 (0.69-1.06)	1.06 (0.86-1.32)	0.96 (0.78-1.20)	1	0.27

\* P value is calculated using linear contrast statistics.

† Odds ratio with 95% confidence interval in parentheses is adjusted for university, faculty, residential area, and family's economic status.

‡ Among students sexually active in the previous year.

§ Including pornographic novel, magazine, and/or video.

Type of sexual partner, multiple partnerships and condom use in the previous year were further analyzed adding the age of first sexual experience as an independent variable to assess possible confounding of the different proportions of early or late initiations into sex across the grades. This is because students who became sexually active early (before university) are more likely to ever have multiple partnerships and to ever have non-regular partners than were students who were initiated late (mean numbers of sexual partners for males in the previous year were  $1.5 \pm 1.1$  [SD] and  $1.2 \pm 0.6$  [SD] for early initiation and late initiation, respectively ( $P < 0.001$ ), and  $1.4 \pm 0.8$  and  $1.1 \pm 0.4$ , respectively, among females ( $P < 0.001$ ); proportions of having non-regular sexual partners for males in the previous year were 20.8% and 10.8% for early initiation and late initiation, respectively ( $P < 0.001$ ), and 9.4% and 2.4%, respectively, among female ( $P < 0.001$ ). These analyses showed that significant trend between the grade disappeared after the adjustment with the age of first sex in the type of sexual partner (odds ratios after further adjustment ranged between 0.84–1.03 for males and 0.87–1.27 for females) and in the number of sexual partners (0.73–1.03 for males) but not in the condom use in the previous year (1.0–1.73 for males and 1.0–1.98 for females, both  $P \leq 0.02$ ). These results suggest that the trend of lower-grade students to have casual and/or commercial sexual partners and multiple partnerships more than higher-grade students are likely due to an increase in the number of students who initiate sex early, but the trend in unprotected sex is not.

## Discussion

Rates of sexual experience reported by the university students who responded to our study were 17.6% among males and 8.6% among females. These rates fall within the ranges reported by Chinese university/college students in other Chinese cities since 1995 [12,13,15]. During the last decade, the rates of sexual experience among Chinese university students do not appear to have undergone a dramatic change, remaining much lower than rates observed in the USA, Europe, and Japan during the 1990s and early 2000s [16-19]. This may be related to the fact that at the time of this survey, the Chinese Ministry of Education prohibited marriage among university students and the universities discouraged sex, although the Ministry's ban was effectively lifted in September 2005 [20]. However, our results clearly indicate that there have been changes in the sexual behaviors and awareness of university students, with both male and female students in lower grades becoming more aware of sex, having sex earlier, and having more casual/commercial and multiple partnerships. If this trend continues, it may expand the subpopulation of students who have multiple partners in a year, expanding the sexual network among them.

Our study also revealed prevalent unsafe sexual practices among respondents; 35% of respondents from both genders reported never/rarely using condoms in the previous year. This, together with the low contraceptive pill use among respondents, is probably the basis for the prevalence of both pregnancy and induced abortion, which were both as high as 10% among sexually active female respondents and the female partners of male respondents. Since pregnancy rates were almost identical to rates of induced abortion, it is possible that most pregnancies were artificially aborted, highlighting the importance of introducing safe sex education. In contrast to rates of induced abortion, the prevalence of sexually active students diagnosed with an STD during their lifetime was below 2% for students of both genders. This may be due to under-reporting, to the presence of certain STDs such as chlamydial and gonorrheal infections that remain largely asymptomatic especially among women [21,22], to embarrassment or financial costs preventing students from seeking medical care, to the limited availability of testing for chlamydial infections in the study area, or to the fact that the university students' sexual network was not developed enough to allow the spread of STDs.

Another important finding was that the condom use progressively lessened in lower-grade students of both genders. Though data are not shown in this paper, the same trends were significant for condom use over students' lifetimes as well as during their last sexual encounter. Since multiple logistic regression analyses revealed that these trends were all independent of the age of first sexual experience, it appears that sexually active younger university students are generally less protected than the older students. If this trend continues together with the increase in early sex initiation associated with more non-regular and more multiple partnership, the vulnerable subpopulation of students engaging in unsafe sexual practices will expand, potentially leading to an increased incidence of induced abortion and probably increased future STDs and HIV infection. This concern is supported by many previous studies indicating that an early age of sexual debut is associated with negative outcomes such as unwanted pregnancy, induced abortion, and STDs [23-25]. Research done in African countries has demonstrated that having sex at an early age is significantly associated with an increased incidence of HIV infection [26,27].

These trends of lower grade students to be sexually active earlier, to be aware of sex earlier, and to more accept adolescent sex compared to higher grade students were closely associated with the proportion of students who were exposed at a young age to pornographic media such as books/magazines/videos, and websites, suggesting that pornographic media may have had some influence on respondents' sexual awareness and practices. The rates



reported having been exposed to pornography are similar to rates reported recently among young men in Hong Kong [28] and much higher than the prevalence (27.6%) reported among young Chinese adults in 1993 [29], implying that young Chinese people have become increasingly exposed to pornographic media over the last decade.

The Internet is a new, fast-developing media in China, and the population of users under 35 years of age has dramatically increased during the last several years (1.9 million in 1999 to 65 million in 2004 nationwide) [30]. This may be the cause of greater amounts of and earlier exposure to pornographic websites in lower-grade students. Our study also revealed that about half of our respondents in both genders had used the Internet to meet a girl/boy friend. Previous reports have shown that the use of the Internet for partner seeking and exposure to pornographic media are associated with risky sexual behaviors that lead to STD/HIV infection [28,31-33]. Careful monitoring will be needed in China regarding the possible future impact of the Internet and pornographic media on the sexual attitudes and behaviors of young people.

This study found striking gender differences (male > female) in rates of sexual experience, attitudes about premarital sex, and exposure to pornographic media; these differences were consistent with previous studies done in China [13,15,34-37], suggesting the importance of targeting prevention efforts toward male students. However, our study also suggested the need to carefully monitor possible changes among female students. Female students appear to be rapidly changing in sexual awareness and behavior, as the proportion of female students who became aware of sex before university was much greater in first- than in fourth-grade students, and the proportion of female first-grade students who reported having sex with non-regular partners in the previous year was over five-fold greater than that in fourth-grade students.

Finally, our study revealed that 3.4% of male students had experienced homosexual and/or bisexual activities. As well, 14.7% of males and 4.7% of females reported that their sexual encounters in the previous year involved commercial sex and casual sex. Though the proportions of these sexual practices were relatively small, prevention should clearly target these subpopulations since HIV/STDs epidemics has already been found in populations of men who have sex with men and in commercial sex workers in many parts of China [4-7]. The liberal attitudes both genders have about commercial sex and premarital sex are of serious concern in this respect, and should be adequately addressed in any future prevention program.

This study had several limitations. First, its cross-sectional design was limited in evaluating cause-and-effect associations. Second, the results obtained in this study should not be generalized to all Chinese young people or to all Chinese university students, since our sample was limited to university students within one municipality and socio-demographic or socio-economic characteristics are greatly diverse among Chinese provinces. Finally, the possible bias introduced by under-reporting should be noted, since missing data was disproportionately high (up to 20%) in questions related to sexual behaviors. A proportion of non-respondents may have considered questions about sexual behaviors to be too sensitive as all of them were unmarried.

### Conclusion

Our results suggests that, though sexual activity is still moderate among the respondents, sexual behaviors are poorly protected and sexual awareness and behaviors are under possible rapid changes becoming more active and risky, potentially driven by heavy exposures to various pornographic media and Internet from early age. Since the change was associated with earlier sex initiation, more commercial and casual sex, greater multiple partnerships and less condom use, vulnerable sexual network that allows the spread of STDs and HIV may grow among university students if these trend persist. Further surveys and surveillance on sexual behavior, its consequences, therefore, should be carried out among Chinese youth to develop targeted and effective prevention to protect them from adverse reproductive outcomes and STDs and future infection of HIV.

### Abbreviations

STD: Sexually Transmitted Disease

HIV: Human Immunodeficiency Virus

AIDS: Acquired Immune Deficiency Syndrome

### Competing interests

The author(s) declare that they have no competing interests.

### Authors' contributions

All authors contributed to the design of this research. MQ performed the statistical analysis and draft of the manuscript; CL and XG coordinated the study in field; ZS and SMR helped analyze the data; MOK and MK supervised the research, statistical analysis and revised the manuscript. All the authors of the manuscript have read and agreed to its content.

### Acknowledgements

This research was supported by a grant from Japanese Foundation for AIDS Prevention, Japan. The authors are grateful to the participants and research

team members from the Zhejiang Province and Ningbo Municipality Centers for Disease Control, as well as the Ningbo Municipal Education Board and the administrators and counselors of the participating universities. The authors greatly appreciate contribution of Mr Koji Oba from Kyoto University School of Public Health for his critical comments on the statistical analyses.

## References

- Zhang KL, Ma SJ, Xia DY: **Epidemiology of HIV and sexually transmitted infections in China.** *Sex Health* 2004, 1:39-46.
- China Ministry of Health. **China statistical summary for health for 2003, 2004, 2005** [[http://www.moh.gov.cn/news/sub\\_index.aspx?tp\\_class=C3](http://www.moh.gov.cn/news/sub_index.aspx?tp_class=C3)]
- 2005 Update on the HIV/AIDS Epidemic and Response in China. Ministry of Health, People's Republic of China, Joint United Nations Programme on HIV/AIDS, World Health Organization. Beijing; 2006.
- A joint assessment of HIV/AIDS prevention, treatment and care in China (2003).** China Ministry of Health and UN Theme Group on HIV/AIDS in China. Beijing; 2003.
- A Joint Assessment of HIV/AIDS Prevention, Treatment and Care in China (2004).** State Council AIDS Working Committee Office and UN Theme Group on HIV/AIDS in China. Beijing; 2004.
- Choi KH, Liu H, Guo Y, Han L, Mandel JS, Rutherford GW: **Emerging HIV-1 epidemic in China in men who have sex with men.** *Lancet* 2003, 361:2125-6.
- Zhang B: **HIV epidemic and intervention among MSM: Background, practice and support.** *Chin J STD/HIV Cntl (in Chinese)* 2001:413-415.
- Rivers K, Aggleton P. **Adolescent sexuality, gendering the HIV epidemic.** New York: **UNDP HIV and Development Programme** [<http://www.undp.org/hiv/publications/gender/adolesce.htm>]
- Xinhua News Agency. **Sixty percent of Chinese HIV carriers are young people** [<http://www.china.org.cn/english/1/69741.htm>]
- Zhang SB: **An investigation on college students about AIDS knowledge.** *AIDS Bull* 1993, 4:78-81.
- Li H, Zhang KL: **The progress of social behavior science related to HIV/AIDS.** *Chin J Prev Med (in Chinese)* 1998, 2:120-124.
- Li A, Wang A, Xu B: **University students' attitudes toward premarital sex and their sexual activity in Beijing.** *Sexology (in Chinese)* 1998, 7:19-24.
- Research Group on Sex Education among University Students: **Report on sexual behavior survey among Chinese university students in 2000.** *Youth Study (in Chinese)* 2001, 12:31-39.
- Zhejiang Provincial Bureau of Health, China. **Notifications for notifiable infectious disease in Zhejiang province** [<http://www.zjwst.gov.cn/goto.aspx?WebSite=1&Hnumb=560&UrlName=yqtb/default.jsp&type=57>]
- Zhang L, Gao X, Dong Z, Tan Y, Wu Z: **Premarital sexual activities among students in a university in Beijing, China.** *Sex Transm Dis* 2002, 29:212-5.
- Reinisch JM, Hill CA, Sanders SA, Ziemba-Davis M: **High-risk sexual behavior at a midwestern university: A confirmatory survey.** *Fam Plan Perspect* 1995, 27:79-82.
- Raab GM, Burns SM, Scott G, Cudmore S, Ross A, Gore SM, O'Brien F, Shaw T: **HIV prevalence and risk factors in university students.** *AIDS* 1995, 9:191-7.
- Ford NJ, Halliday J, Little J: **Changes in sexual lifestyles of young people in Somerset, 1990-1996.** *Br J Fam Plann* 1999, 25:55-77.
- Ono-Kihara M, Kihara M, Amano K, Nakaune N, Kimura H, Ichikawa S: **A nationwide study on knowledge, attitudes and behaviors related to HIV/STD infection among university students.** In *Annual Report of the Study Group on HIV/AIDS Epidemiology and Prevention (in Japanese)* Japan: Ministry of Health and Welfare; 2000:584-593.
- No. 21 order of Ministry of Education of the People's Republic of China: **Regulation for management of students in higher education institutions.** China Ministry of Education. Beijing; 2005.
- Stamm WE: **Chlamydia trachomatis infections of the adult.** In *Sexually Transmitted Disease* 3rd edition. Edited by: Holmes KK. USA: The McGraw-Hill Companies; 1999:407-422.
- Hook EW, Handsfield HH: **Gonococcal infections in the adult.** In *Sexually Transmitted Disease* 3rd edition. Edited by: Holmes KK. USA: The McGraw-Hill Companies; 1999:451-466.
- Singh S, Wulf D, Samara R, Cuca YP: **Gender difference in the timing of first intercourse: Data from 14 countries.** *Int Fam Plan Perspect* 2000, 32:21-28.
- Carret ML, Fassa AG, da Silveira DS, Bertoldi AD, Hallal PC: **Sexually transmitted diseases symptoms in adults: Prevalence and risk factors.** *Rev Saude Publica* 2004, 38:76-84.
- Greenberg J, Magder L, Aral S: **Age at first coitus. A marker for risky sexual behavior in women.** *Sex Transm Dis* 1992, 19:331-334.
- Pettifor AE, van der Straten A, Dunbar MS, Shiboski SC, Padian NS: **Early age of first sex: A risk factor for HIV infection among women in Zimbabwe.** *AIDS* 2004, 18:1435-42.
- Bulterys M, Chao A, Habimana P, Dushimimana A, Nawrocki P, Saah A: **Incident HIV-1 infection in a cohort of young women in Butare, Rwanda.** *AIDS* 1994, 8:1585-1591.
- Janhonorani M, Lam TH, The Youth Sexuality Study Task Force: **Sexual media use by young adults in Hong Kong: Prevalence and associated factors.** *Arch Sex Behav* 2003, 32:545-553.
- Pan S: **China: Acceptability and effect of three kinds of sexual publication.** *Arch Sex Behav* 1993, 22:59-71.
- China Internet Network Information Center (CNNIC). **Statistical report for 16th internet network development survey in China** [<http://www.cnnic.net.cn/index/0E/00/11/1/>]
- McFarlane M, Bull SS, Rietmeijer CA: **Young adults on the Internet: risk behaviors for sexually transmitted diseases and HIV.** *J Adolesc Health* 2002, 31:11-6.
- Tashima KT, Akt EN, Harwell JI, Fiebig-Perez DK, Flanigan TP: **Internet sex-seeking leads to acute HIV infection: a report of two cases.** *Int J STD AIDS* 2004, 15:206-8.
- McFarlane M, Kachur R, Bull S, Rietmeijer C: **Women, the Internet, and sexually transmitted infections.** *J Womens Health* 2004, 13:689-94.
- Lu H, Zhao PF: **A KAP survey on the level of knowledge about HIV/AIDS among medical students in Shanghai.** *Sexology (in Chinese)* 1995, 4:48-54.
- Gao Y, Lu ZZ, Shi R, Sun XY, Cai Y: **AIDS and sex education for young people in China.** *Reprod Fertil Dev* 2001, 13:729-37.
- Suoadi, Zhong A, Zhou ZA, Mubarak: **Research report for sexual attitudes of undergraduate students.** *Youth Study (in Chinese)* 2004, 4:30-38.
- Liu DL: **Sexual behavior in modern China: A report of the nationwide sex civilization survey of 20,000 subjects in China.** Shanghai: Shanghai San Lian Bookshop; 1996.

## Pre-publication history

The pre-publication history for this paper can be accessed here:

<http://www.biomedcentral.com/1471-2458/6/232/prepub>

Publish with **BioMed Central** and every scientist can read your work free of charge

*"BioMed Central will be the most significant development for disseminating the results of biomedical research in our lifetime."*

Sir Paul Nurse, Cancer Research UK

Your research papers will be:

- available free of charge to the entire biomedical community
- peer reviewed and published immediately upon acceptance
- cited in PubMed and archived on PubMed Central
- yours — you keep the copyright

Submit your manuscript here:  
[http://www.biomedcentral.com/info/publishing\\_adv.asp](http://www.biomedcentral.com/info/publishing_adv.asp)



Research article

Open Access

## Substance use and sexual behaviours of Japanese men who have sex with men: A nationwide internet survey conducted in Japan

Yasuharu Hidaka<sup>\*1,2</sup>, Seiichi Ichikawa<sup>3</sup>, Junko Koyano<sup>4</sup>, Michiko Urao<sup>5</sup>, Toshihiko Yasuo<sup>2,6</sup>, Hirokazu Kimura<sup>7</sup>, Masako Ono-Kihara<sup>1</sup> and Masahiro Kihara<sup>1</sup>

Address: <sup>1</sup>Department of Global Health and Socio-epidemiology, Kyoto University School of Public Health Yoshidakonoe-cho, Sakyo-ku, Kyoto 606-8501, Japan, <sup>2</sup>Japanese Foundation for AIDS Prevention 5th floor, 1-3-12, Misaki-cho, Chiyoda-ku, Tokyo 101-0061, Japan, <sup>3</sup>Nagoya City University School of Nursing 1 Kawasumi, Mizuho-cho, Mizuho-ku, Nagoya 467-8601, Japan, <sup>4</sup>Matsuhama Hospital 3396 Matsuhama-cho, Niigata, 950-3121, Japan, <sup>5</sup>Genetic Counselling and Clinical Research Unit, Kyoto University School of Public Health Yoshidakonoe-cho, Sakyo-ku, Kyoto 606-8501, Japan, <sup>6</sup>AIDS Medical Center, Osaka National Hospital 2-1-14, Hoenzaka, Chuo-ku, Osaka, Japan and <sup>7</sup>Minami Public Health and Welfare Center, City of Yokohama 3-48-1 Hananogi-cho, Minami-ku, Yokohama, 232-0018, Japan

Email: Yasuharu Hidaka\* - [yass@kta.att.ne.jp](mailto:yass@kta.att.ne.jp); Seiichi Ichikawa - [yaichisei@ybb.ne.jp](mailto:yaichisei@ybb.ne.jp); Junko Koyano - [k-junko@apost.plala.or.jp](mailto:k-junko@apost.plala.or.jp); Michiko Urao - [m-urao@khaki.plala.or.jp](mailto:m-urao@khaki.plala.or.jp); Toshihiko Yasuo - [tyasuo@onh.go.jp](mailto:tyasuo@onh.go.jp); Hirokazu Kimura - [hi06-kimura@city.yokohama.jp](mailto:hi06-kimura@city.yokohama.jp); Masako Ono-Kihara - [okmasako@pbh.med.kyoto-u.ac.jp](mailto:okmasako@pbh.med.kyoto-u.ac.jp); Masahiro Kihara - [poghse@pbh.med.kyoto-u.ac.jp](mailto:poghse@pbh.med.kyoto-u.ac.jp)

\* Corresponding author

Published: 26 September 2006

Received: 25 May 2006

BMC Public Health 2006, 6:239 doi:10.1186/1471-2458-6-239

Accepted: 26 September 2006

This article is available from: <http://www.biomedcentral.com/1471-2458/6/239>

© 2006 Hidaka et al; licensee BioMed Central Ltd.

This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/2.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

### Abstract

**Background:** Japanese men who have sex with men (MSM), especially those living in large metropolitan areas such as Tokyo and Osaka, are facing a growing HIV/AIDS epidemic. Although the Internet is used as a new venue for meeting sex partners, it can also serve as a useful research tool for investigating the risk behaviours of Japanese MSM. This Internet survey explored the extent of substance use and its association with sexual risk behaviours among Japanese MSM.

**Methods:** Between 28 February 2003 and 16 May 2003 MSM were recruited through 57 Japanese gay-oriented Web sites, gay magazines, and Internet mailing lists. Participants completed a structured questionnaire anonymously through the Internet.

**Results:** In total, 2,062 Japanese MSM completed the questionnaire. The average age of participants was 29.0 years and 70.5% identified as gay, 20.8% as bisexual, and 8.7% as other. Overall, 34.5% reported never using a substance, 45% reported ever using one type of substance (lifetime reported single substance users), and 19.6% had used more than 1 type of substance (lifetime reported multiple substance users) in their lifetimes. The substances most commonly used were amyl nitrite (63.2%), 5-methoxy-N, N-diisopropyltryptamine (5MEO-DIPT) (9.3%), and marijuana (5.7%). In the multivariate analysis, unprotected anal intercourse, having had 6 or more sexual partners, visiting a sex club/gay venue in the previous 6 months, a lower education level, and being 30 to 39 years of age were associated with both lifetime single and lifetime multiple substance use. Lifetime reported multiple substance use was also correlated with having a casual sex partner, having symptoms of depression, being diagnosed as HIV-positive, and greater HIV/AIDS-related knowledge.

**Conclusion:** This is the first Internet-based research focused on the sexual and substance use behaviours of MSM in Asia. Our findings suggest a compelling need for prevention interventions to reduce HIV risk-related substance use behaviours among Japanese MSM. The results also suggest that the Internet is potentially a useful tool for collecting behavioural data and promoting prevention interventions among this population.

## Background

Recently, the HIV epidemic has spread rapidly among men who have sex with men (MSM) in Japan. New HIV infections through sexual contact among MSM have continued to rise steadily over the last two decades with data indicating the rate of increase accelerating since 1999. According to the 2005 annual surveillance report on HIV/AIDS by the AIDS Surveillance Committee of the Ministry of Health, Labour, and Welfare, there were 7,392 people infected with HIV and 3,644 people with AIDS. In addition, there were 1,435 people who acquired with HIV/AIDS through unheated blood products. In 2005, Japanese MSM accounted for 66.8% of new HIV infections and 37.9% of new AIDS cases reported among men [1]. Of new HIV infections reported among MSM, the majority were from metropolitan areas such as Tokyo and Osaka, indicating that these are potential centres of an emerging HIV epidemic in Japan.

High levels of substance use have been reported among MSM populations in the USA, Australia and substance use is increasing among MSM in Asian countries, such as Nepal and the Philippines [2-10]. Studies suggest that substance use is strongly associated with high-risk sexual behaviours [3,11,12]. There is therefore a pressing need to collect data on the sexual and substance use behaviours of MSM to understand HIV risk and develop effective prevention programmes. However, research on substance use and sexual behaviours among Japanese MSM has been limited due to the deeply rooted social prejudice towards homosexuality and the illegal nature of substance use in Japan.

The use of the Internet is widespread in Japan, with the Ministry of Internal Affairs and Communication White Paper reporting 68% of Japanese households having Internet access in 2005 [13]. At the end of 2003, Internet usage rates of 90% were reported in the following age groups: 13 to 19, 20 to 29, and 30 to 39 [14]. The Internet has developed into a useful research tool for conducting surveys and is increasingly used to conduct behavioural surveys of hard-to-reach or hidden populations, such as MSM [15]. The Internet enables researchers to engage with anonymous participants, allowing access to populations that cannot be reached using conventional sampling procedures, such as venue-based or snowballing samplings. In addition, it allows the collection of a large number of participants in a short period of time, beyond geographic boundaries, with lower costs. The Internet has also been used increasingly as an effective tool for general and personalized intervention because of its universal accessibility and interactive nature.

Many Japanese MSM use the Internet and it has become a vital tool for meeting new partners and friends, develop-

ing relationships, and making sexual contacts [16,17]. Given the social stigma facing this group, the use of the Internet to meet new partners might be especially important for MSM who are not open about their sexuality, those who prefer that their interest in same-sex relationships remain hidden.

This study is the first Internet-based survey in Japan to explore substance use and sexual behaviours among Japanese MSM. The data will be used to inform the development of effective Internet-based health education and HIV prevention programmes for Japanese MSM.

## Method

### Sampling

A Web site was created to host this Internet survey, and sampling was conducted continuously from 28 February to 16 May 2003. In order to attract potential research participants, unpaid and paid banners advertising the research project were posted on 57 gay related Web sites and announcements were published in gay magazines and Internet mailing lists.

To prevent duplicate responses, cookie data were collected to determine the first response from an individual Internet browser. To participate, a male must have had sexual experience(s) with other male(s), be currently residing in Japan, be able to read and write Japanese, and have access to the Internet. In addition, to confirm that the participant was a member of the target group, respondents were asked about the meaning of 2 slang words that are used by Japanese gay men. Individuals who could not answer the questions were deemed ineligible, based on the supposition that they were not MSM and their responses were not included in analysis.

Informed consent was requested from all participants on the first page of the questionnaire, and only those who consented were given access. The study protocol was approved by the Ethics Committee of Kyoto University Graduate School and Faculty of Medicine.

### Measures

The questionnaire was developed from the results of a previous study that focused on psychological and social problems among 388 Japanese MSM who participated in an online qualitative study [18]. The questionnaire was developed in collaboration with a clinical psychologist who had clinical experience with MSM and people living with HIV/AIDS. A pilot survey was conducted with 47 individuals recruited via the Internet to clarify the wording of the questionnaire. Questionnaire items included age; educational background; sexual orientation; existence of a casual male sex partner; HIV status; lifetime histories of hepatitis A, hepatitis B, and syphilis; and HIV

antibody test history in the previous year. The questionnaire also assessed depression using the Japanese version of the Self-rated Depression Scale [19] adapted from the original Zung measure [20]; scores above 50.0 have been shown to indicate high levels of depression in Japanese subjects [21] (Cronbach's  $\alpha=0.917$ ). Questions were also asked sexual behaviours in the previous 6 months including: unprotected anal intercourse (UAI), the number of male sexual partners, and the frequency of attending gay venues (gay bars) and sex clubs. HIV/STI knowledge was assessed using five true-or-false items: 'You can assess your HIV status 2 to 3 days after a high-risk event'; 'You are more likely to be infected with HIV if you have an STI'; 'You can contract an STI through oral sex'; 'You will not contract an STI through insertive anal sex'; and 'You will not contract HIV through insertive anal sex'. The participants were divided into two groups based on their responses: those who answered all five items correctly, and those who answered one or more question incorrectly.

Questions regarding substance use included lifetime use of the substances listed in Table 1. The reason for asking for lifetime substance use was based on the results of the study's pilot study in which many participants expressed hesitancy in reporting recent involvement in illegal substance use.

#### Statistical analysis

Bivariate and multiple logistic regression analyses were conducted to identify correlates of substance use. The subjects were divided into three groups according to their lifetime substance use history: those who never used any substance ("never-used" group), those who used only one type of substance ("lifetime reported single substance user" group), and those who used more than one type of

substance ("lifetime reported multiple substance user" group). The never-used group was compared to each substance user group using the chi-square test. Multiple logistic regression analysis was then used to evaluate the independent correlations of demographic, behavioural, and psychological variables with substance use in each substance user group, with the never-used group as the reference. Due to the cross-sectional design and the different time frames of questions regarding substance use and sexual behaviour, causal analysis cannot be made.

## Results

### Demographic characteristics

There were 2,195 respondents to the survey, and the data from 2,062 participants were used. Of the 133 respondents who were eliminated, 88 had incomplete questionnaires and 45 did not live in Japan. The average age of the participants was 29.0 years (range 14–76, SD = 8.0). Sixty percent had university degrees or higher. Regarding sexual orientation, 70.5% identified as gay, 20.8% as bisexual, and 8.7% as other. Of the participants, 73% resided in Tokyo, Osaka, or another urban area.

### Substance use

Of the participants, 65% had lifetime experience of substance use and 35% had never used (see Table 1). The most frequently used substances were amyl nitrite (63.2%), followed by 5-methoxy-N,N-diisopropyltryptamine (5MEO-DIPT) [22] (9.3%), known as "gomeo", marijuana (5.7%), and other substances (0.1–3.3%). Among lifetime reported single substance users, the vast majority (96.4%) reported using amyl nitrite. Most of the lifetime reported multiple substance users had used amyl nitrite (96.8%) and almost half had used 5MEO-DIPT. In addition, substance use involving marijuana (25.4%), magic mushrooms (16.8%), Viagra (15.1%), ecstasy

**Table 1: Substance use among Japanese MSM recruited through the Internet (N = 2,062).**

	Overall n = 2062	Lifetime reported single substance user n = 945	Lifetime reported multiple substance user n = 405
	%	%	%
Amyl nitrites (Poppers)	63.2	96.4	96.8
5-methoxy-N,N-diisopropyltryptamine (5MEO-DIPT)	9.3	0.2	46.9
Marijuana	5.7	1.6	25.4
Magic mushrooms	3.3	0.1	16.8
Viagra	3.1	0.3	15.1
Methylenedioxymethamphetamine (Ecstasy)	2.8	0.2	13.8
Methamphetamine	2.6	0	13.3
Psychotropic agents	2.6	0.6	11.9
Thinner	1.6	0.1	7.7
Crack or Cocaine	0.8	0	4.0
Lysergic acid diethylamide(LSD)	0.6	0	3.0
Heroin	0.2	0	1.5
Injectable steroids	0.1	0	0.7

(13.8%), and methamphetamine (13.3%) were reported. Of the lifetime reported multiple substance users, only 18 (4.4%) had ever injected substances and one of them was HIV-positive. Overall, 70% of both lifetime reported single and multiple substance users resided in Tokyo, Osaka, or other urban areas.

#### **Correlates of type of substance and sexual behaviour**

Bivariate analyses showed higher percentages of unprotected sexual activities among substance users, particularly among lifetime reported multiple substance users (See Table 2). Regarding sexual behaviour within the previous 6 months, 45% of lifetime reported multiple substance users reported a casual sex partner with another man (male sex friend), 49.6% had four or more sexual partners, 57.0% had unprotected anal intercourse (UAI), 64.2% visited a sex club, and 73.3% visited a gay venue. Lifetime reported multiple substance use was associated with a higher frequency of diagnosis with STIs: HIV 7.4%, syphilis 17.8%, hepatitis A 3.0%, and hepatitis B 10.9%. Older age, less education, HIV testing within the previous year, and higher HIV-related knowledge scores were also concentrated among lifetime reported single and multiple substance users, with a greater concentration among lifetime reported multiple substance users. Depression was associated with substance use only in lifetime reported multiple substance users.

Table 3 shows the results of the multivariate regression analysis conducted to identify independent correlates of substance use inputting all variables compulsorily, except for a history of diagnosis with syphilis or hepatitis which were closely correlated with HIV infection. The analysis revealed that UAI and visiting sex club/gay venues in the previous 6 months were significantly associated with the lifetime reported single and multiple substance user groups and the association was strongest with lifetime reported multiple substance use. The association of having six or more sex partners in the previous 6 months, educational background, and age group showed a consistent pattern across the substance user groups and peaked in the 30 to 39 year age group. Having had an HIV test within the previous year reached statistical significance in both lifetime reported single and multiple substance user groups. Lifetime reported multiple substance use was significantly correlated with having a casual male sex partner, depression, being HIV-positive, and HIV-related knowledge.

#### **Discussion**

As the first Internet survey conducted with a large sample of MSM in Japan, it is the first to reveal the profile of substance use and its relationship with sexual behavior among this population. Our results indicate that amyl nitrite was ever used by 63.2% of respondents, 5MEO-DIPT by 9.3% suggesting that amyl nitrite and 5MEO-

DIPT represent the substances most commonly used. Frequent use of 5MEO-DIPT has been also observed in other study conducted among Japanese MSM in 2003 where 18.8% of 576 gay night club clients reported lifetime use of 5MEO-DIPT [23]. Comparison with the results of a randomized nationwide general population survey on substance use, conducted in 2005 in Japan [24], suggests that substance use is relatively high among our respondents in that marijuana use is 4 times, Methylenedioxymethamphetamine use 28 times and methamphetamine use 8 times higher than the general population sample, though no comparable data has been available on amyl nitrite or 5MEO-DIPT. Regarding the substance use profile, it is important to note that the most common substances used were those that were not prohibited by law at the time of the survey, though both 5MEO-DIPT and amyl nitrite became prohibited substances in 2005 and 2006, respectively. Rates of use could be biased due to the underreporting of illegal substance use by respondents, though care was taken to ask lifetime use rather than current use. Thus, actual substance use rates among respondents could actually be higher than the situation revealed in our study. The results of the interviews conducted as a part of the pilot survey pointed to discourses by MSM that 5MEO-DIPT and amyl nitrite were as effective as other illegal substances in increasing sexual sensation and that these substances would be safe because the law would not allow the sale and use of unsafe substances. It is possible that the combination of a number of factors, including the efficacy of these substances, feeling of security in obeying the law and false perception of medical safety, lead to the use of 5MEO-DIPT and amyl nitrite in preference to illegal substances. If this is the case, it is possible that the substance use profile has changed substantially since the recent criminalisation of 5MEO-DIPT and amyl nitrite, and it is an imperative that follow up surveys be conducted to determine this.

#### **Type of substance use and sexual behaviour**

There is a body of research indicating the connection between amyl nitrite use and sexual behaviour, including high risk sexual behaviours such as UAI and multiple sexual partners [3,5,6,25]. Our results were consistent with previous studies, indicating that lifetime reported multiple substance users had a greater number of sex partners and engaged in unprotected sex more frequently, placing them at greater risk for HIV and STIs. In fact, among lifetime reported multiple substance users in this study, infection rates of 7.4% for HIV and 17.8% for syphilis were reported; this HIV prevalence is the highest among any MSM subpopulation ever surveyed to date in Japan. The sexual risks of lifetime reported single substance users were no less alarming, since nearly half had engaged in UAI during the previous 6 months and 2.3% reported infection with HIV and 8.0% with syphilis. Similar high

Table 2: Socio-demographics, risk characteristics, and sexually transmitted infections of Japanese MSM recruited through the Internet

	Overall n = 2062		Never users n = 712		Lifetime reported single substance user n = 945		Lifetime reported multiple substance user n = 405	
	%	n	%	n	%	n	%	n
Age group								
14-19	7.8	11.5	6.1	5.5	.000	.000		
20-29	51.4	52.0	53.2	48.3				
30-39	30.6	24.3	32.8	37.8				
40+	9.5	12.2	8	8.5				
Education level					.103	.002		
No University degree	40.2	36.5	40.5	45.9				
University degree	59.8	63.5	59.5	54.1				
Sexual orientation					.000	.002		
Gay	70.5	62.8	75.2	73.1				
Bisexual	20.8	25.7	18.2	18				
Other	8.7	11.5	6.6	8.9				
Currently have a casual sex partner					.000	.000		
No	70.0	78.7	69.9	54.8				
Yes	30.0	21.3	30.1	45.2				
Depression <sup>1</sup>					.638	.000		
Low	81.7	84.3	83.4	73.3				
High	18.3	15.7	16.6	26.7				
HIV status					.010	.000		
Negative	97.2	99.3	97.7	92.6				
Positive	2.8	0.7	2.3	7.4				
Syphilis					.000	.000		
No	92.3	98.5	92.0	82.2				
Yes	7.7	1.5	8.0	17.8				
Hepatitis A					1.00	.011		
No	98.7	99.2	99.2	97.0				
Yes	1.3	0.8	0.8	3.0				
Hepatitis B					.000	.000		
No	95.1	96.6	95.0	89.1				
Yes	4.9	1.4	5.0	10.9				
UAI in the previous 6 month					.000	.000		
No anal intercourse	56.6	18.8	7.1	4.7				
Protected	21.3	49.4	44.3	38.3				
Unprotected	22.1	31.7	48.6	57.0				
Number of sexual partners in the previous 6 months					.000	.000		
0	18.9	26.7	15.7	12.6				
1	23.0	30.1	20.1	17.3				
2-3	23.7	24.0	24.9	20.5				
4-5	14.7	9.8	17.6	16.5				
6+	19.7	9.4	21.8	33.1				
Sex club in the previous 6 months					.000	.000		
No	52.0	69.0	46.2	35.8				
Yes	48.0	31.0	53.8	64.2				
Gay venue in the previous 6 months					.000	.000		
No	39.6	54.1	34.2	26.7				
Yes	60.4	45.9	65.8	73.3				
Tested for HIV within the past year					.000	.000		
No	76.3	85.5	74.1	65.4				
Yes	23.7	14.5	25.9	34.6				
HIV/STI knowledge score					.000	.000		
0-4	53.7	61.8	51.6	44.2				
Full score	46.3	38.2	48.4	55.8				

1 Dichotomous categories based on Kawano, Suematsu & Shinzato (1990)

Table 3: Multivariate analysis of substance use of Japanese MSM recruited through the Internet.

	Lifetime reported single substance user (n = 945)			Lifetime reported multiple substance user (n = 405)		
	AOR	95% C.I.	P-value	AOR	95% C.I.	P-value
Age group						
14-19	1			1		
20-29	1.60	1.07-2.40	.023	1.53	0.85-2.77	.160
30-39	2.12	1.38-3.25	.001	2.62	1.41-4.86	.002
40+	1.02	0.62-1.67	.944	1.16	0.57-2.38	.679
Education level						
No University degree	1			1		
University degree	0.74	0.56-0.94	.012	0.66	0.48-0.89	.007
Sexual orientation						
Gay	1			1		
Bisexual	0.81	0.62-1.06	.120	1.00	0.68-1.46	.985
Other	0.62	0.42-0.92	.016	1.19	0.72-1.98	.502
Currently have a casual sex partner						
No	1			1		
Yes	1.24	0.96-1.60	.104	2.57	1.84-3.59	.000
Depression						
No	1			1		
Yes	1.12	0.84-1.50	.447	2.27	1.58-3.27	.000
HIV status						
Negative	1			1		
Positive	2.91	0.92-9.21	.070	7.78	2.33-25.93	.001
UAI in the previous 6 months						
No anal intercourse	1			1		
Protected	1.57	0.95-2.58	.078	1.20	0.56-2.56	.634
Unprotected	2.53	1.53-4.17	.000	2.42	1.14-5.16	.022
Number of sex partners in the previous 6 months						
0	1			1		
1	0.82	0.54-1.25	.360	1.08	0.59-1.98	.804
2-3	1.04	0.68-1.58	.864	1.06	0.59-1.92	.838
4-5	1.44	0.90-2.29	.127	1.22	0.65-2.30	.543
6+	1.67	1.05-2.67	.031	2.13	1.15-3.95	.016
Sex club in the previous 6 months						
No	1			1		
Yes	1.64	1.29-2.09	.000	2.00	1.44-2.80	.000
Gay venue in the previous 6 months						
No	1			1		
Yes	1.65	1.32-2.01	.000	2.56	1.78-3.39	.000
Tested for HIV within the past year						
No	1			1		
Yes	1.42	1.08-1.88	.013	1.78	1.25-2.54	.001
HIV/STI knowledge score						
0-4	1			1		
5 (full score)	1.22	0.98-1.52	.081	1.59	1.18-2.16	.003

OR, odds ratio; CI, confidence interval



rates of syphilis prevalence have also been reported in recent data of Japanese MSM who attended HIV/STIs-testing programmes for gay men in the Osaka area, where syphilis prevalence was found to be 14.7% in 2000, 15.9% in 2001 and 19.6% in 2002 [26], suggesting the possible emergence of a syphilis epidemic among these groups. Since syphilis increases susceptibility to HIV infection, syphilis prevention and treatment programmes for Japanese MSM should be prioritised. Furthermore, substance use needs to be factored into the development of HIV prevention education programmes for MSM in Japan.

In this study, there was a strong association between lifetime reported multiple substance use and depression, which may imply that participants with depressive symptoms might use substances to cope. However, the explanatory pathways remain unclear due to the cross-sectional survey design. Interventions for Japanese MSM could include the use of Internet technologies to provide referrals to specialists, such as clinical psychologists, psychiatrists, and substance treatment and mental health organizations, to address substance use and depression. There is also a need for education to increase knowledge about the needs and concerns of MSM among Japanese medical doctors, nurses, and other public health professionals because homosexuality and same-sex behaviour are poorly understood within Japan's health sector.

Our results suggest that the Internet is a potentially useful tool for promoting intervention measures for Japanese MSM, as reflected in the successful recruitment of large number of participants our Web site achieved within a short period. In addition to disseminating information to the public at large, the Internet could be used to provide personalized intervention or support for vulnerable and more marginalized populations at risk for HIV, and it is particularly relevant in cultures and settings in which MSM remain highly stigmatized and less visible, such as Japan.

#### Limitations

There are several limitations to our study. First, it is impossible to determine whether study participants represent the MSM population as a whole or only MSM using the Internet. We also recognize that there was a sampling bias in terms of the respondents' age and educational background. Second, no causal inference was possible because of the cross-sectional design of the study. Third, substance history referred to lifetime behaviour, whereas the time frame for sexual behaviour related questions was the previous six months. Caution should therefore be exercised in interpreting the observed association between substance use and sexual behaviour as the data does not suggest causal relationships, and it may well be that other, as yet unexamined, variable influence sexual risk behaviour

and multiple substance use. It is possible that some of the lifetime reported single or multiple substance users were no longer using during the preceding 6 months, which could have weakened the association between lifetime substance use and sexual behaviour. Finally, although the study was conducted through the Internet, there could still be underreporting of sensitive questions, such as HIV status or illicit-substance use.

Future research should specify the time frames for substance use, why and how substances are used by Japanese MSM. Indeed, it is a necessity to clarify the motivation, situational context, and psychological problems associated with substance use among Japanese MSM in order to develop effective education and prevention programmes.

#### Conclusion

This is the first academic study to use the Internet to examine the sexual and substance use behaviours of MSM in Asia. Our findings clearly indicate that substance use was widespread among respondents, as was unsafe sexual behaviours and HIV/STIs infection, especially among lifetime reported multiple substance users. These results indicate an urgent need to introduce effective community-based prevention measures for HIV and STIs among MSM in Japan. The present study also suggests that it may be possible to offer prevention programmes via the Internet.

#### Competing interests

The author(s) declare that they have no competing interests.

#### Authors' contributions

YH conceived this study and developed the overall procedure used in this project, including the questionnaire, sampling, and statistical analysis, and drafted the manuscript. JK, MU, TY and M O-K were responsible for the study design and creating the questionnaire.

SI, HK and MK were responsible for the data analysis and involved in writing and revising the manuscript. All of the authors participated in the study design, and read and approved the final manuscript.

#### Acknowledgements

We thank the respondents in this study. This research was supported by a Grant-in-Aid for HIV Prevention Research from the Ministry of Health, Labour and Welfare of Japan in 2002 and 2003.

#### References

1. AIDS surveillance committee MHLW: **Annual surveillance report of HIV/AIDS in Japan, 2004.** Ministry of Health, Labour and Welfare 2004.
2. Thiede H, Valleroy LA, MacKellar DA, Celentano DD, Ford WL, Hagan H, Koblin BA, LaLota M, McFarland W, Shehan DA, Torian LV: **Regional patterns and correlates of substance use among young men who have sex with men in 7 US urban areas.** *Am J Public Health* 2003, **93**(11):1915-1921.

3. Mattison AM, Ross MW, Wolfson T, Franklin D, San Diego HIV Neurobehavioral Research Center Group: **Circuit party attendance, club drug use, and unsafe sex in gay men.** *J Subst Abuse* 2001, **13(1-2)**:119-126.
4. Klitzman RL, Pope HGJ, Hudson JI: **MDMA ("Ecstasy") abuse and high-risk sexual behaviors among 169 gay and bisexual men.** *Am J Psychiatry* 2000, **157(7)**:1162-1164.
5. Fernandez MI, Perrino T, Collazo JB, Varga LM, Marsh D, Hernandez N, Rehbein A, Bowen GS: **Surfing new territory: club-drug use and risky sex among Hispanic men who have sex with men recruited on the Internet.** *J Urban Health* 2005, **82(1 Suppl 1)**:79-88.
6. Choi KH, Operario D, Gregorich SE, McFarland W, MacKellar D, Valieroy L: **Substance use, substance choice, and unprotected anal intercourse among young Asian American and Pacific Islander men who have sex with men.** *AIDS Educ Prev* 2005, **17(5)**:418-429.
7. Hirschfield S, Remien RH, Humberstone M, Walavalkar I, Chiasson MA: **Substance use and high-risk sex among men who have sex with men: a national online study in the USA.** *AIDS Care* 2004, **16(8)**:1036-1047.
8. Prestage G, Van de Ven P, Mao L, Grulich A, Kippax S, Kaldor J: **Contexts for last occasions of unprotected anal intercourse among HIV-negative gay men in Sydney: the health in men cohort.** *AIDS Care* 2005, **17(1)**:23-32.
9. Tamang A, Acharya LB, Pant SB, Basnyat A, Guruvachrya VL, Smills S, Neilsen G, Girault P: **Integrated bio-behavioural survey (IBBS) among men who have sex with men in Kathmandu valley.** In *CREPHA, FHI, BDS and SACTS report Nepal*; 2005.
10. CEMSHAD-DoH-USAIDS/FHI-Philippines: **Presentation on HIV/AIDS risks and vulnerabilities in 4 cities in the Philippines. Pap, Men at "Pamin".** *Dissemination forum and consultative workshop, May 27, Manila, Philippines* 2005.
11. Mansergh G, Colfax GN, Marks G, Rader M, Guzman R, Buchbinder S: **The Circuit Party Men's Health Survey: findings and implications for gay and bisexual men.** *Am J Public Health* 2001, **91(6)**:953-958.
12. Darrow WW, Biersteker S, Geiss T, Chevalier K, Clark J, Marrero Y, Mills V, Oblaja K: **Risky sexual behaviors associated with recreational drug use among men who have sex with men in an international resort area: challenges and opportunities.** *J Urban Health* 2005, **82(4)**:601-609.
13. Ministry of Internal Affairs and Communications: **Information and Communications in Japan, 2006.** *Ministry of Internal Affairs and Communications* 2006.
14. Ministry of Internal Affairs and Communications: **Information and Communications in Japan, 2004.** *Ministry of Internal Affairs and Communications* 2004.
15. Rhodes SD, Bowie DA, Hergenrather KC: **Collecting behavioural data using the world wide web: considerations for researchers.** *J Epidemiol Community Health* 2003, **57(1)**:68-73.
16. Bull SS, McFarlane M: **Soliciting sex on the Internet: what are the risks for sexually transmitted diseases and HIV?** *Sex Transm Dis* 2000, **27(9)**:545-550.
17. Hoppers HJ, Kok G, Harterink P, de Zwart O: **A new meeting place: chatting on the Internet, e-dating and sexual risk behaviour among Dutch men who have sex with men.** *AIDS* 2005, **19(10)**:1097-1101.
18. Hidaka Y, Ichikawa S, Koyano J, Urao M, Yasuo T, Kihara M: **Online qualitative research investigating sexual behaviors among Japanese Men who have Sex with Men.** *Presented at 130th Annual meeting of American Public Health Association* 2002.
19. Fukuda K, Kobayashi S: **The Japanese Version of SDS.** In *Sankyoubou Kyoto, Japan*, Sankyoubou; 1983.
20. Zung WW: **A Self-Rating Depression Scale.** *Arch Gen Psychiatry* 1965, **12**:63-70.
21. Kawano T, Suematsu H, Shinzato R: **Shinsin Igaku no tameno Shinri tesuto. Asakura-shoten. [in Japanese]** 1990.
22. **Schedules of controlled substances: placement of alpha-methyltryptamine and 5-methoxy-N,N-diisopropyltryptamine into schedule I of the Controlled Substances Act. Final rule.** *Fed Regist* 2004, **69(188)**:58050-58053.
23. Kimura H, Onitsuka T, Tsuji H, Okamoto G, Ichikawa S: **HIV prevention intervention in Osaka (in Japanese).** *Annual report of HIV prevention program for men who have sex with men in Japan* 2005:57-78.
24. Wada K: **Yakubutsu shiyounikansuru zenkoku jyunin chousa. Yakubutsu ranyou izon no jittaihaaku to ranyou izonyanitasuru taiou-sakuni kansurukenyu** 2006:17-91.
25. Buchbinder SP, Vittinghoff E, Heagerty PJ, Celum CL, Seage GR, Judson FN, McKirnan D, Mayer KH, Koblin BA: **Sexual risk, nitrite inhalant use, and lack of circumcision associated with HIV seroconversion in men who have sex with men in the United States.** *J Acquir Immune Defic Syndr* 2005, **39(1)**:82-89.
26. Ichikawa S: **Prevention Intervention of HIV infection among Men who have sex with men(MSM)- Project MASH Osaka.** In *The Journal of AIDS Research Volume 5. Tokyo*, The Japanese Society for AIDS Research; 2003:174-181.

### Pre-publication history

The pre-publication history for this paper can be accessed here:

<http://www.biomedcentral.com/1471-2458/6/239/prepub>

Publish with **BioMed Central** and every scientist can read your work free of charge

\*BioMed Central will be the most significant development for disseminating the results of biomedical research in our lifetime.\*

Sir Paul Nurse, Cancer Research UK

Your research papers will be:

- available free of charge to the entire biomedical community
- peer reviewed and published immediately upon acceptance
- cited in PubMed and archived on PubMed Central
- yours — you keep the copyright

Submit your manuscript here:  
[http://www.biomedcentral.com/info/publishing\\_adv.asp](http://www.biomedcentral.com/info/publishing_adv.asp)



# High Prevalence of HIV Infection Associated With Incarceration Among Community-Based Injecting Drug Users in Tehran, Iran

Saman Zamani, MD, PhD,\* Masahiro Kihara, MD, PhD,\* Mohammad M. Gouya, MD, MPH,†  
 Mohsen Vazirian, MD,‡§ Bijan Nassirimanesh, MD,¶ Masako Ono-Kihara, PhD,\*  
 Shahrzad Mortazavi Ravari, DDS,\* Afshin Safaie, DMSc,† and Seiichi Ichikawa, PhD||

**Objectives:** To determine the prevalence and correlates of HIV-1 infection among community-based injecting drug users (IDUs) in Tehran, Iran.

**Methods:** In October 2004, 213 IDUs were recruited from a drop-in center and its neighboring parks and streets in Tehran. Participants were interviewed using a structured questionnaire regarding their sociodemographics and HIV risk characteristics, and specimens of oral mucosal swab were collected and tested for HIV-1 antibodies. Data were analyzed using  $\chi^2$  and multiple logistic regression to estimate odds ratios (OR) and 95% confidence intervals (CI).

**Results:** The prevalence of HIV-1 infection was 23.2% (48 of 207) among male injecting drug users. In the multivariable analysis, a history of shared drug injection inside prison (OR, 2.45; 95% CI, 1.01–5.97) and that of multiple incarcerations (OR, 3.13; 95% CI, 1.08–9.09) were associated with significantly higher prevalence of HIV-1 infection.

**Conclusions:** The prevalence of HIV-1 infection has reached an alarming level among IDUs in Tehran, with incarceration-related exposures revealed to be the main correlates of HIV-1 infection. Urgent and comprehensive harm reduction programs for drug users in prison and those in the community in Tehran are of prime importance to prevent further transmission of HIV infection.

**Key Words:** HIV, injecting drug user, prison, MSM, Iran

(*J Acquir Immune Defic Syndr* 2006;42:342–346)

The intertwined epidemics of HIV/AIDS and injecting drug use are among the most vexing public health problems in Iran. To date, about 12,000 people have been identified as

having HIV or AIDS in Iran, with more than half of this figure being detected within the past 2 years.<sup>1</sup> The dominant mode of HIV transmission is still through injection drug use,<sup>2</sup> and this accounts for about 86% of reported cases with known transmission routes.<sup>1</sup> While the population of injecting drug users (IDUs) has been growing in Iran,<sup>3</sup> recent figures indicate that the prevalence of HIV-1 infection has reached 15% among IDUs visiting treatment centers in the capital, Tehran.<sup>4</sup> The epidemic of HIV/AIDS among IDUs in Iran should also be considered in a broader and regional context in central Asia, where many countries such as neighboring Armenia reportedly have a high prevalence of HIV among its IDUs.<sup>5</sup>

In response to the growing epidemic of HIV/AIDS among IDUs, Iranian authorities have taken several positive steps. Upon adoption of a harm reduction policy for drug use in 2002, programs to provide substitute therapies and needle/syringe exchanges have been established in many provinces.<sup>6,7</sup> Although the level of coverage of these programs for drug users has not yet been evaluated, there is evidence showing that a rapid scale up in the availability of preventive programs inside prisons and in the outside community has occurred.<sup>6–8</sup> The number of centers providing substitute therapies and/or sterile needles/syringes in Iran has now increased to more than 30 centers since the establishment of the first one in 2002 (unpublished data from the Ministry of Health in Iran).

Despite the rapid increase in community-based programs for IDUs in Iran, there is little research-based evidence on the prevalence of HIV infection and risk behaviors among this population. This study was conducted as a part of the HIV/AIDS Prevention Study among Drug Users in Iran (HADI project—phase 2) aiming to determine the prevalence of HIV-1 infection and its correlates among a group of community-based IDUs in Tehran.

## METHODS

The survey was conducted in the Shoosh area in south-central Tehran, a relatively poor area where there is a high concentration of migrants and drug users.<sup>9</sup> Because of the increasing number of drug users, authorities were urged to set up the first outreach program for drug users in this area of Tehran. The outreach program that was designed by the Ministry of Health and initially funded by the United Nations Office on Drug and Crime has been run by a nongovernmental organization (NGO) called the Persepolis Society since October 2003. The NGO has been providing drug users

Received for publication November 26, 2005; accepted February 8, 2006.

From the \*Department of Global Health and Socio-epidemiology, Kyoto University School of Public Health, Kyoto, Japan; †Center for Disease Management and ‡Bureau for Psychosocial and School Health, Ministry of Health and Medical Education, Tehran, Iran; §Iranian National Center for Addiction Studies (INCAS), Tehran, Iran; ¶Persepolis Society, Tehran, Iran; ||Laboratory for Infection Control and Prevention, School of Nursing, Nagoya City University, Nagoya, Japan.

Supported by the Department of Global Health and Socio-epidemiology in Kyoto University of Japan and by a grant from the Ministry of Health and Medical Education of Iran.

Reprints: Dr Saman Zamani, Department of Global Health and Socio-epidemiology, Kyoto University School of Public Health, Yoshida-Konoe-cho, Sakyo-ku, Kyoto 606-8501, Japan (e-mail: szamani@pbh.med.kyoto-u.ac.jp).

Copyright © 2006 by Lippincott Williams & Wilkins

with a range of services including a needle/syringe program through its drop-in center and mobile services in the area.<sup>7,10</sup>

In October 2004, a consecutive sample of drug users was recruited at the drop-in center and at parks and streets in the area. Active drug users were approached by an ex-user NGO staff member for recruitment and were then interviewed by a male researcher. After obtaining informed consent, each respondent was interviewed using a structured questionnaire that included 60 questions about sociodemographic characteristics, drug use characteristics, history of incarceration, and sexual behavior. The questionnaire was developed based on the findings of our previous qualitative and quantitative studies; and participants were accordingly asked if they ever used a shared needle or syringe for drug injection (receptive sharing of needle or syringe), if they were ever incarcerated (being kept in prison) in their lifetime, and if they ever used a shared injection device (needle, syringe, or handmade injection device) while incarcerated. All interviews were conducted in the Persian language.

On completion of the interview, the trained interviewer took an oral mucosal transudate sample from consenting participants. Oral samples were obtained using the OraSure oral fluid specimen collection device (OraSure Technologies, Inc, Beaverton, Ore) and were shipped in batches to Japan for testing. All samples were tested twice for HIV-1 with enzyme-linked immunosorbent assay (Oral Fluid Vironostika HIV-1 Microelisa System; BioMérieux Inc, Durham, NC), and repeatedly reactive enzyme-linked immunosorbent assay samples were confirmed using a Western blot test (OraSure HIV-1 Western Blot Kit; OraSure Technologies, Inc, Bethlehem, Pa).<sup>11</sup>

The research protocol was approved by the Ethical Committee of the Iranian National Center for Addiction Studies at Tehran University of Medical Sciences in Iran and by the Committee for Research on Human Subjects at Kyoto University in Japan. Informed consent was obtained separately for the interview and HIV testing, and no personal identifiers were recorded on the questionnaires. After being interviewed, participants were recommended to undertake free serum HIV testing, available at the drop-in center, to obtain a confirmatory clinical diagnosis.

Statistical analysis was performed using SPSS for Windows (version 12.01; SPSS Inc, Chicago, Ill).  $\chi^2$  or Fisher exact tests were performed to determine bivariate associations between HIV-1 status and categorical variables. Variables were entered into a multivariable model if their association with HIV-1 infection by bivariate analyses had a *P* value  $\leq 0.10$  or if they were considered epidemiologically important. Multivariable logistic regression analysis was used to examine the associations of independent variables with the outcome, simultaneously adjusting for potential confounders, and to estimate adjusted odds ratios (OR) and 95% confidence intervals (CI).

## RESULTS

Of the 302 drug users who were invited to participate in the study, 2 men refused to be interviewed (response rate 99.3%) and 2 incomplete questionnaires were later excluded. All participants gave specimens for oral HIV testing.

Of the respondents, 213 (207 male and 6 female) reported ever injecting illicit drugs in their lifetime and were thus defined in this study as IDU. Among 207 male IDUs, 48 were confirmed to be positive for HIV-1 antibodies using the Western blot test, giving an HIV-1 prevalence of 23.2%. Among 6 female IDUs, 2 were found to be HIV-positive; both had experienced multiple incarcerations and had used drugs inside prison. Having recruited too few female IDUs for adequate statistical analysis, only the data relating to male IDUs are presented in this article.

### Sociodemographic Characteristics

The median age of male IDUs was 32.0 and 74% were recruited from the drop-in center, with others recruited from the center's neighboring parks and streets. IDUs had diverse ethnicities composed of 60% Fars, 27% Azerbaijani, and 13% other ethnicities including Kurd, Lur, Arab, and Afghan. Whereas 14% had never attended school, 25% of IDUs had reached high school or college level. About 57% of male IDUs had ever been married, of which only 37% were living with their spouse. At the time of interview, 66% were jobless and one third had no place other than parks, streets, or abandoned buildings to live (Table 1). None of the

**TABLE 1.** Sociodemographic Characteristics of Male Injecting Drug Users Recruited From a Drop-in Center and its Neighboring Area in Tehran in 2004 (n = 207)

Characteristics	n (%)
Recruitment site	
Drop-in center	153 (73.9)
Park/street	54 (26.1)
Age at interview (years)	
<30	75 (36.2)
30-39	82 (39.6)
$\geq 40$	50 (24.2)
Ethnicity	
Fars	124 (59.9)
Azerbaijani	56 (27.1)
Others	27 (13.0)
Education	
Primary school or less	77 (37.2)
Junior high school	78 (37.7)
High school or more	52 (25.1)
Marital status	
Never married	90 (43.5)
Married (not living with spouse)	74 (35.7)
Married (living with spouse)	43 (20.8)
Place of residence	
Residential place	139 (67.5)
Park/street/abandoned building	67 (32.5)
Migrated to Tehran	
No (originally from Tehran)	135 (65.9)
Yes (<5 years ago)	21 (10.2)
Yes ( $\geq 5$ years ago)	49 (23.9)
Job situation	
Have a job	71 (34.3)
Jobless	136 (65.7)