

TABLE 4. Sex Under Influence of Substance Use

	Tourist ( <i>n</i> = 104) %	Student ( <i>n</i> = 89) %	Temporary Worker ( <i>n</i> = 43) %	Total ( <i>n</i> = 236) %	$\chi^2$
During Lifetime					
Ever had sex under the influence of					
Alcohol	82.7	77.5	81.4	80.5	ns
Drugs	12.5	21.3	39.5	20.8	13.55**
In the past 12 months					
Had sex with steady partner under an influence of	( <i>n</i> = 80) %	( <i>n</i> = 72) %	( <i>n</i> = 36) %	( <i>n</i> = 188) %	
Alcohol	67.5	68.1	77.8	69.7	ns
Drugs	5.0	9.7	41.7	13.8	29.66**
In Hawaii					
Had sex with casual partner under an influence of	( <i>n</i> = 4) %	( <i>n</i> = 24) %	( <i>n</i> = 16) %	( <i>n</i> = 44) %	
Alcohol	100.0	75.0	100.0	86.4	ns
Drugs	( <i>n</i> = 4) 0	( <i>n</i> = 23) 26.1	( <i>n</i> = 16) 62.5	( <i>n</i> = 43) 37.2	7.97*
In Japan					
Had sex with casual partner under an influence of	( <i>n</i> = 26) %	( <i>n</i> = 16) %	( <i>n</i> = 10) %	( <i>n</i> = 52) %	
Alcohol	92.3	81.3	90.0	88.5	ns
Drugs	11.5	12.5	60.0	21.2	11.21**

Note. ns = not significant. \* $p \leq .05$ , \*\* $p \leq .01$ .

Overall, 56%, 26%, and 19% of the participants tried their first illicit drug in Japan, Hawaii, and other foreign countries, respectively. Students (40%) were significantly more likely to have experimented with a first illicit drug in Hawaii compared with the tourists (4%) and temporary workers (29%), whereas 88% of the tourists reported their first use in Japan ( $p < .01$ ). In the past 6 months, marijuana was the most commonly used drug (57% of the 82 drug users), followed by ecstasy (12%) and cocaine (7%). Eleven tourists reported using marijuana in the past 6 months (78% of these used in Japan and 33% in Hawaii), 15 students reported this behavior (13% of these used in Japan and 100% in Hawaii), and 21 temporary workers reported this behavior (14% of these in Japan and 91% in Hawaii). As expected, during the past 6 months, more students and temporary workers had used marijuana in Hawaii, and more tourists had used marijuana in Japan.

#### SEX UNDER INFLUENCES OF ALCOHOL AND DRUGS

Engaging in sex under the influence of substances was common among the study participants (Table 4). In lifetime, 81% and 21% of the participants had engaged in sex under the influence of alcohol and drugs, respectively. Overall, engaging in sex under the influence of alcohol was commonly reported in all subgroups (no significant group difference). However, a higher proportion of the temporary workers (40%) reported having engaged in sex under the influence of drugs than the other groups ( $p < .01$ ). Similarly, in the past 12 months, a higher proportion of the temporary workers (42%) reported this behavior with steady partners than the students (10%) or tourists (5%) ( $p < .01$ ).

TABLE 5. Multiple Regression Analysis on Sexual Risk Behaviors with Steady Partner in the Past 12 Months

Variables	Beta	t
Frequency of condom use for vaginal sex	$R^2 = .35, F(7, 162) = 12.6, p = .000$	
Tourists <sup>a</sup>	-.05	-.42
Students <sup>b</sup>	.24	2.53*
Age	-.01	-.13
Gender <sup>c</sup>	-.15	-2.24*
Level of education	.05	.71
Attitude toward drug use	.03	.42
HIV knowledge	-.12	-1.62
Attitude toward condom use with casual partners	-.01	-.12
Attitude toward condom use in general	.55	6.46**
Adaptation to American life	.04	.41
Frequency of sex under the influence of drugs	$R^2 = .36, F(7, 172) = 14.5, p = .000$	
Tourists <sup>a</sup>	-.17	-1.51
Students <sup>b</sup>	-.11	-1.26
Age	.02	.29
Gender <sup>c</sup>	.11	1.68
Level of Education	.10	1.42
Attitude toward drug use	.37	4.97**
HIV knowledge	.13	1.92
Attitude toward condom use w/ casual partners	-.17	-2.27*
Attitude toward condom use in general	-.22	-2.65**
Adaptation to American life	-.00	-.01

Note. <sup>a</sup>Temporary Workers (0), Tourists (1); <sup>b</sup>Temporary Workers (0), Students (1); <sup>c</sup>Male (1), Female (2). \* $p < 0.05$ , \*\* $p < 0.01$ .

Overall, 89% and 86% of the participants had engaged in casual sex under the influence of alcohol in the past 12 months in Japan and in Hawaii, respectively (no significant group difference). However, there were significant group differences in having had casual sex under the influence of illicit drugs. Among the participants who had had sex with casual partners in Japan during the past 12 months, a higher proportion of temporary workers (60%) had engaged in casual sex under the influence of drugs than the students (13%) and tourists (12%),  $\chi^2(2, N = 52) = 11.2, p < .01$ . Similarly, among those who had had sex with casual partners in Hawaii in the past 12 months, a higher proportion of temporary workers (63%) had had sex with casual partners under the influence of drugs than the students (26%) or tourists (0%),  $\chi^2(2, N = 43) = 7.97, p < .05$ .

#### PSYCHOSOCIAL MEASURES

The study investigated five psychosocial measures: AIDS knowledge, positive attitudes toward condom use in general, positive attitudes toward condom use with casual partners, positive attitudes toward drug use, and adaptation to American life. There were significant group differences on these measures. Tourists ( $M = 3.7$ ) had lower levels of AIDS knowledge than students ( $M = 3.9$ ) and temporary workers ( $M = 4.1$ ),  $F(2, 246) = 7.12, p < .01$ . Students ( $M = 3.7$  on condom use in general,  $M = 3.1$  on condom use with casual partners) and tourists ( $M = 3.6$  for general,  $M = 2.8$  for casual) had more positive attitudes toward condom use than temporary workers ( $M = 3.4$  for



general,  $M = 2.7$  for casual): condom use in general,  $F(2, 244) = 3.4, p < .05$ ; condom use with casual partners,  $F(2, 241) = 6.8, p < .01$ . Temporary workers ( $M = 2.9$ ) had stronger positive attitudes toward drug use than students ( $M = 2.4$ ) and tourists ( $M = 2.1$ ),  $F(2, 246) = 11.0, p < .01$ . As expected, temporary workers ( $M = 3.3$ ) and students ( $M = 3.0$ ) had higher scores on the scale of the adaptation to American life than the tourists ( $M = 1.7$ ),  $F(2, 246) = 109.5, p < .01$ .

The psychosocial measures were significantly inter-correlated. Those who had higher HIV knowledge were more likely to have positive attitudes toward condom use in general,  $r(245) = .29, p < .01$ , and toward condom use with casual partners,  $r(242) = .24, p < .01$ . The participants who had positive attitudes toward drug use were less likely to have positive attitudes toward condom use in general,  $r(245) = -.33, p < .01$ , and toward condom use with casual partners,  $r(242) = -.20, p < .01$ . There was no significant correlation between the adaptation to American life and any other measures.

Regression analyses were conducted on sexual risk behaviors, controlling for participant groups, age, level of education, and gender (Table 5). The frequency of condom use for vaginal sex with a steady partner in the past 12 months was significantly and positively correlated with student status compared with temporary workers, males compared with females, and positive attitudes toward condom use in general. The frequency of sex with a steady partner under the influence of drugs in the past 12 months was significantly and positively correlated with attitudes toward drug use, and negatively correlated with attitudes toward condom use in general and with casual partners.

## DISCUSSION

Japan is still one of the low HIV seroprevalence countries, whereas HIV/AIDS has become a major social problem in neighboring Southeast Asian countries (Kihara, 2002; Nemoto, 2004). Because a large number of Japanese youths and young adults travel abroad and many of them engage in sex with other Japanese tourists, local people, and sex workers, these transient Japanese may be infected with HIV while they are traveling or temporarily staying in foreign countries where HIV seroprevalence is high. These transient Japanese may also transfer HIV/STDs to others when they return to Japan. Therefore, it is very important to understand their HIV-related risk behaviors in Japan in comparison with those while they visit or temporarily stay in foreign countries. However, there are very few studies investigating HIV-related risk behaviors among transient people or travelers, including Japanese.

There are a number of interesting findings from in this study which would provide implications for future HIV prevention intervention programs targeting Japanese tourists, students, and temporary workers. First, only 12% have been tested for HIV. Second, overall, more than one third of the participants had had casual sex in the past 12 months; however, there were gender and group differences, as well as countries where they engaged in casual sex (e.g., tourists who reported casual sex in Hawaii were all females). Third, more than one third of male participants reported having had sex with female sex workers in their lifetime, and 40% of them had ever had sex with sex workers without using a condom. Fourth, overall, 81% and 21% of the participants reported having ever had sex under the influence of alcohol and drugs, respectively. Fifth, the study participants who had positive attitudes toward condom use in general had used a condom with steady partners for vaginal sex more frequently. Finally, the study participants who had favorable attitudes toward drug use and were



males or temporary workers had engaged in sex with steady partners under the influence of illicit drugs more frequently.

The study findings should not be extrapolated to the general populations in Japan or Japanese who visit or stay in Hawaii because of the snowball and convenient sampling methods and the voluntarily nature of participation in the study. Moreover, owing to a small sample size of male participants who have engaged in sex with sex workers in the past 12 months, the study encountered limitations to further investigate their HIV-related risk behaviors with sex workers, such as sexual behaviors under the influence of substances and risky sexual behaviors by location (Hawaii and Japan) and group (temporary workers, students, and tourists).

Nevertheless, the study revealed that the Japanese tourists, students, and temporary workers sampled in Honolulu had engaged in HIV-related risk behaviors both in Japan and Hawaii (e.g., inconsistent condom use with steady as well as casual partners, and having had sex under the influence of alcohol or drugs). Although we found gender and group differences in terms of engaging in casual sex in Hawaii and Japan, the study participants did not differentiate their safer sex practices (e.g., consistent condom use) with steady partners from casual partners, which occurred either in Japan or Hawaii. These results may indicate that the participants perceive little risk in engaging in casual sex in both countries, in general. However, the male participants seemed to perceive higher risk and used a condom more often when they had sex with sex workers compared with having sex with steady or casual partners. In addition, the attitudinal factors toward drug and condom use had influenced the participants' safer sex practices. These results may suggest that if we provide them with the accurate information regarding HIV-related risk and increase their attitudes toward practicing safer sex and drug use, they are more likely to practice safer sex. The study also delineated a high-risk group: temporary workers, for a focal point of future intervention.

Although the reported annual HIV incidences in Japan have been relatively stable in recent years (about 600 incidences a year), HIV as well as sexually transmitted infections (STIs) could spread among sexually active youths and young adults because of the unique social and cultural factors in Japanese society, such as low social awareness regarding HIV/AIDS, negative attitudes toward HIV/AIDS education in Japanese school systems, abundant and uncontrolled information in public to facilitate commercial and casual sex (e.g., internet dating services), and low HIV testing rates in the general population (cf, Kihara, 2002; Nemoto, 2004). Based on a public health perspective, it would be worthwhile to warn Japanese society about HIV/AIDS in terms of predicting its detrimental effects on the society, health and psychological impact on people with HIV/AIDS, as well as economic impact, such as loss of workforce and increase in health care costs. However, warnings about the future impact of HIV/AIDS in general may not be effective to change people's sexual behaviors and attitudes toward practicing safer sex and drug use, as well as to redirect public policy regarding HIV/AIDS care and prevention. Instead of providing general information about risk for HIV, future intervention programs could be effective if we target specific risk groups and provide them with the accurate risk assessment and culturally appropriate intervention tools specific to the groups (e.g., counseling, workshops, and support groups).

Among the AIDS cases in Japan, the estimated 23% of heterosexual male and 14% of female cases were infected in foreign countries (Ministry of Health, Labor, and Social Welfare, 2005). HIV infection in Asian countries among Japanese tourists



or businessmen could be a vector for spreading HIV to Japanese society, first to high-risk populations and then to the general population (Kihara et al., 2003). Nemoto and his colleagues (2002) investigated HIV risk behaviors among Japanese tourists who were temporarily staying in Bangkok, Thailand. Similar to our current study, young Japanese tourists in Bangkok reported using illicit drugs both in Japan and Thailand and having engaged in unprotected sex with steady and casual partners and in sex under the influence of alcohol and drugs. Nemoto's previous study in Thailand and our current study revealed that about 35% of the participants in both studies had had sex with casual partners in the past 12 months. However, consistent condom use for vaginal sex with casual partners differed in these studies. One third and 44% of the Japanese samples in the Thai study reported always using a condom with casual partners in Japan and in Thailand, respectively, whereas Japanese samples of the current study reported always using a condom with casual partners in Japan (22%) and in Hawaii (28%). It seems that more Japanese tourists in Thailand had engaged in safer sex in Thailand than in Japan, whereas about a quarter of the Japanese who were visiting Hawaii had not engaged in safe sex in both countries. These results seem to further confirm that the Japanese tourists had practiced safer sex according to their perception of risk for HIV/STIs; that is, Japanese perceive that the risk in Hawaii and Japan is similarly low but as being much higher in Thailand.

In addition to inconsistent condom use with casual partners, the study participants had engaged in sex under the influence of alcohol and drugs. Most of the participants (86%) reported having had sex with casual partners under the influence of alcohol both in Japan and Hawaii. Similarly, about 80% of Japanese visiting Thailand reported having had casual sex under the influence of alcohol both in Japan and Thailand (Nemoto et al., 2002). In Japanese society, which accepts or even encourages social drinking, Japanese youths and adults often engage in casual sex under the influence of alcohol. Education programs teaching cognitive impairment and elevated risks for HIV/STIs and victims of violence after alcohol use should be implemented, particularly for Japanese youths who are sexually active.

The prevalence of any lifetime illicit drug use among the study participants (35%) was much lower than that in Nemoto's previous study among Japanese tourists in Thailand (62%). This is mainly because of the sampling areas; that is, the samples of the Thai study were recruited from the Khaosan Road Area in Bangkok where drug use is more prevalent and accessible than the sampling areas in Hawaii. The participants in our current study were recruited at the targeted community venues for Japanese students, tourists, and temporary workers in Honolulu. Although the prevalence of drug use among the current samples was low, the participants reported similar patterns of drug use; that is, almost all drug users had used marijuana, and many used LSD and ecstasy. The types of drugs used were similar to those observed among Japanese tourists in Thailand (Nemoto et al., 2002).

As Japanese tourists in Thailand used illicit drugs in Japan, Thailand, and other Asian countries, Japanese participants in our current study used drugs both in Japan and Hawaii. About two thirds of the study participants reported their first illicit drug use in Japan. There is a widespread belief that drug use is still not a social problem in Japan because of the strict criminal law against illicit drug use, possession, and trafficking in Japan, as well as strong social sanctions against drug users and their family members. For example, a national survey among junior high school students in Japan



revealed that only 0.4% had ever used marijuana, 0.4% used amphetamines, and 1.3% used solvents (Wada, 2000). However, our current study revealed that many Japanese tourists visiting Hawaii had used marijuana both in Japan and Hawaii, and that Japanese staying for relatively longer period of time in Hawaii (students and temporary workers) had used marijuana in Hawaii more than in Japan.

First of all, Japanese policy makers must acknowledge the prevalence of drug use among Japanese youths who travel abroad, particularly countries where drugs are accessible and commonly consumed. The substance abuse prevention programs targeting youths must be implemented at high school, universities, and community centers based on culturally appropriate prevention models. The current media campaign in Japan, stressing only negative consequences of drug use or encouraging a simple reaction to peer pressure by just saying no would not be effective for those Japanese who are already using or experimenting with drugs.

In combination with substance use, the study participants reported having had sex under the influence of alcohol and drugs both in Japan and Hawaii. Compared with the students and tourists, more than one third of temporary workers had ever engaged in sex under the influence of drugs and in casual sex under the influence of drugs in Hawaii during the past 12 months. A similar proportion of the Japanese tourists in Thailand (38%) reported having had sex with casual partners in Thailand under the influence of drugs (Nemoto et al., 2002). In addition, almost all Japanese samples of Nemoto's both studies had also reported sex under the influence of alcohol. It is not surprising that the cognitive impairment by drug or alcohol use and a combination of these substances would have significant effects on practicing safer sex and judgment in general, particularly among inexperienced Japanese youths. Multivariate analysis revealed that positive attitudes toward drugs and negative attitudes toward condom use were significant predictors for engaging in sex under the influence of drugs. Thus, previously mentioned drug prevention programs should be integrated with HIV prevention programs, which address attitudes toward drug and condom use, specific to Japanese youths who travel abroad.

Currently Japan is facing a number of social problems, which include HIV/AIDS and substance abuse. In comparison to other Asian countries as well as industrialized and economically developed countries, HIV/AIDS and substance abuse are still perceived as being "under control" by many Japanese policy makers, educators, and health professionals. The findings of our current study, which further concur with those in Nemoto's previous study (2002), provide a number of implications for future substance abuse and HIV/STI prevention programs for Japanese youths and adults. Developing these prevention programs will never be late. Considering the current study's findings that certain groups of Japanese and individuals with positive attitudes toward practicing safer sex tend to engage in protective behaviors, we may be able to significantly reduce the further spread of HIV/STIs and illicit drug use if the prevention efforts are developed at all levels of society in Japan, including policy makers, school teachers and principals; high school and university students; employed or unemployed youths and adults; parents; health and social service providers; and most of all, those at the highest risk, but neglected and stigmatized, populations, such as drug users, sex workers, gay men and women, and transgender individuals.

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Research article

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## Sexual behavior and awareness of Chinese university students in transition with implied risk of sexually transmitted diseases and HIV infection: A cross-sectional study

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### Abstract

**Background:** The vulnerability of young people to HIV and the recent emergence of the HIV epidemic in China have made it urgent to assess and update the HIV/STD risk profile of Chinese young people.

**Methods:** A self-administered questionnaire survey with cross-sectional design was conducted among 22,493 undergraduate students in two universities in Ningbo, China. Bivariate trend analysis and multiple logistic regression analysis were used to compare sexual behaviors and awareness between grades.

**Results:** Of respondents, 17.6% of males and 8.6% of females reported being sexually active. Condom was reported never/rarely used by 35% of sexually active students in both genders in the previous year. Pregnancy and induced abortion had each been experienced by about 10% of sexually active female students and the female partners of male students, and about 1.5% of sexually active students of both genders reported being diagnosed with an STD. Multivariate analysis revealed that students in lower grades, compared to those in higher grades, were more likely to have become sexually active before university, to have become aware of sex before high school, and to have been exposed to pornographic media before the age of 17 years, and for sexually active respondents of both genders, to have engaged in sex without using a condom.

**Conclusion:** Sexual behaviors of Chinese university students are poorly protected and sexual behaviors and awareness may have been undergoing rapid change, becoming active earlier and more risky. If this trend continues, vulnerable sexual network will grow among them that allow more expansion of sexually transmitted diseases and HIV.



## 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 (%)						
	Grade I	Grade II	Grade III	Grade IV	Total	P value*	Grade I	Grade II	Grade III	Grade IV	Total	P value*	
<b>Sexual experience†</b>													
Yes	11.7	16.7	23.8	22.6	17.6	<0.001	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	<0.001	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	0.002	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	0.001	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	<0.001	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	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	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
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
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
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 (%)						
	Grade I (n = 3728)	Grade II (n = 3308)	Grade III (n = 2949)	Grade IV (n = 1270)	Total (n = 11255)	P value*	Grade I (n = 3708)	Grade II (n = 3375)	Grade III (n = 2869)	Grade IV (n = 1286)	Total (n = 11238)	P value*
<b>Period became aware of sex</b>												
Before high school	65.6	59.0	52.8	52.5	58.8	<0.001	42.3	32.3	30.0	26.7	34.4	<0.001
High school	32.6	36.6	39.3	37.2	36.1		51.9	52.3	45.1	41.4	49.1	
University	1.3	3.8	7.4	9.8	4.6		5.5	15.1	24.7	31.4	16.2	
Missing	0.4	0.7	0.4	0.6	0.5		0.3	0.3	0.2	0.5	0.3	
<b>First exposure to pornographic media†</b>												
Early (≤ 16 year-old)	44.4	31.8	29.8	28.5	35.1	<0.001	10.0	6.8	5.6	3.4	7.2	<0.001
Late (≥ 17 year-old)	27.3	40.4	46.2	52.3	38.9		7.6	13.4	19.9	22.3	14.2	
Never	19.1	11.2	8.4	8.3	12.8		80.4	77.5	71.0	70.9	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	
<b>First exposure to pornographic website</b>												
Early (≤ 16 year-old)	13.7	7.0	3.2	1.8	7.6	<0.001	0.9	0.5	0.1	0.2	0.5	<0.001
Late (≥ 17 year-old)	42.5	55.0	67.1	75.4	56.3		5.0	8.2	15.4	15.9	9.8	
Never	35.7	22.3	14.9	11.5	23.6		93.3	90.1	81.9	81.3	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	
<b>Meet a girlfriend friend over the Internet</b>												
Yes	51.3	49.4	52.2	52.2	51.1	0.31	42.9	40.6	47.1	47.0	43.8	<0.001
No	48.4	50.3	47.5	47.6	48.6		56.9	59.3	52.9	52.9	56.1	
Missing	0.3	0.3	0.3	0.2	0.3		0.1	0.1	0.1	0.1	0.1	
<b>Approve of sex during high school</b>												
Disapprove	61.1	60.9	61.5	71.1	62.3	<0.001	84.0	87.3	86.8	88.5	86.2	<0.001
Approve/Don't know	37.2	35.4	35.6	27.6	35.2		15.4	12.0	12.3	10.3	13.0	
Missing	1.7	3.7	2.9	1.3	2.6		0.6	0.7	0.9	1.2	0.8	
<b>Approve of sex before marriage</b>												
Disapprove	14.1	12.0	9.4	12.4	12.1	<0.001	36.4	29.7	26.7	26.2	30.8	<0.001
Approve/Don't know	83.4	83.5	86.6	85.8	84.5		62.6	69.0	71.9	72.2	68.0	
Missing	2.5	4.5	4.0	1.7	3.4		1.0	1.3	1.3	1.6	1.2	
<b>Approve of commercial sex</b>												
Disapprove	69.9	68.4	63.4	65.3	67.3	<0.001	86.5	85.4	83.2	83.1	84.9	<0.001
Approve/Don't know	28.1	27.8	33.4	32.9	29.9		12.9	13.9	15.8	15.6	14.2	
Missing	2.0	3.8	3.2	1.8	2.8		0.7	0.7	1.0	1.2	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 sub-population 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 suggest 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 trends 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.

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Research article

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**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>

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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