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Changes in HIV prevalence and sexual behavior among men who have sex with men in a northern Chinese city: 2002–2006

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Summary *Objective:* To examine HIV prevalence and sexual behavior changes among MSM in Harbin.
Methods: Three community-based cross-sectional surveys among MSM were conducted based on the same protocol and methodology in 2002, 2004 and 2006 in Harbin, China. Men who were eligible were interviewed with a standard questionnaire. Urine samples were collected to screen their HIV status.
Results: Among the MSM in Harbin, an increased trend was observed towards more self-identifying as homosexual (from 58% to 80%) and more living with a male partner (from 12% to 41%) over the study period. Although there was a trend towards a reduction in the rate of never using a condom and an increase in the rate of always using condoms during anal sex in the past six months, the prevalence of unprotected anal intercourse (UAI) was still at a high level (from 90% in 2002 to 72% in 2006). The HIV prevalence in 2006 (2.2%, 15/674) was higher than that in other study years, but no statistically significant change was detected.
Conclusions: Although an increase in condom use and a decline in drug use, STD infection and commercial sex have been monitored under current HIV prevention strategies, the MSM in Harbin is still highly vulnerable to HIV transmission given a high level of UAI and an increasing number of male sexual partners over the study period.

Introduction

China is facing an emerging HIV epidemic among men who have sex with men (MSM). This has been widely demonstrated in government documents and research findings.[1–4] The 2005

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national estimates indicated that there were approximately 650,000 people (a prevalence rate of 50 per 100,000) living with HIV/AIDS in China, of whom 7.3% were classified into the MSM risk category.[5] The HIV prevalence among MSM in some metropolitan areas is higher than that in the general population. For example, it was 3.1% in Beijing,[6] 1.7% in Guangdong (Southern China) and 1.2% in Shenyang (northern China).[3] Although the national HIV infection rate among MSM in China is relatively low compared with many other countries, even a small increase in infection rate may convert into a large number of people infected with HIV, given the huge size of the MSM population in China (currently estimated 20 million).[1,4,7–9] High risk behaviors such as unprotected anal intercourse (UAI) and multiple sexual partners and the deficiency of HIV preventive knowledge place the Chinese MSM at higher risk for HIV infection.[7–9]

Substantial changes in gay men's sexual behaviors have been observed internationally since the emergence of the HIV epidemic.[10–12] Recent studies have reported a resurgence of the HIV epidemic among the MSM[13] and an increase in high risk sexual behaviors and HIV/STI infections.[10–12,14,15] The HIV epidemic among MSM in China has been relatively neglected and only in recent years relevant education and intervention programs have been introduced as a part of HIV prevention strategies. Although the Chinese Central Government has been trying to conduct systematic comprehensive surveillance focusing on behavioral and HIV prevalence changes among the MSM in six Chinese cities since 2004, these surveillance sites are not functioning very well because of low quality of collected data, smaller sample sizes of participants and limitations of possible sampling methods. These surveillance results provide limited useful information to reflect the HIV epidemic and to evaluate the effect of current intervention programs in the MSM population. The purpose of this project was to examine whether there were any changes in risk behaviors and HIV prevalence among the MSM population in north China during the last five years following current HIV prevention strategies, and to provide evidence for developing, implementing and evaluating effective HIV prevention programs in China.

Methods

This study was conducted in Harbin—the capital of Heilongjiang Province in northern China with a population of 3.9 million in 2006—where a hot line supporting the gay population and a gay website have been established since 2004. In addition, peer education, outreach and condom promotion programs among MSM have been conducted sporadically.

Data collection

Based on the same protocol and methodology, three cross-sectional surveys were conducted in 2002, 2004 and 2006 among the MSM who socialized in gay venues across Harbin. The required sample sizes for each survey were calculated based on a standard formula.[16] In order to detect a 10% decrease in the prevalence of men who have had UAI in the past six months based on a 95% level of significance with 85% power assuming a design effect of 1.5, a minimum of 400 respondents were to be recruited in each survey. Men, who were over 18 years old, lived in this city for more than three months and have had anal or oral sex with other males in the past year, were invited to participate in the survey regardless of their sexual orientation. Given the limitation of the sampling method used in this project, the target population was limited to the MSM who frequently visit traditional gay venues such as gay bars, public bath houses or sauna centers, public toilets or parks, etc.

Before each field survey, a sampling frame was compiled of all gay-identified venues in Harbin, together with information on the average number of MSM visitors per day at each venue. Gay venues were divided into three groups: gay bars, clubs or gyms; sauna centers or bathhouses; and public toilets or parks. As there were only appropriately 20 gay venues in Harbin, all were enrolled in the sampling process for this study. Sampling from each of three groups was in proportion to their estimated visitor numbers. Within each group a continuous sampling method was used and respondents were recruited from all gay venues within the group until the sub-sample size was reached.

It took about two months for data collection in each round of field investigation. Potential MSM respondents were approached by trained peer recruiters and interviewers (health professionals). The written informed consent was recommended but the verbal was used as a substitute if participants disagreed to provide the written (most participants provided verbal consent). The men who were eligible and willing to participate were then interviewed by a health professional with a standard questionnaire. The questionnaire[7] elicited information on demographic characteristics (age, marital status, educational level, occupation, self-reported sexual orientation), knowledge and attitudes to HIV/AIDS, the number of male and female sexual partners in the previous six months, frequency of anal and vaginal sex in previous six months, condom use during anal (insertive and receptive sex), commercial sex (exchanging sex for money or exchanging money for sex), injecting drug use, HIV test history and lifetime history of sexually transmitted diseases, etc.

Respondents were also asked to provide, after their consent, 20 ml urine samples to screen their HIV status. HIV antibodies were tested repeatedly by HIV-1 Urine Enzyme-Linked Immunosorbent Assay (EIA) (Calypte Biomedical Corporation, Alameda, USA). No other test methods were used as other urine test methods were not available in China. The urine tests were analyzed in the HIV/AIDS confirmatory laboratory in Heilongjiang Province. Respondents who were willing to know their screen results were provided a card with their questionnaire ID number and a four-digit confidential number. After four weeks, results and post-test counseling were available at the specified Center for Disease Control and Prevention.

This study was approved by the University of Adelaide Australia Human Research Ethics Committee and the ethics committee of the National Centre for AIDS/STD Control and Prevention, Beijing, China.

Data analysis

Stata 9 was used for statistical analysis in this study.[17] Data analysis focused on the indicators which define the aspects

of behavior that are important to the spread of HIV, and behaviors that HIV prevention programs generally try to change.[16] Frequencies and medians for categorical and continuous variables respectively were calculated by year using chi-square tests or Kruskal–Wallis tests. To test for trends over time of categorical variables, chi-square tests for linear trend were used considering the year of survey as an ordered categorical variable. When a significant association was found between the year of survey and the key risk factors, a multivariate logistic analysis was performed using a model in which each key risk indicator was treated as independent variable. Year of survey was entered as a dummy variable. The adjusted odds ratios derived from these models measured the change from one year to the next after controlling for confounding factors. Confounding factors were variables that were significantly associated with both the dependent variable and the independent variable.[18] UAI was defined as the number of respondents who did not use a condom every time when they had anal sex with a male partner in the past six months divided by the total number of all participants.[16] The reverse of this indicator referred to those who had no anal sex or always used a condom during anal intercourse in the past six months.[16]

Results

Trends in demographic characteristics

A total of 1259 participants provided completed questionnaires: 215, 397 and 647 in 2002, 2004 and 2006, respectively. Significant demographic differences were observed over study years (Table 1). Participants recruited in 2004 were younger than the men recruited in 2002 and 2006. The median age in 2004 was 26 years old (range: 18–75 years), whereas it was 29 years (range: 18–67 years) in 2002 and 27 years (range: 18–69 years) in 2006. This may reflect the higher proportion of students being recruited in 2004: 25.4% were full-time students, while the proportions were 12.0% in 2002 and 17.7% in 2006. After stratifying the respondents into two groups: students and non-students, there were no significant differences in age across the three study years (Kruskal–Wallis test: $\chi^2 = 3.707$, $p = 0.1567$ for students; $\chi^2 = 1.455$, $p = 0.4832$ for non-students).

A significant trend was observed with an increasing proportion of MSM identified themselves as homosexual over the period 2002–2006 (Chi square test for linear trend, $\chi^2 = 30.53$, $p < 0.001$). Consistent with this, an increasing proportion of respondents were currently living with a male partner (Chi square test for linear trend, $\chi^2 = 65.89$, $p < 0.001$) (Table 1). After stratifying by student status, the increasing trends of living with a male partner across three years remained significant for both students and non-students (Chi square test for linear trend for students, $\chi^2 = 33.50$, $p < 0.001$; for non-students $\chi^2 = 38.95$, $p < 0.001$).

Trends in behavioral characteristics

Most respondents reported having more than one male sexual partner (multiple partners) in the past six months: 86.5% in 2002, 76.0% in 2004 and 91.6% in 2006. The proportion of men having anal sex with more than six partners in the past six months in 2006 was significantly higher than that in 2002 and 2004. No difference was detected between the 2002 and 2004 samples (Table 2). A decrease was observed in the proportion of men who reported having sex with women in the past six months. For the men recruited in 2002, around 42% had sex with women in the past six months, the prevalence decreased to approximately 20% in 2004 and 2006 ($p < 0.001$).

The proportion of the MSM who had anal sex in the last six months had been maintained at a high level over the study period: 94.3% in 2006, which was a little higher than those in 2002 (90.3%) and 2004 (93.1%). Using 2002 results as baseline, significant trends were observed in the use of condoms during insertive and receptive anal intercourse: the proportion of men who never used a condom during anal intercourse in the past six months decreased over the same period (Chi square test for linear trend: $\chi^2 = 52.49$, $p < 0.001$ for insertive anal intercourse; $\chi^2 = 37.34$, $p < 0.001$ for receptive anal intercourse). Consistent with this, the proportion of men who always used condoms during anal intercourse in the past six months increased significantly over the study period (Chi square test for linear trend: $\chi^2 = 29.26$, $p < 0.001$ for insertive anal intercourse; $\chi^2 = 13.46$, $p < 0.001$ for receptive anal intercourse) (Fig. 1). Using UAI as the indicator to reflect the risk of HIV for the study population, the prevalence among all participants in 2006 (71.5%) was still at a very high level (Fig. 1). In the multivariate analysis (Table 2), after adjusting for confounding factors, the decrease in the prevalence of UAI across three years was still significant. Using the 2002 study as baseline, decreasing trends were also observed in the proportion of men who had commercial sex experiences. In 2002, 20.3% of men paid for sex with male partners in the past six months, while the proportion decreased to around 12% in 2004 and 2006. Consistently, the proportion of men who exchanged sex for money with male clients in the past six months in 2002 (26.4%) was significantly higher than in 2004 (11.5%) and 2006 (12.9%).

Few MSM respondents from the three surveys reported having injected illegal drugs. The prevalence in injecting drug use tended to decrease: it was 6.1% in 2002 but the figure dropped to 0.2% in 2006. Very few respondents reported ever having shared needles. The prevalence of men who had a history of STD declined significantly in 2006 (10.2%) compared with the prevalence in 2002 (32.2%) and 2004 (19.0%).

HIV prevalence

There were 154 urine samples collected in 2002, 320 in 2004 and 674 in 2006 (26 respondents in 2006 agreed to provide samples for HIV tests but provided incomplete questionnaires). The HIV prevalence among the MSM in 2006 (2.2%) was higher than that in 2002 (1.3%) and 2004 (0.9%). However, no significant change was detected (Table 2).

Discussion

Data on MSM behaviors in China are scarce and the data that can track trends in risk behaviors and HIV prevalence are

Table 1 Demographic characteristics by year of survey

Demographic characteristics	2002		2004		2006		*P*
	$n = 215$		$n = 397$		$n = 648$		
	%	*n*	%	*n*	%	*n*	
Age							
≤20	13.7	28	12.0	47	11.8	76	
21–30	39.2	80	54.1	212	49.4	319	
31–40	34.8	71	25.0	98	21.2	137	
≥41	12.3	25	8.9	35	17.7	114	0.001
Education							
Junior high school or less	16.7	36	13.4	53	16.2	104	
Senior high school	40.5	87	31.8	126	42.4	273	
College	42.8	92	54.8	217	41.5	267	0.001
Occupation							
Student	12.0	25	25.4	90	17.7	100	
Others	88.0	184	74.6	264	82.3	465	0.001
Employment							
Employed	66.8	141	62.5	245	71.3	457	
Unemployed	33.2	70	37.5	147	28.7	184	0.013
Living with someone							
Living with a male partner	12.2	26	29.0	113	41.0	265	
Living with a female partner	1.87	4	1.0	4	1.6	10	
Single	86.0	184	70.0	273	57.5	372	0.001
Self reported sexual orientation							
Homosexual	58.2	124	74.9	290	79.4	510	0.001
Bisexual	34.3	73	17.8	69	16.8	108	0.001
Heterosexual	3.3	7	0.8	3	1.3	8	0.046
Undecided	4.2	9	6.5	25	2.5	16	0.008
Sexual preferences							
Only insertive anal	31.4	65	25.7	89	30.7	193	0.148
Only receptive anal	10.1	21	17.6	61	28.3	178	0.001
Both	48.8	101	49.7	172	35.2	221	0.001
Neither	9.7	20	6.9	24	5.7	36	0.203

Note: Values may not sum to totals because of missing data.

even rare. This paper filled the gap and studied the changes in HIV prevalence and sexual behavior among the MSM in Harbin over three time points. Our findings indicate that the MSM increasingly identify themselves as homosexual and accordingly more are choosing to live with a male partner over the study period. Although Chinese MSM are still facing serious social problems such as stigmatization, social pressure to marry and raise a family,[4,8] there is no doubt the Chinese society is becoming more tolerating to homosexuality. Persecution from police under anti-hooliganism laws, losing employment or being targets of blackmail and discrimination from health providers are less likely to happen in the current Chinese society. This may be the reason why MSM are becoming more open and clear about their sexual orientation in the investigation. However, no direct measures on experience of discrimination or perceived legal and social acceptance are collected in this study. The relationship between openness of being homosexual and social acceptance should be tested in future research.

The increasing trend of self-identifying as homosexual and the decline in bisexuality may serve as good signs in the context of HIV prevention. Usually homosexual men are more likely to choose to live with a male partner and less likely to have sex with females. This study showed that compared with 2002, the proportion of men who had sex with women in the past six months decreased significantly in 2004 and 2006. These changes are helpful in reducing the bridging role of the MSM population—the possibility of HIV spread from the risky MSM population to a wider population of women and their other male partners.[7] Creating a liberal society and encouraging gay men to have stable relationships might be regarded as a possible and effective option for the prevention of HIV transmission in China.

The majority of MSM in Harbin are sexually active. Most respondents reported having more than one male sexual partner in the six months prior to the survey. Around half had more than six partners in the past six months. In particular, the men recruited in 2006 were two times more likely to have had more than six sexual partners in the six months prior to the study than the samples in 2004. Some studies have indicated that the MSM are avid users of the Internet to look for sexual partners and the Internet has emerged as a new high risk meeting place for MSM.[19–23] In China the number of people accessing the Internet has been increasing dramatically over years and more than 200 gay websites have been developed in 2005.[24] The ease of

Table 2 Logistic regression analysis of changes in key risk indicators among MSM in Harbin, 2002—2006

Key indicators	2002		2004		2006		2004 vs. 2002		2006 vs. 2004		Confounding factors[b]
	%	*n*	%	*n*	%	*n*	AOR (95% CI)[a]	*p*	AOR (95% CI)	*p*	
Self identified as homosexual	58.2	124	74.9	290	79.4	510	1.59 (1.08, 2.34)	0.019	1.20 (0.86, 1.66)	0.278	A B C
Living with a male partner	12.2	26	29.0	113	41.0	265	2.39 (1.44, 3.99)	0.001	1.97 (1.45, 2.66)	0.001	A B D
Having sex with women in the past six months	41.9	90	24.7	98	25.0	162	0.57 (0.38, 0.84)	0.004	1.68 (1.11, 2.54)	0.013	A B C D
Having ≧6 sexual partners in the past six months	50.7	109	49.6	197	56.5	366	0.89 (0.58, 1.35)	0.570	2.12 (1.61, 2.78)	0.001	A B C D F G
Insertive anal intercourse in the past six months											
Never used a condom	41.8	71	32.5	86	14.8	63	0.65 (0.42, 1.03)	0.067	0.36 (0.24, 0.56)	0.001	A E F G
Always used a condom	16.5	28	21.1	56	36.5	155	1.12 (0.63, 1.98)	0.701	0.58 (0.41, 0.82)	0.002	A E G
Receptive anal intercourse in the past six months											
Never used a condom	48.4	59	33.1	79	21.4	87	0.48 (0.29, 0.81)	0.002	0.43 (0.28, 0.65)	0.001	A D E F G
Always used a condom	13.9	17	22.2	53	29.1	118	1.84 (0.94, 3.64)	0.077	1.63 (1.07, 2.49)	0.023	A E F G
Unprotected anal intercourse[c]	89.7	153	81.4	248	71.5	405	0.82 (0.46, 1.46)	0.503	0.56 (0.39, 0.78)	0.001	E
Exchanging sex for money in the past six months	21.3	45	7.5	29	5.6	36	0.34 (0.20, 0.59)	0.000	0.81 (0.47, 1.40)	0.444	A
Exchanging money for sex in the past six months	22.6	48	11.2	43	11.4	73	0.28 (0.17, 0.48)	0.000	0.93 (0.58, 1.49)	0.767	A
Injection drug use	6.1	13	2.1	8	0.2	1	0.30 (0.12, 0.75)	0.011	NA	NA	—
STD history	32.2	68	19.0	74	10.2	65	0.52 (0.34, 0.79)	0.002	0.43 (0.29, 0.63)	0.001	A B
HIV prevalence	1.3 (2/154) CI (0.2, 4.5)		0.9 (3/320) CI (0.2, 2.7)		2.2 (15/674) CI (1.3, 3.6)		—	—	—	—	—

[a] AOR, adjusted odds ratio; CI, confidence interval.

[b] Confounding factors included A: age (≦30 vs. ≧31); B: living with a male partner (yes vs. no); C: students (yes vs. no); D: sexual orientation (homosexual vs. heterosexual, bisexual and undecided); E: having ≧6 sexual partners in the past six months (≧6 vs. <6); F: exchanging sex for money in the past six months (yes vs. no); and G: exchanging money for sex in the past six months (yes vs. no).

[c] Derived by dividing the number of men who did not always use condoms during anal sex by all participants.

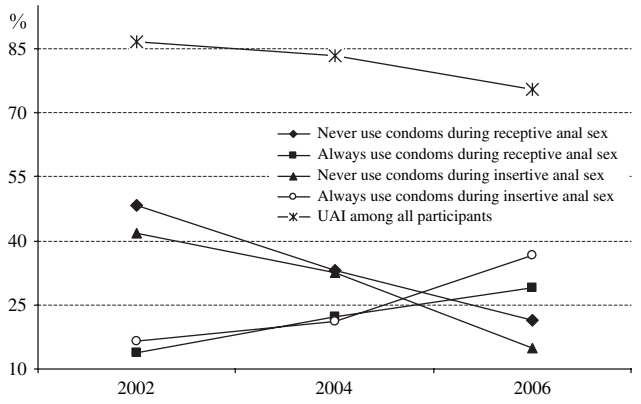

Figure 1 Percent of MSM reporting condom use during anal sex with males in the past six months in Harbin: 2002—2006.

seeking sexual partner through the Internet may be one contributor to the increasing number of sexual partners. No studies, however, have been conducted to explore the role of the Internet in the sex seeking process among the Chinese MSM population. This merits further investigation.

The results of this study did show encouraging trends in the reduction of risk behaviors. The proportion of MSM who always use condoms during anal sex has been continually increasing over the study period and there is a significant drop of men who never use condoms during anal intercourse. However, the MSM population in Harbin is still highly vulnerable to HIV infection. In addition to those who never used condom, there are still more than 50% of respondents who use condom sometimes (but not always). There is little evidence that using condoms sometimes provides any greater protection than not using condoms at all. A study conducted in Uganda, for example, found that those who sometimes used condoms were at higher risk of infection than those who never used them, perhaps because they were more risky in other aspects of their sexual behaviors, such as the number of partners they had.[25] Clear evidence has been documented among the MSM and female sex workers that people can be convinced to use condoms.[26,27] Therefore, effective condom promotion strategies are critically necessary to convince MSM to use condoms consistently in China.

The proportion of MSM who exchanged sex for money in the past six months has been decreasing in Harbin over the study period. In 2006 about 13% of respondents engaged in commercial sex in the six months prior to the survey. A similar cross-sectional study conducted in Beijing in 2004 found that nearly one in four men sampled reported receiving money form men for sex in the past six months.[7] According to our research experience, there were not many ''professional'' male sex workers in China in 2002 and the entertainment establishments were relative simple at that time. Gay men might exchange sex for money occasionally. In 2006 in some provincial capital cities of China, there has been a burgeoning of the hospitality and entertainment industry where male and female sex services are provided. These male sex workers are even more difficult to reach than the regular MSM population.[7] This selection bias might partly contribute to the decline in the prevalence of male commercial sex behaviors as observed in this study. Several studies have also indicated that the MSM who trade sex for money were more likely to engage in UAI.[1,7] Male sex workers, so called ''money boys'' in China, rarely insist on condom use when given extra money. This sub-population carries a higher risk for HIV transmission. Since men selling sex to men have been becoming an identifiable population in China,[15] separated and tailored prevention and intervention should be developed immediately for this specific population.

Although high risk sexual behaviors make the MSM population vulnerable to HIV/AIDS, the HIV prevalence among them in Harbin has remained at a relatively lower level. This was similar to several other surveys in China (Gaungzhou-1.7%, Shenyang-1.2%, Beijing-3.2%).[3] Why is the HIV prevalence still low among MSM in China while high-risk sexual behaviors are so popular among them? Perhaps it is because injecting drug use is not widely common in this specific population, at least not in Harbin. China's HIV/AIDS epidemic follows a chain of transmission similar to several Asian countries,[28] where an HIV epidemic occurs initially among injection drug users (IDUs), followed by the spread among Female Sexual Workers (FSWs). As the next link in the chain, clients of the FSWs then can transmit the virus to their female partners and to the general population. The small overlap between the MSM and the IDUs may slow the rate of HIV transmission from the IDUs to the MSM. Our study results indicate that few MSM respondents ever injected drugs in Harbin. This may raise concerns about the HIV transmission among the MSM in western China (e.g. Yunnan and Xinjiang Provinces) where injecting drug use is a serious issue.

The low prevalence of injecting drug use also indicates that currently male-male sex transmission may be the main mode of HIV transmission among the MSM in Harbin. The extent of decreasing risk behaviors seems to be not significant enough to prevent new infections, although not statistically significant difference was found in the HIV prevalence across the study years. Given the high rate of UAI and high number of male sexual partners in this population, HIV infection rates will continually spread unless effective prevention measures are implemented.[1,6,15] In this study we have noticed that six HIV positives in 2006 were recruited from the same gay bar. The chain of HIV transmission might have been established across them through risky sexual activities.

Limitations

Limitations of this project should be acknowledged. The sample sizes varied across three surveys. Only 215 men participated in 2002, when homosexual activities were facing strong social pressure in China, which made the MSM population very difficult to reach .[29—31] The social atmosphere has been much easier in recent years along with the appearance of open and semi open gay-gathering places as well as AIDS education and care support programs for gay men in China.

The sampling method used in this project is another important issue. In order to reduce the impact of different types of gay venues on behaviors, gay venues were divided into three groups and sampling from each of these groups was in proportion to their estimated visitor numbers.

However, a convenient sampling design was used within each group of gay venues. Although all gay venues in the city were enrolled in the sampling process, only those MSM who visit these venues could be reached. Therefore the target population can only refer to the MSM who frequent gay venues and the results cannot be generalized to the total MSM population in the study area. We have noticed that the types and distribution of gay venues in this city have remained relatively stable. This may reduce the bias caused by the convenient sampling method within each group of gay venues. As mentioned before that seeking sex on the Internet has been increasingly popular among the MSM population in China, we are conducting an online survey to describe the use of the Internet and to compare the difference between the online and venue-based MSM populations (this will be reported elsewhere). This may provide extra evidence to understand the risk for HIV of MSM in northern China. Some other sound sampling techniques such as respondent driven sampling could also be used in further studies.

Exposure to HIV/AIDS interventions has not been evaluated in this project. This should be performed in future studies in order to clarify whether exposure to an intervention program may plausibly have contributed to any observed behavioral changes.

Another limitation of this study is that the measure of condom use during anal sex was not analyzed by distinguishing between regular and non-regular partners.[16] Defining a regular partner was very difficult in the context of male-male sex has been clandestine and stigmatized in China. In addition, only a small proportion of MSM (12%) had steady partners in 2002. Since a gradually increase in the proportion of living with a male partner has been observed, distinguishing risk behaviors between regular and non-regular partners will be considered in further surveys.

Conclusion

These systematic cross-sectional surveys indicate that there have been behavioral changes among the MSM in Harbin over the study period 2002—2006. An increasing proportion of MSM identifies themselves as homosexual and has a steady relationship with a male partner. The prevalence of consistent condom use in anal sex has been increasing gradually and fewer people never use a condom in anal sex. The MSM population in Harbin, however, is still highly vulnerable to HIV transmission in view of a high level of UAI and an increasing number of male sexual partners. The HIV prevalence in this population remains at a low level and currently male-male sex is the main HIV transmission mode. HIV infection rates might increase unless effective prevention measures are implemented and strengthened to match the scope of the potential AIDS epidemic.

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