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ORIGINAL PAPER

Sociodemographic Factors, Sexual Behaviors, and Alcohol and Recreational Drug Use Associated with HIV Among Men Who Have Sex with Men in Southern Vietnam

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Abstract A total of 2768 MSM participated in a survey in southern Vietnam. Univariate and multivariate logistic regression analyses were performed to determine predictors of HIV infection. The prevalence of HIV among MSM was 2.6 %. HIV infection was more likely in MSM who were older, had a religion, had engaged in anal sex with a foreigner in the past 12 months, previously or currently used recreational drugs, perceived themselves as likely or very likely to be infected with HIV, and/or were syphilis seropositive. MSM who had ever married, were exclusively or frequently receptive, sometimes consumed alcohol before sex, and/or frequently used condoms during anal sex in the past 3 months were less likely to be infected with HIV. Recreational drug use is strongly associated with HIV infection among MSM in southern Vietnam. HIV interventions among MSM should incorporate health promotion, condom promotion, harm reduction, sexually transmitted infection treatment, and address risk behaviors.

Keywords HIV · Risk factors · MSM · Vietnam

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Introduction

It is estimated that there were 35 million people worldwide living with HIV/AIDS by the end of 2013, of whom 16 million were women and 19 million were men [1]. Among men, people who inject drugs (PWIDs) and men who have sex with men (MSM) were recognized as high-risk groups in many countries.

MSM bear a disproportionately higher burden of HIV infection than the general population. In Asia, MSM are as much as 18.7 times more likely to be infected with HIV than the general adult population [2]. Adult men who report having sex with men account for 3–5 % of male cases in East Asia, 6–12 % in South and Southeast Asia, 6–15 % in Eastern Europe, and 6-20 % in Latin America [3].

By the end of 2012, there were approximately 209,000 people living with HIV in Vietnam. The national prevalence rate was estimated to be 0.37 % [4]. The southern region accounted for almost 50 % of total cases, and had the highest number of cases compared to the other three regions of Vietnam: northern, central and highland. Vietnam is still facing an HIV epidemic that has occurred primarily in PWIDs and female sex workers (FSWs). Recently, the epidemic has been rising significantly among MSM (e.g., from 9.4 % in 2006 to 19.9 % in 2009 in Hanoi and from 5.3 % in 2006 to 14.4 % in 2009 in Ho Chi Minh City [5], and interventions have been implemented to reduce HIV infections in this hidden population [6].

Although two quantitative studies of MSM in Ho Chi Minh city and An Giang province in southern Vietnam have reported the HIV prevalence rates of 8 and 6.4 % respectively, these studies were implemented in just one province or city, and the sample size was not large enough to investigate different risk factors [7, 8]. The study

reported herein had a larger sample size and was conducted in eight provinces in southern Vietnam to assess the risk profile for HIV infection among MSM.

Methods

Participants and Data Collection

A mapping team was established that included health-care workers and local MSM or peer educators who identified all known active MSM "hotspots" (where MSM often gather to meet, talk, exercise, drink, etc., such as coffee bars, clubs, restaurants, hotels, movie theaters, parks, swimming pools, gyms, etc.). The team visited these hotspots to estimate the numbers of MSM in each. With the assistance of MSM and hotspot owners, additional hotspots were identified, yielding a total of 745. Local health staff, with the help of MSM peers, accessed these venues and conducted rapid interviews of hotspot owners and several MSM to get information for estimating the size of the MSM population and how to approach MSM in each hotspot.

The number of hotspots per province was 247 in Tay Ninh, 54 in Dong Nai, 96 in Ba Ria-Vung Tau, 21 in Ben Tre, 119 in Vinh Long, 110 in Dong Thap, 58 in Hau Giang, and 40 in Soc Trang. The proportion of the total MSM populations (from mapping data) recruited was 64 % in Tay Ninh, 81.3 % in Dong Nai, 98.3 % in Ba Ria-Vung Tau, 71.6 % in Ben Tre, 70.3 % in Vinh Long, 48.6 % in Dong Thap, 75.9 % in Hau Giang, and 87.7 % in Soc Trang. Based on the mapping information obtained, several surveys among MSM were conducted between June 2010 and June 2012 in eight southern provinces of Vietnam, including three in the southeastern region (Tay Ninh (400), Dong Nai (360), and Ba Ria-Vung Tau(400)), and five in the southwestern region (Ben Tre (380), Vinh Long (338), Dong Thap (290), Hau Giang (300), and Soc Trang (300).

MSM were invited to participate in this survey if they were at least 16 years old and self-reported having had oral and/or anal sex with another male in the past 12 months. Those with any history of poor blood clotting were excluded due to the risk of prolonged bleeding after drawing of blood, and those with hearing disorders were excluded due to the difficulty for them to clearly hear and understand the questions being asked and responding to them correctly.

Based on the estimated prevalence of HIV among MSM in each province, the sample size was calculated as follows:

$$N = Z^2_{1-\alpha}\frac{p(1-p)}{d^2}$$

+ HIV prevalence estimate: P
+ Alpha level (α) = 5 %
+ Desired precision: d
+ Sample size N

Sample sizes are shown in the following table

No	Province	Sample size	Notes
1	Tay Ninh	400	P = 4 %
2	Ba Ria Vung Tau	400	P = 4 %
3	Dong Nai	360	P = 4 %
4	Ben Tre	380	P = 4 %
5	Dong Thap	290	P = 3 %
6	Hau Giang	300	P = 3 %
7	Vinh Long	338	P = 3 %
8	Soc Trang	300	P = 3 %
Total		2768	

There were differences between provinces in sample sizes because of variations in prevalence estimates and/or limited funding. The HIV prevalence among MSM per site was estimated using proxy data of nearby provinces (e.g., 6.4 % in An Giang province whose risk for HIV infection among MSM was thought to be higher than in our study provinces). We also had personal communications with peer educators and staff of provincial AIDS centers from the study provinces to gain insights into the probable HIV prevalence and risk behaviors among MSM to estimate the HIV prevalence for selecting suitable sample sizes. The prevalence of HIV in MSM in southern Vietnam was estimated to be approximately 4 %, and the desired precision was set at 2 %, indicating that a sample size of 369 was needed; allowing 10 % for incomplete data and specimen damage, the sample size was rounded to 400. However, since funding was insufficient, the sample size was lower (360) for four provinces, where the estimated prevalence was approximately 3 %, and the desired precision was set at 2 %. The sample size needed was 279, rounded to 300. For Vinh Long, a sample size of 338 was obtained, since more individuals were willing to participate.

The surveys were conducted in the listed hotspots in each province (mapping), in which the number of MSM was estimated. The sample size in each province was stratified based on the estimated size of MSM population in each district, then in each hotspot. All interviewers, medical technicians, and physicians attended a three-day training course specific for conducting the study.

Informed consent was obtained prior to face-to-face interviews to collect data on sociodemographic characteristics, sexual identity, sexual behaviors, knowledge related to HIV and sexually transmitted infection (STIs), history of STIs, alcohol and recreational drug use, and access to HIV/STI intervention programs. After the interview, four ml of blood and 50 ml of urine were collected. Interviews were conducted by health staff or staff with a background in social sciences who were trained to administer the questionnaire. Biological samples were taken by trained phlebotomists according to national protocols.

HIV testing was performed using ELISA (Genscreen HIV ½) and a rapid test (Determine, SFD). All specimens were tested at provincial AIDS centers. Syphilis was screened using RPR (SD Bioline Syphilis 3.0; Standard Diagnostics, Kyonggi-Do, Korea) at the AIDS centers. Positive specimens were transported to the Pasteur Institute in Hochiminh City (PIHCM) for further confirmation by the Treponema pallidum haemagglutination assay (TPHA, Bio-Rad, Marnes La Coquette, France). If positive for both tests, the specimen was considered positive for syphilis. Due to limited funding, syphilis testing was only performed in seven provinces (not Soc Trang). *Neisseria gonorrhoeae* (NG) and *Chlamydia trachomatis* (CT) were tested by PCR (Amplicor NG/CT, Roche) at the PIHCM for only six provinces (not Dong Thap or SocTrang).

The test results were returned to the participants through local voluntary HIV counseling and testing clinics. Men infected with syphilis, NG, and/or CT were referred to local STI centers for free treatment according to national STI treatment syndrome guidelines [9]. HIV-positive individuals were referred to local outpatient clinics. Ethical approval for this study was granted by the institutional review board in each province (at provincial AIDS centers and/or Departments of Health).

Data Management and Analysis

All interview answer sheets were checked by the interviewers for any missing information, then sent to the supervisors for futher checking before being sent to PIHCM. Interview answer sheets were stored in locked cabinets in the Provincial AIDS Centers (PACs) and sent to PIHCM. Data were entered using Epi-Data version 3.1 (EpiData Association, Odense, Denmark), and all statistical analyses were carried out using Stata version 13.0 (StataCorp, TX).

Frequency distributions and percentages were used to describe the HIV infection rate and several qualitative variables. Mean, median and variance were estimated for quantitative continuous variables. These parameters were also used to clean data before further analysis. To partially reduce the effect of temporal relationships between HIV and risk behaviors, those who had been tested for HIV previously and knew they were HIV-positive were removed from the univariate and multivariate analyses, because they might have altered their risk behaviors, and this could possibly cause an inverse association if binary logistic regression analysis was used. Potential covariates were first identified in the existing literature or by subjective prior knowledge plus those variables with p values of ≤ 0.25 in univariate analysis, and were entered in the full model [10]. Backward elimination was used. Any variable which had a p value over 0.05 was removed from the model. A log likelihood ratio test was performed to compare the "bigger" and "reduced" models. If the log likelihood ratio test gave a p value of ≤ 0.05, the corresponding variable was retained in the model. The procedure was repeated until no other variables in the model yielded p values of > 0.05. The final estimates were also adjusted for cluster effects (8 provinces).

Results

Sociodemographic Features (Table 1)

Over three-quarters of the MSM participating in the study were 30 years or younger. The median age was 22 years. Approximately one-fifth (19.2 %) of participants had low education (grade 1–5 or illiterate), and nearly 95 % were Kinh ethnicity (the major ethnic group in Vietnam). Eighty five percent of participants had never married, 65.6 % had a religion, and 13 % were unemployed. The majority of participants were blue collar workers (34.6 %), and 16.7 % were students. MSM in this study had an average income of VNĐ 2,000,000/month (approximately US $100).

The majority (66 %) of the participants currently lived with parents/relatives, whereas 5.4 % were living with wives/female partners and 17.7 % with male partners/friends.

The proportion of MSM who thought that they were very likely, likely, not likely, or not at all likely to be infected with HIV were 4.6, 21.4, 14.6 and 59.4 %, respectively. Only 7.9 % of MSM in the survey had previously been tested for HIV.

Basic knowledge of HIV was also assessed. The majority was able to recognize safe sex behaviors in general, but only 38.9 % correctly answered all five questions on knowledge related to HIV transmission. Nearly two-third (61.5 %) of the participants had ever heard about STIs and 44 % knew at least one male STI-related symptom; 2.3 % of MSM reported ever having an STI (Table 1).

Table 1 Socio-demographic characteristics, sexual behaviors and HIV/STI knowledge among MSM in eight southern provinces of Vietnam

Characteristics	Ba Ria-Vung Tau		Dong Nai		TayNinh		Ben Tre		Vinh Long		Dong Thap		HauGiang		SocTrang		Overall	
	n	%	n	%	n	%	N	%	n	%	n	%	n	%	n	%	n	%
Age (years)	400		358		400		380		338		289		300		300		2765	
16–18		9.3		6.4		29.7		31.8		24.6		15.9		26.3		19.3		20.5
19–24		45.0		27.7		39.0		44.7		42.0		50.2		34.3		34.3		39.7
25–30		28.3		23.7		16.0		9.8		12.4		22.5		25.7		23.7		20.0
31–61		17.4		42.2		15.3		13.7		21.0		11.4		13.7		22.7		19.8
Mean	25.9		30.0		23.6		22.7		24.9		24.0		24.2		26.0		25.2	
Median	24.0		28.0		20.5		20.0		21.0		22.0		23.0		24.0		22.0	
Range	16–61		16–57		16–56		16–54		16–59		16–55		16–53		16–56		16–61	
Education	394		358		399		380		338		290		300		300		2759	
Illiterate/primary school		18.3		24.6		15.3		8.2		16.0		26.2		14.3		34.3		19.2
Secondary school		40.1		45.5		35.8		38.2		30.8		33.8		34.3		47.7		38.3
High school		33.0		27.7		40.4		38.3		33.1		35.2		33.1		17.0		32.6
Vocational/tertiary or higher		8.6		2.2		8.5		15.3		20.1		4.8		18.3		1.0		9.9
Kinh ethnicity	398	99.3	353	97.7	400	99.0	380	99.5	337	99.1	287	98.6	300	93.0	300	67.0	2755	94.8
Marital status	400		357		400		380		338		290		300		300		2765	
Never married		89.2		87.1		90.5		91.3		86.3		84.1		85.0		64.6		85.4
Never married but co–habiting with a male partner		2.8		3.6		5.0		1.3		3.0		3.8		1.0		24.7		5.3
Married/cohabiting with a female partner		4.5		1.7		1.8		4.0		7.1		8.6		11.7		6.0		5.4
Separated/divorced/ widowed		3.5		7.6		2.7		3.4		3.6		3.5		2.3		4.7		3.9
Having a religion	400	79.0	358	79.6	400	65.8	380	50.8	335	50.2	288	59.0	299	49.2	300	89.7	2760	65.6
Residing in the local area	400	88.8	354	75.1	397	91.7	380	79.2	338	79.3	289	89.6	300	91.3	300	98.0	2758	83.4
Occupation	400		360		400		380		338		290		300		300		2768	
Unemployed		4.5		6.1		17.5		25.5		14.5		7.9		6.7		20.0		13.0
Small business/vendors		18.3		15.6		10.8		11.6		18.6		13.1		21.7		16.3		15.6
Singers/barbers		16.8		31.4		20.0		2.6		6.8		14.8		9.7		10.3		14.3
White collar workers		3.0		2.5		1.3		0.3		2.1		4.2		10.7		1.0		2.9
Students		11.0		3.6		18.0		27.4		31.1		15.2		23.0		3.7		16.7
Blue collar workers and others		46.4		40.8		32.4		32.6		26.9		44.8		28.2		48.7		37.5
Average income/month (million VND)	400		353		400		380		334		290		299		297		2753	
≤2		29.8		33.4		70.7		77.3		77.0		61.7		63.2		40.7		56.7
Between 2 & 4		49.2		47.6		26.0		19.0		18.8		31.4		33.4		46.8		33.9
>4		21.0		19.0		3.3		3.7		4.2		6.9		3.4		12.5		9.4
Mean	3.4		3.3		1.8		1.8		1.8		2.1		2.0		2.7		2.4	
Median	3.0		3.0		2.0		1.5		1.5		2.0		2.0		2.5		2.0	

Table 1 continued

Characteristics	Ba Ria-Vung Tau		Dong Nai		TayNinh		Ben Tre		Vinh Long		Dong Thap		HauGiang		SocTrang		Overall	
	n	%	n	%	n	%	N	%	n	%	n	%	n	%	n	%	n	%
Range	0.0–15.0		0.0–35.0		0.0–15.0		0.15–20.0		0.0–10.0		0.0–10.0		0.2–7.0		0.45–10.0		0.0–35.0	
Currently living with	400		357		400		380		338		290		300		300		2765	
Alone		14.3		19.9		8.5		5.5		12.4		9.3		6.3		9.7		10.9
Parents/relatives		60.0		57.1		77.2		82.4		60.1		60.0		76.3		51.0		66.0
Male partners/friends		20.7		21.3		12.5		9.2		21.3		20.7		6.1		32.0		17.7
Wife/female partner		5.0		1.7		1.8		2.9		6.2		10.0		11.3		7.3		5.4
Age at sexual debut	397		352		399		380		338		290		300		300		2756	
≤15 years old		9.6		8.5		10.8		10.5		11.8		1.4		13.0		6.3		9.2
Mean	18.2		18.6		17.8		17.7		18.5		18.1		17.8		18.2		18.1	
Median	18.0		19.0		17.0		17.0		18.0		18.0		17.0		18.0		18.0	
Range	12.0–33.0		11.0–41.0		8.0–35.0		12.0–27.0		12.0–44.0		12.0–26.0		13.0–33.0		12.0–35.0		8.0–44.0	
Self-reported type of sexual identity	399		358		399		379		336		289		298		300		2758	
Transvestite gay		15.5		29.1		19.8		10.3		11.9		22.5		24.8		14.0		18.3
Non-transvestite gay		72.4		51.7		63.9		68.6		59.8		50.9		35.2		67.3		59.6
Bisexual		12.0		19.3		16.3		21.1		28.3		26.6		39.9		18.7		22.1
Sexual roles in past 12 months	345		236		285		338		229		243		273		209		2158	
Exclusively insertive		16.2		12.7		22.1		23.7		39.7		25.1		38.8		31.1		25.6
Frequently insertive		22.9		15.3		9.1		10.4		7.9		8.2		12.8		8.1		12.3
Versatile		55.9		35.1		43.2		49.4		26.2		48.2		35.2		23.4		41.1
Frequently receptive		3.8		30.1		5.6		11.2		8.7		11.9		4.8		18.7		11.1
Exclusively receptive		1.2		6.8		20.0		5.3		17.5		6.6		8.4		18.7		9.9
Typical meeting places/past 12 months																		
Pubs/restaurants	394	22.3	356	39.9	400	22.8	379	21.6	337	51.6	289	50.9	300	58.3	298	31.9	2753	36.1
Guest houses/motels	394	53.1	356	62.4	400	52.5	380	31.6	337	41.5	289	40.5	300	13.0	298	24.5	2754	41.0
Hotels	394	12.4	356	30.9	400	5.5	380	2.4	337	3.0	289	8.3	300	0.0	298	2.4	2754	8.4
Swimming pools	394	0.5	356	4.2	400	2.5	380	1.8	337	0.0	289	0.4	300	0.0	298	1.7	2754	1.5
Fitness/aerobic centers	394	1.8	356	2.0	400	0.0	380	1.3	337	0.3	289	0.4	300	0.0	298	1.3	2754	0.9
Internet	394	16.2	356	9.0	400	9.8	380	16.6	337	4.2	289	10.4	300	3.0	298	3.4	2754	9.5
Match-makers	394	1.0	356	7.6	400	2.3	380	1.8	337	0.0	289	2.8	300	0.0	298	5.4	2754	2.6
Massage/sauna	394	4.8	356	1.7	400	1.8	380	0.5	337	0.3	289	6.6	300	0.3	298	1.3	2754	2.1
Bars/discotheques	394	20.3	356	2.8	400	8.3	380	7.4	337	4.5	289	12.8	300	2.7	298	4.7	2754	8.2
Theaters	394	1.5	356	0.3	400	2.3	380	1.1	337	0.6	289	2.4	300	0.0	298	0.3	2754	1.1
On streets, parks, lake/river shores	394	19.0	356	21.6	400	14.8	380	34.0	337	11.3	289	24.6	300	37.0	298	52.4	2754	26.0
Cafés, billiards	394	32.5	356	11.2	400	53.5	380	64.0	337	50.5	289	73.4	300	80.7	298	43.6	2754	50.1
Others (home, workplace, school)	394	12.2	356	8.2	400	12.5	380	14.7	337	17.8	289	9.7	300	9.0	298	4.4	2754	11.3

Table 1 continued

Characteristics	Ba Ria-Vung Tau		Dong Nai		TayNinh		Ben Tre		Vinh Long		Dong Thap		HauGiang		SocTrang		Overall	
	n	%	n	%	n	%	N	%	n	%	n	%	n	%	n	%	n	%
Number of male oral sex partners in past 3 months	396		349		400		380		337		290		300		299		2751	
Mean	2.0		6.8		2.5		2.1		1.9		2.0		2.3		4.6		3.0	
Median	2.0		5.0		2.0		1.0		1.0		1.0		2.0		3.0		2.0	
Range	0.0–30.0		0.0–60.0		0.0–30.0		0.0–30.0		0.0–50.0		0.0–8.0		0.0–15.0		0.0–30.0		0.0–60.0	
Number of male anal sex partners in past 3 months	398		356		399		380		336		290		300		299		2758	
None		16.3		44.9		37.3		20.5		37.5		18.3		9.3		33.4		27.5
1		35.4		10.5		24.1		33.2		27.7		42.1		32.7		18.7		27.9
2–4		45.2		26.1		30.8		39.7		27.7		29.3		46.0		33.4		34.9
≥5		3.1		18.5		7.8		6.6		4.1		10.3		12.0		14.5		9.7
Mean	1.7		2.4		1.8		1.9		1.6		1.9		2.4		2.3		2.0	
Median	1.0		1.0		1.0		1.0		1.0		1.0		2.0		1.0		1.0	
Range	0.0–13.0		0.0–22.0		0.0–30.0		0.0–25.0		0.0–21.0		0.0–8.0		0.0–12.0		0.0–20.0		0.0–30.0	
Having sex in the past 12 months with																		
Foreigners	400	2.3	360	3.1	400	2.8	380	2.6	338	1.2	290	5.5	300	0.0	300	0.7	2768	2.3
Females/girlfriends	400	19.5	350	10.3	400	19.3	380	35.8	338	40.5	290	46.6	300	50.7	297	32.0	2755	30.7
Wife/cohabiting partner	400	18.0	350	8.6	400	16.8	380	25.8	338	34.3	290	42.4	300	49.7	296	29.7	2754	27.0
Female sex workers	400	7.5	350	1.7	400	3.0	379	6.6	336	4.8	290	10.7	300	6.0	295	5.1	2750	5.6
Female clients	400	0.3	348	0.0	400	0.0	379	1.6	336	0.6	290	2.8	300	2.0	296	1.0	2749	1.0
Voluntary male partners	399	91.2	357	73.1	400	90.3	380	90.8	337	95.9	290	91.0	300	99.7	299	88.3	2762	89.8
Male clients	399	24.8	356	35.7	400	20.5	380	40.8	337	16.6	290	13.5	300	6.0	299	42.1	2761	25.4
Male sex workers	398	10.1	357	15.4	400	11.3	380	14	337	2.1	290	6.9	300	2.7	299	19.4	2761	10.4
Condom use during anal sex with male partners in past 3 months	328		205		257		295		189		234		272		202		1982	
Never		14.6		21.0		20.6		36.6		28.0		20.1		20.2		21.3		22.7
Sometimes		17.7		35.6		6.6		10.9		9.1		14.5		8.8		15.8		14.5
Often		35.1		17.1		23.0		14.7		16.9		13.3		11.4		17.8		19.3
Always		32.6		26.3		49.8		38.0		46.0		52.1		59.6		45.1		43.5
Use of condoms when having sex with female sex workers/past 12 months	29		6		12		25		16		31		18		15		152	
Never		0.0		0		50.0		12		12.5		0.0		27.8		13.3		11.8
Sometimes		10.3		0		0.0		4		18.8		16.2		16.7		6.7		10.5
Often		0.0		17		8.3		8		12.4		16.1		16.7		0.0		9.3
Always		89.7		83		41.7		76		56.3		67.7		38.8		80.0		68.4
Lubricant use when having anal intercourse in past 12 months	345		236		285		335		228		241		273		209		2152	
Never		69.9		29.7		60.0		60.6		66.2		32.4		60.4		70.8		57.0

Table 1 continued

Characteristics	Ba Ria-Vung Tau		Dong Nai		TayNinh		Ben Tre		Vinh Long		Dong Thap		HauGiang		SocTrang		Overall	
	n	%	n	%	n	%	N	%	n	%	n	%	n	%	n	%	n	%
Saliva		2.6		2.1		4.2		3.9		1.8		13.7		0.8		1.0		3.7
Water		22.6		18.2		9.8		17.3		12.3		9.1		0.0		5.7		12.5
Oil/cream		4.9		50.0		26.0		18.2		19.7		44.8		38.8		22.5		26.8
Self-assessment of HIV risk among those who had ever heard about HIV/AIDS	383		304		328		336		287		220		268		211		2337	
Not at all		56.7		44.1		69.8		48.2		67.2		69.5		62.7		63.0		59.4
Not likely		15.9		11.8		16.5		14.0		17.1		15.0		19.4		4.8		14.6
Likely		22.7		38.8		12.5		28.9		13.6		10.9		16.0		24.6		21.4
Very likely		4.7		5.3		1.2		8.9		2.1		4.6		1.9		7.6		4.6
Ever tested for HIV	400	12.8	360	6.9	400	3.5	380	9.2	338	8.3	290	4.5	300	1.0	300	16.7	2768	7.9
Had heard about HIV	400	95.8	358	85.2	400	82.0	380	88.4	338	84.9	290	75.9	300	89.3	300	70.3	2766	84.5
Correct knowledge about HIV prevention	400		358		400		380		338		290		300		300		2766	
Always using condoms during sex can reduce HIV transmission		77.3		68.4		77.8		85.3		78.1		71.4		76.7		65.7		75.5
A healthy-looking person can be infected with HIV		64.0		69.8		70.8		71.3		70.4		59.0		70.3		56.0		66.8
Sharing food with PLWHIV does not transmit HIV		91.0		74.3		74.5		77.4		75.4		48.6		82.3		65.3		74.5
Mosquitoes do not transmit HIV		58.3		65.9		56.5		67.9		57.4		50.3		63.3		61.3		60.3
Having only one partner can reduce the risk of HIV infection		68.0		63.7		68.5		73.4		70.1		64.1		70.7		57.3		67.3
Necessary knowledge about HIV (National AIDS preventive indicator-21) (×)	400	30.8	358	41.9	400	38.3	380	44.2	338	41.1	290	29.3	300	42.3	300	43.3	2766	38.9
Heard or knew about STIs	400	64.8	357	65.6	400	65.3	380	76.3	337	69.1	290	54.1	300	57.3	299	31.4	2763	61.5
Knew at least one male STI-related symptom	400	58.3	360	60.8	400	27.5	380	39.2	338	53.0	290	43.1	300	43.0	300	25.0	2768	44.0
Ever had an STI	400	0.8	360	1.9	400	1.8	380	4.2	338	1.5	290	5.9	300	1.0	300	2.0	2768	2.3

n number of MSMs; % percentage. Not all questions were answered by all participants, but there were very *few questions that were not answered by the participants*

(×): Having necessary knowledge about HIV including: 1. Being faithful with a partner who is not infected HIV reduces the risk of HIV infection; 2. Condom use reduces the risk of HIV infection; 3. A healthy-looking person can be infected with HIV, 4. Mosquito bite does not transmit HIV, 5. Sharing food with PLWHIV does not transmit HIV

Sexual Behaviors (Table 1)

The median age of sexual debut was 18 years, with little variation across sites. Overall, 9.2 % of participants initiated sexual activity when they were 15 years of age or younger. Sexual identity was self-reported as 18.3 % transvestite gay (who dress like women, known as "bong lo"), 59.6 % "non-transvestite gay" (wear male attire, known as "bong kin"), and 22.1 % bisexuals who had both male and female partners. As expected, gay (transvestite and non-transvestite) men were less likely to have sex with females compared to bisexuals in the past 12 months (21.8 vs. 61.5 %, $p < 0.001$); however, those who identified themselves as gay were more likely to always use a condom when having sex with wife/partner (45.4 vs. 31.8 %, $p < 0.001$) (data available upon request). Sexual role was reported as 25.6 % exclusively insertive, 12.3 % versatile but frequently insertive, 41.1 % versatile, 11.1 % versatile but frequently receptive, and 9.9 % exclusively receptive. The most common places where MSM met were reported to be café/billiard establishments (50.1 %), guest houses/motels (41.0 %), pubs/restaurants (36.1 %), and streets/parks or lake/river shores (26.0 %); the internet was not as popular a means for MSM to meet (9.5 %).

The median number of male oral sex partners in the past 3 months was two, while more than one-third (34.9 %) of participants reported having 2–4 male anal sex partners in the past three months. The majority of participants (85.4 %) were unmarried, and 89.8 % engaged in sex with male partners, but 30.7 % also had sex with females/girlfriends. Few (2.3 %) had engaged in sex with a foreigner in the past 12 months. We found that 49.2 % of those who had ever engaged in sex with a foreigner had ever had transactional sex with male or female clients. Additionally, 24.9 % of those who never engaged in sex with a foreigner ever had transactional sex with male or female clients (not shown in Table 1). One-fourth had had sex with male clients, and 10.4 % had had sex with a male sex worker in the past 12 months. Only 43.5 % had consistently used condoms with any anal sex partners, and 22.7 % never used condoms. Unprotected anal intercourse was slightly higher among unmarried MSM (57.3 %) than ever-married MSM (49.4 %) (not shown in Table 1). Participants also engaged in sex with their wives/cohabiting partners (27 %) or female sex workers (5.6 %) in the past 12 months, and female clients (1.0 %) in the past three months. The rate of consistent condom use with female sex workers was 68.4 %. Lubricant was also used by almost 40 % for anal sex with either males or females (26.8 % oil or cream, 12.5 % water-based).

Cigarette, Alcohol, and Recreational Drug Use (Table 2)

Daily cigarette smoking among participants was quite prevalent (49.1 %), 7.8 % reported consuming alcohol on a daily basis, and 31.5 % reported frequent drinking (a few times per week). One-fifth of the participants reported never drinking in the past month (for the questions asked about behavior in the past month, not in lifetime). Among participants who had sex in the past three months, 75 % reported alcohol consumption before sex; the proportion was 23.7 % reporting always, 21.1 % frequently, 30.0 % sometimes, and 25.2 % never.

Recreational drug use is strictly prohibited in Vietnam. When asked about recreational drug use, 7.1 % reported ever using them. This proportion included 4.7 % who had previously but no longer used, 1.5 % who were currently using drugs that could be inhaled or swallowed, and 0.9 % currently injecting drugs. The most common drug of use was cannabis (54.8 %), "shaking drug" (ecstasy; 18.3 %), heroin (15.7 %), and methamphetamine (6.6 %). The prevalence of men who previously but no longer used drugs, currently inhaled or swallowed drugs, and injected among participants who were exclusively or frequently insertive were 1.1, 2.6, and 5.3 %, respectively, whereas for participants who were exclusively or frequently receptive, 0.4, 1.6 and 2.9 %, respectively (not shown in Table 2).

HIV and Selected STIs Among MSM (Table 3)

The overall prevalence of HIV among participants was 2.6 % (95 % CI 2.0–3.2), ranging from 0 % (95 % CI 0.0–1.2) in Hau Giang to 8.64 % (95 % CI 5.7–11.6) in Dong Nai. The prevalence of syphilis, urethral gonorrhea, urethral chlamydia, urethral gonorrhea, and/or chlamydia were 1.6 %, ranging from 0 % in Ben Tre to 5.8 % in Dong Nai; 2.4 % (from 1.1 % in Dong Nai to 4.0 % in Hau Giang), 4.3 % (from 2.2 % in Dong Nai to 6.5 % in Vinh Long), and 6.3 % (from 3.3 % in Dong Nai to 8.3 % in Vinh Long), respectively.

Factors Associated with HIV Infection (Table 4)

In univariate analysis, HIV infection was more prevalent among older MSM, those residing in the southeastern provinces (versus southwestern), small businessmen/vendors or freelance singers/barbers, those reporting having a religion, ever having sex with a foreigner, consuming alcohol on a daily basis, ever using recreational drugs

Table 2 Cigarette, alcohol and recreational drug use among MSM in eight southern provinces of Vietnam

Characteristics	Ba Ria-Vung Tau		Dong Nai		TayNinh		Ben Tre		Vinh Long		Dong Thap		HauGiang		SocTrang		Overall	
	N	%	n	%	n	%	n	%	N	%	n	%	n	%	n	%	n	%
Cigarette smoking in the last month	400		358		400		379		338		285		300		299		2759	
Daily		38.2		51.1		46.0		55.9		51.2		43.2		34.3		74.5		49.1
Sometimes		27.3		18.2		8.8		9.3		9.8		13.0		8.0		6.4		12.9
Never		13.5		30.7		45.2		34.8		39.0		43.8		57.7		19.1		38.0
Consuming alcohol in the past month	400		353		399		380		338		290		269		300		2756	
Every day		10.5		18.7		5.3		2.4		8.6		5.5		6.5		4.3		7.8
A few times a week		36.0		41.1		14.8		32.6		47.0		25.9		35.8		18.7		31.5
A few times a month		26.5		23.8		42.8		39.5		32.5		29.6		40.5		35.0		33.8
Only one time per month		8.0		2.8		6.0		0.8		2.7		10.7		17.2		5.7		6.4
Never		19.0		13.6		31.1		24.7		9.2		28.3		0.0		36.3		20.5
Consuming alcohol before sex in the past 3 months	327		194		242		279		211		234		272		199		1958	
Never		27.8		17.5		33.0		28.7		22.3		24.8		19.9		24.6		25.2
Sometimes		41.6		40.7		23.6		15.8		13.3		44.9		27.2		32.2		30.0
Frequent		19.6		18.1		26.0		19.0		19.9		17.5		31.6		15.1		21.1
Always		11.0		23.7		17.4		36.5		44.5		12.8		21.3		28.1		23.7
Recreational drug use	400		360		400		380		338		290		300		300		2768	
Never		89.2		96.4		94.9		86.6		90.8		95.5		98.7		92.3		92.9
Previously, but no longer using		7.0		1.1		4.3		10.5		6.5		3.1		0.3		3.3		4.7
Current use via smoking/ inhaling/drinking		2.0		0.8		0.5		2.6		1.5		1.4		0.7		2.7		1.5
Current use via injecting		1.8		1.7		0.3		0.3		1.2		0.0		0.3		1.7		0.9
Types of recreational drug use	42		13		20		51		31		13		4		23		197	
Heroin		19.1		7.7		25.0		7.8		16.2		7.7		0		30.4		15.7
Opium		4.8		0.0		5.0		2.0		0.0		0.0		0		0.0		2.0
Sedative		0.0		15.4		0.0		2.0		0.0		7.7		25		0.0		2.6
Cannabis		64.2		53.8		65.0		62.8		29.0		46.1		50		52.1		54.8
Ecstasy		11.9		23.1		0.0		21.5		29.0		30.8		25		13.1		18.3
Ice (methamphetamine)		0.0		0.0		5.0		3.9		25.8		7.7		0		4.4		6.6

N number of participants; % percentage

(previously but no longer using, currently inhaling/swallowing, currently injecting), and those who thought that they were likely or very likely to be infected with HIV. HIV was less prevalent among those who had higher education levels, and/or never or only sometimes consumed alcohol immediately before having sex.

In multivariate analysis, 10 factors were associated with HIV in the final model, including having ever married, having a religion, exclusively/frequently receptive, engaging in sex with a foreigner in past 12 months, consuming alcohol before anal sex in the past 3 months, using condoms during anal sex in the past three months, ever using recreational drugs, using amphetamine-type stimulants (ATS)/heroin, perceiving oneself to be likely/very likely to be infected, and testing positive for syphilis. When age was increased by one year (between 16 and 61 years),

Table 3 Prevalence of HIV and selected STIs among MSM in eight southern provinces of Vietnam

Characteristics	Ba Ria-Vung Tau		Dong Nai		Tay Ninh		Ben Tre		Vinh Long		Dong Thap		Hau Giang		Soc Trang		Overall	
	N	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
HIV	400	2.25	359	8.64	395	1.01	380	1.05	337	3.86	290	1.72	300	0.00	300	2.00	2761	2.61
95 % CI	0.8–3.7		5.7–11.6		0.3–2.6[a]		0.3–2.7[a]		1.8–5.9		0.6–4.0[a]		0.0–1.2[a]		0.4–3.6		2.0–3.2	
Syphilis	400	1.00	360	5.83	400	0.25	380	0.00	337	0.89	290	0.00	300	3.67	–	–	2467	1.62
95 % CI	0.3–2.5[a]		3.4–8.3		0.01–1.4[a]		0.0–1.0[a]		0.2–2.6[a]		0.0–1.3[a]		1.5–5.8				1.1–2.1	
Urethral gonorrhea	400	2.75	360	1.11	400	3.00	380	1.58	338	2.07	–	–	299	4.01	–	–	2177	2.39
95 % CI	1.1–4.4		0.3–2.8[a]		1.3–4.7		0.3–2.8		0.5–3.6				1.8–6.3				1.7–3.0	
Urethral chlamydia	400	4.50	360	2.22	400	3.50	380	4.47	338	6.51	–	–	299	4.68	–	–	2177	4.27
95 % CI	2.5–6.5		0.7–3.8		1.7–5.3		2.4–6.6		3.9–9.2				2.3–7.1				3.4–5.1	
Urethral gonorrhea and/or chlamydia	400	6.75	360	3.33	400	6.00	380	5.79	338	8.28	–	–	299	8.03	–	–	2177	6.29
95 % CI	4.3–9.2		1.5–5.2		3.7–8.3		3.4–8.1		5.3–11.2				4.9–11.1				5.3–7.3	

N number of participants; *%* percentage; *CI* confidence interval

[a] Binomial exact

the risk of HIV infection increased by 13 % (OR 1.13, 95 % CI 1.08–1.18). HIV infection was higher among MSM who had a religion (OR 3.56; 95 % CI 2.21–5.73), ever engaged in anal sex with a foreigner (OR 9.24, 95 % CI 1.83-46.64), and/or were syphilis-seropositive (OR 8.12, 95 % CI 2.59–25.53). Compared with those who had never used recreational drugs, those who reported previously but no longer using (OR 7.37, 95 % CI 2.22–24.52), currently inhaling/swallowing drugs (OR 19.29, 95 % CI 4.60–80.92), or currently injecting drugs (OR 63.58, 95 % CI 28.20–143.38) were at significantly increased risk of HIV. When the drug use route was replaced by types of drug in the final model, compared with those who had never used recreational drugs, those who reported using ATS (OR 28.87, 95 % CI 5.10–163.54) or heroin (OR 48.16, 95 % CI 25.23–91.90) were at a higher risk of HIV infection. Moreover, MSM who thought that they were likely (OR 2.48, 95 % CI 1.00–6.18) or very likely (OR 3.76, 95 % CI 1.20–11.79) to be infected with HIV were at a higher risk of HIV infection.

MSM who had ever married (OR 0.10, 95 % CI 0.03–0.39), were exclusively or frequently receptive (OR 0.28, 95 % CI 0.13–0.62), sometimes consumed alcohol immediately before having sex (OR 0.15, 95 % CI 0.06–0.34), and/or frequently used condoms during anal sex in the past three months (OR 0.07, 95 % CI 0.01–0.90) were less likely to be infected with HIV.

Discussion

The observed prevalence of HIV among MSM in the eight provinces was low compared with other provinces in Vietnam [>5 % in Hanoi, Hochiminh City, Can Tho and An Giang (bordering with Cambodia)], except for Dong Nai (8.6 %) [6, 8, 11]. The prevalence of HIV in the southwestern provinces was lower than that observed in southeastern provinces, including Dong Nai (8.6 %). Dong Nai borders with Hochiminh City, which has amongst the highest prevalence of HIV in Vietnam in all high-risk groups, including those who inject drugs, MSM, and female sex workers. Previous studies among MSM in Vietnam were carried out in urban populations, whereas our study was conducted in rural or small urban areas, except for Dong Nai which is an industrial province where HIV prevalence may be lower [8, 12]. The prevalence of HIV in the current study, 2.6 %, was lower than in other countries, including 13.6 % in Brazil [13], 12.9 % in northern Thailand [14], and 4.8 % in Beijing, China [15].

Several correlates of HIV infection were identified in this study. Increasing age was found to be correlated with a higher likelihood of HIV infection, perhaps due to cumulative exposure, as was observed in studies in Malawi,

Table 4 Factors associated with HIV among MSM in eight southern provinces of Vietnam

Characteristic	N	% HIV	Univariate		Multivariate[b]	
			OR (95 % CI)	*p* value	aOR (95 %CI)	p value
Age (years)	2752		1.06 (1.04–1.09)	**<0.001**	**1.13 (1.08–1.18)**	**<0.001**
Region	2754					
Southwestern	1604	1.6	1			
Southeastern	1150	3.5	2.28 (1.37–3.77)	**0.001**	–	–
Educational level	2746					
Low (illiterate/primary school)	525	5.0	1			
Secondary school	1053	1.9	0.37 (0.21–0.67)	**0.001**	–	–
High school	894	1.9	0.37 (0.20–0.69)	**0.002**	–	–
Vocational/college/ university	274	0.7	0.14 (0.03–0.60)	**0.008**	–	–
Occupation	2754					
Unemployed	357	1.7	1			
Small business/vendor	430	4.4	2.70 (1.07–6.85)	**0.036**	–	–
Singer/barber shopper	393	4.1	2.48 (0.96–6.42)	0.06	–	–
White collar	81	2.5	1.48 (0.29–7.47)	0.634	–	–
Students	461	0.4	0.25 (0.05–1.27)	0.095	–	–
Other (worker, laborer, farmer)	1032	1.9	1.16 (0.46–2.90)	0.757	–	–
Marital status	2752					
Never married	2497	2.4	1		1	
Ever married	255	2.0	0.81 (0.32–2.04)	0.658	**0.10 (0.03–0.29)**	**<0.001**
Income (per month)	2740					
≤2 VND million	1552	1.6	1		1	
2–4 VND million	931	3.4	2.27 (1.33–3.87)	**0.003**	1.27 (0.55–2.93)	0.574
>4 VND million	257	3.5	2.31 (1.06–5.03)	**0.035**	3.85 (0.75–19.63)	0.105
Having a religion	2747					
No	945	1.4	1		1	
Yes	1802	2.9	2.13 (1.15–3.93)	**0.016**	**3.56 (2.21–5.73)**	**<0.001**
Residing in the local area	2745					
No	453	1.6	1			
Yes	2292	2.5	1.65 (0.75–3.65)	0.212	–	–
Currently living with	2752					
Alone	297	4.0	1			
Parents/relatives	1816	2.3	0.55 (0.28–1.06)	0.073	–	–
Friends/male partners	489	2.0	0.50 (0.21–1.16)	0.107	–	–
Wife/cohabiting/girl friend	150	1.3	0.32 (0.07–1.45)	0.14	–	–
Age at sexual debut (years)	2743					
>15	2490	2.4	1			
≤15	253	2.0	0.82 (0.32–2.05)	0.666	–	–
Sexual identity	2745					
Transvestite gay	502	4.0	1			
Non transvestite gay	1637	2.3	0.56 (0.32–0.97)	**0.038**	–	–
Bisexual	606	1.3	0.32 (0.14–0.74)	**0.007**	–	–
Sexual role	2148					
Exclusively or frequently insertive	815	1.8	1		1	***

Table 4 continued

Characteristic	N	% HIV	Univariate		Multivariate[b]	
			OR (95 % CI)	*p* value	aOR (95 %CI)	p value
Versatile (equally insertive and receptive)	882	1.8	0.99 (0.48–2.01)	0.968	0.38 (0.11–1.33)	0.130
Exclusively or frequently receptive	451	2.4	1.33 (0.61–2.93)	0.474	**0.28 (0.13–0.62)**	**0.002**
Basic HIV knowledge (national indicator–20)[a]	2753					
No	1684	2.2	1			
Yes	1069	2.6	1.20 (0.73–1.97)	0.478	–	–
Number of male anal sex partners in past 3 months	2745					
1	767	1.2	1			
2–4	957	2.2	1.89 (0.86–4.15)	0.113		
≥5	267	2.3	1.94 (0.68–5.49)	0.214	–	–
Engaged in sex with a foreigner in past 12 months	2754					
No	2692	2.3	1		1	
Yes	62	6.5	2.97 (1.05–8.45)	**0.041**	**9.24 (1.83–46.64)**	**0.007**
Consumed alcohol before anal sex in past 3 months	1950					
Always	463	3.2	1		1	
Frequently	413	0.7	0.22 (0.06–0.76)	**0.017**	0.19 (0.02–1.45)	0.108
Sometimes	583	1.4	0.42 (0.17–0.99)	**0.047**	**0.15 (0.06–0.34)**	**<0.001**
Never	491	1.6	0.49 (0.21–1.18)	0.11	0.46 (0.09–2.32)	0.345
Condom use during anal sex in past 3 months	1943					
Never	441	2.5	1		1	
Sometimes	283	2.8	1.14 (0.45–2.86)	0.785	0.97 (0.34–2.78)	0.959
Frequently	377	0.8	0.31 (0.09–1.13)	0.077	**0.07 (0.01–0.90)**	**0.041**
Always	842	1.4	0.56 (0.25–129)	0.176	0.42 (0.08–2.22)	0.306
Lubricant used during anal sex in past 12 months	1984					
No	1174	1.4	1			
Yes	810	2.4	1.74 (0.89–3.40)	0.106	–	–
Cigarette smoking during past month	2746					
Never	1043	2.4	1			
Sometimes	355	2.3	0.94 (0.42–2.10)	0.878	–	–
Daily	1348	2.4	0.99 (0.58–1.68)	0.971	–	–
Consumed alcohol during past month	2743					
Never	560	1.8	1		1	
One or a few times/month	1104	2.1	1.17 (0.55–2.48)	0.681	2.14 (0.51–8.92)	0.297
One or a few times/week	864	2.6	1.44 (0.68–3.06)	0.347	1.19 (0.15–9.61)	0.871
Daily	215	4.7	2.68 (1.10–6.54)	**0.03**	0.32 (0.01–7.21)	0.474
Recreational drug use	2754					
Never	2558	2.0	1		1	***
Previously but no longer	129	5.4	2.77 (1.23–6.21)	**0.014**	**7.37 (2.22–24.52)**	**0.001**
Currently inhaling/ swallowing	42	7.1	3.71 (1.11–12.38)	**0.033**	**19.29 (4.60–80.92)**	**<0.001**

Table 4 continued

Characteristic	N	% HIV	Univariate		Multivariate[b]	
			OR (95 % CI)	*p* value	aOR (95 %CI)	p value
Currently injecting	25	12.0	6.57 (1.91–22.64)	**0.003**	**63.58 (28.20–143.38)**	**<0.001**
Types of recreational drug use +++	2754					
Never	2559	2.0	1		1	***
Cannabis and others	117	1.7	0.84 (0.20–3.48)	0.808	2.90 (0.49–17.14)	0.239
ATS	47	14.9	8.44 (3.61–19.71)	**<0.001**	**28.87 (5.10–163.54)**	**<0.001**
Heroin	31	12.9	7.14 (2.41–21.15)	**<0.001**	**48.16 (25.23–91.90)**	**<0.001**
HIV risk self-assessment	1899					
Not at all likely to be infected	1100	2.6	1		1	***
Unlikely to be infected	297	1.7	0.91 (0.37–2.21)	0.828	0.42 (0.12–1.45)	0.170
Likely to be infected	424	1.7	1.88 (1.03–3.45)	**0.04**	**2.48 (1.00–6.18)**	**0.050**
Very likely to be infected	78	1.3	3.08 (1.24–7.63)	**0.015**	**3.76 (1.20–11.79)**	**0.023**
Syphilis-positive	2454					
No	2414	2.3	1		1	
Yes	40	10	4.77 (1.64–13.85)	**0.004**	**8.12 (2.59–25.53)**	**<0.001**
Urethral infection with either gonorrhea or Chlamydia	2164					
No	2029	2.5	1		1	
Yes	135	3.0	1.18 (0.42–3.33)	0.748	3.18 (0.71–14.24)	0.131

Full model includes: age, region, education level, occupation, marital status, income, having a religion, residing in the local area, whom currently living with, sexual identity, sexual role, number of male anal sex partners in past three months, ever engaging in sex with a foreigner in past 12 months, consuming alcohol before anal sex in past three months, condom use during anal sex in past three months, lubricant use during anal sex in past 12 months, drinking last month, recreational drug use, types of recreational drug use, self HIV risk assessment, syphilis, urethral infection with either gonorrhea or chlamydia (Four HIV cases previously tested for HIV were removed from the model)

N sample size; *OR* odds ratio; *aOR* adjusted OR; *CI* confidence interval; +++: recreational drug use was replaced by types of recreational drug use in the full model (to see the effect of types of recreational drug use on HIV)

***p for trend <0.05

[a] Having necessary HIV knowledge includes correct answers to the all 5 as below: 1. Having only one partner who is not infected HIV can reduce the risk of HIV infection; 2. Condom use can reduce the risk of HIV infection; 3. A healthy-looking person can be infected with HIV; 4. Mosquito bites do not transmit HIV; 5. Sharing food with PLWHIV does not transmit HIV

[b] Adjusted for cluster effect in the final model

Namibia, and Botswana [16] and China [17, 18]. Ever being married was associated with a lower likelihood of HIV, similar to that observed in China; unmarried and homosexual MSM who did not have female sex partners were six-fold more likely to be infected with HIV compared to married or non-homosexual MSM with a female partner(s) [15]. Both that study and ours found that unprotected anal intercourse among married MSM was lower than among those who had never married. The association between having a religion and HIV infection found in this study might be due to infected individuals seeking consolation with religion. However, it is possible that people may believe that their destinies are decided by God and therefore take fewer precautions. It has been shown that personal sexual behaviors and cultures are sometimes related to religion [19–21]. Hence, education about HIV transmission and prevention should be discussed with religious leaders so they can deliver appropriate messages to MSM and their partners or families.

Recreational drug use, especially injecting, was shown to be highly associated with HIV, consistent with a number of other studies [7, 8, 22, 23]. Drug injection was associated with a higher risk of HIV than inhalation, smoking, or swallowing drugs. The fact that those who had previously but no longer used drugs had higher rates of HIV infection suggests either under-reporting current drug use or quitting drug use when learning they were HIV-positive. The risk of HIV infection was different according to drug used: cannabis (lowest, OR = 2.9; not statistically significant), ATS (OR = 28.9), and heroin (highest, OR = 48.2).

Receptive anal intercourse was found to be an important risk factor for sexual HIV transmission in several studies [18, 24–26]. However, in our study, receptive anal intercourse was associated with a lower likelihood of HIV infection than for those who were exclusively or frequently insertive. This could be partly explained by a higher rate of recreational drug use (both injection and non-injection) in the "insertive" group than the "receptive" group in our study. Although a low proportion of MSM engaged in sex with foreigners, this was significantly associated with a higher risk of HIV infection. Another study amongst migrant MSM in Beijing, China found that having a foreign MSM friend was significantly associated with HIV infection [27]. It is possible that foreigners who have sex with Vietnamese MSM may have higher risks of HIV infection, since they may also have sex with other MSM in other countries where they travel. We also found that nearly half of MSM who had ever engaged in sex with a foreigner also had transactional sex with male or female clients. It has been reported in Hochiminh City and Hanoi that a foreigner pays much more for sex than local clients, and financial power influences decision-making about using condoms [28]. In that same study, MSM thought that not using condoms was a way to show hospitality to foreign clients.

Alcohol use was frequent among participants. Alcohol consumption immediately before having sex "sometimes" was significantly associated with a lower risk for HIV infection than "always". In fact, heavy alcohol use has been shown to be a risk for HIV infection [29], since it often leads to unsafe sex and a disregard for safe sexual behavior. In this study, condom use was protective for HIV; however, only "frequent condom use" was a significant protective factor. The role of condom use in protecting MSM from HIV infection has been shown in a number of studies [18, 30–32]. However, consistent condom use in our study was only 43.5 %, which is similar to that in other provinces in Vietnam [4], suggesting a need to expand and strengthen condom programmes for MSM in Vietnam. Condom use helps prevent both HIV and STIs. Self-assessment of their risk of HIV infection was associated with HIV infection, suggesting it is a good indicator for MSM at risk for HIV. It is possible that MSM recognize that they are at risk of HIV if they use drugs, engage in unsafe sex, and have multiple partners. Therefore, HIV risk perception may be a useful way to prioritize which MSM to target for intervention. Strengthening HIV education and counseling programs for MSM to increase their knowledge and awareness of HIV transmission and related risk behaviors may be beneficial.

STIs are recognized as a facilitating factor for HIV transmission [33, 34], although the prevalence of STIs among MSM in this study was not high, though possibly underestimated, since chlamydia and gonorrhea were only tested for in urine samples, not from rectal specimens. In this study, the prevalence of syphilis was low, but it was highly correlated with HIV infection. Syphilis may increase the risk of HIV transmission, because it shares the same sexual route of transmission, or is facilitated by HIV infection [15, 27, 35, 36]. Consistent condom use can effectively reduce sexual transmission of both HIV and STIs.

This study had certain limitations. The study population was very young and may not be representative of all MSM in the study area. Since "mapping" was used for the sampling frame, only those frequenting the mapped areas would be captured by mapping and be invited into the study. Perhaps the sampling strategy is why the majority of the participants identified as "bong kin" (non-transvestite gay). As such, it would be hard to generalize to MSM in Vietnam more broadly unless the proportion in this study is similar to others. However, the results here could be extrapolated to the gay population in southern Vietnam. Moreover, we do not know the refusal rates, since peer educators distributed the invitation cards to participants at each hotspot. It is possible that some MSM refused to participate and/or gave the invitation cards to other MSM who wanted to take part in the study. If the invitees and non-invitees differed in HIV prevalence and risk behaviors, the association could be under- or over-estimated. Moreover, sensitive topics such as drug use and anal sex might have been under-reported, and under-estimation of the association between these behaviors and HIV could have occurred. Last but not least, the cross-sectional design cannot define temporal relationships between exposures and HIV (a chronic infection).

Our findings suggest that recreational drug use is strongly associated with HIV infection among MSM in southern Vietnam. This is similar to findings among female sex workers in Vietnam, where drug use played a very important role in HIV transmission in this high-risk population [12, 37, 38]. This study also supports the evidence of the protective role of condom use in preventing HIV transmission among MSM. Consumption of alcohol, HIV risk self-assessment, and other risk factors found in the study may be useful for recognizing MSM groups with a higher risk for HIV for implementation of interventions.

HIV interventions among MSM should incorporate several components (health promotion, condom promotion, drug harm reduction programs, methadone maintenance treatment, and STI treatment) and address risk behaviors (inconsistent condom use, consuming alcohol and/or recreational drug use) and having a STI(s).

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