

HIV Testing Among Men Who Have Sex with Men in China: A Systematic Review and Meta-Analysis

Huachun Zou, Nan Hu, Qianqian Xin & Jack Beck

AIDS and Behavior

ISSN 1090-7165

Volume 16

Number 7

AIDS Behav (2012) 16:1717-1728

DOI 10.1007/s10461-012-0225-y



Your article is protected by copyright and all rights are held exclusively by Springer Science+Business Media, LLC. This e-offprint is for personal use only and shall not be self-archived in electronic repositories. If you wish to self-archive your work, please use the accepted author's version for posting to your own website or your institution's repository. You may further deposit the accepted author's version on a funder's repository at a funder's request, provided it is not made publicly available until 12 months after publication.

HIV Testing Among Men Who Have Sex with Men in China: A Systematic Review and Meta-Analysis

Huachun Zou · Nan Hu · Qianqian Xin ·
Jack Beck

Published online: 8 June 2012
© Springer Science+Business Media, LLC 2012

Abstract HIV testing among men who have sex with men (MSM) in China has not been well studied. We systematically reviewed studies addressing HIV testing among MSM in China and conducted a meta-analysis on testing indicators before and after the adoption of China's National Plan for HIV/AIDS Prevention and Control among MSM in 2007. Rate of lifetime HIV testing (24 % [period 1—before adoption] vs. 47 % [period 2—after adoption]) and testing in the past 12 months (21 vs. 38 %) were both significantly higher in period 2. Rate of lifetime pre-test counseling showed a significant increase from period 1 to period 2 (72 vs. 90 %), while the figure for the past 12 months pre-test counseling did not change (51 vs. 50 %). More efforts are needed to promote frequent HIV testing among MSM.

Resumen Pruebas de VIH en HSH en China no han sido bien estudiadas. Sistemáticamente hemos revisado estudios dirigidos a pruebas de VIH en HSH en China y hemos conducido un meta-análisis sobre los indicadores antes y después de la adopción del Plan Nacional chino para la Prevención y Control de VIH/SIDA en HSH en 2007. La tasa de pruebas de vida de VIH (24 % [periodo 1 – antes de la adopción] vs. 47 % [periodo 2 – luego de la adopción]) y pruebas en los pasados 12 meses (21 vs. 38 %) son significativamente más altos en el periodo 2. La tasa de consejería de vida antes de la prueba mostró un significativo incremento del periodo 1 al periodo 2 (72 vs. 90 %), mientras que la figura por los pasados 12 meses de consejería previo a la prueba no cambió (51 vs. 50 %). Más esfuerzos son necesarios para promover las pruebas frecuentes de VIH en HSH.

Keywords Men who have sex with men (MSM) · HIV · Testing · Counseling · China

Electronic supplementary material The online version of this article (doi:10.1007/s10461-012-0225-y) contains supplementary material, which is available to authorized users.

H. Zou (✉)
Sexual Health Unit, School of Population Health, University of Melbourne, 580 Swanston Street, Carlton, VIC 3053, Australia
e-mail: rolfe1234@gmail.com

N. Hu
National Center for Noncommunicable and Chronic Disease Control and Prevention, Chinese Center for Disease Control and Prevention, Beijing, China

Q. Xin
National Center for AIDS/STD Control and Prevention, Chinese Center for Disease Control and Prevention, Beijing, China

J. Beck
Global Forum on MSM & HIV (MSMGF), Oakland, CA, USA

Introduction

HIV Among MSM in China

China has a large population of men who have sex with men (MSM). The latest national population census showed that there are 480 million males aged 15–59 in China [1]. Available research indicates that about 2–5 % of sexually active Chinese males have had sex with another man at least once in their lives, indicating a population of between 9.6 and 24 million people [2]. HIV rates among MSM in China are high and climbing. In 2009, the estimated HIV prevalence among MSM nationwide was 5 %, far exceeding the general population prevalence rate of 0.05 %

[3]. In large cities like Chengdu and Kunming, the HIV prevalence among MSM has already surpassed 9 % [4–6]. In Chongqing, it rose from 8.5 % in 2007 [4] to 16.8 % in 2009 [7]. According to the Chinese Ministry of Health, MSM currently account for 32 % of the accumulated 740,000 cases of HIV/AIDS in China [8].

Importance of Frequent HIV Testing Among MSM

Frequent HIV testing has been shown to be an effective strategy for reducing rates of HIV infection among MSM. Current guidelines in well-resourced countries like the United States and Australia recommend that MSM get tested for HIV at least once a year. For MSM with particularly high risk behaviors (engaging in unprotected anal sex, having 10 or more sex partners, attending sex-on-premises venues, use of recreational drugs, or seeking sex partners via the Internet), the guidelines recommend HIV testing every 3–6 months [9, 10]. Frequent testing creates opportunities for early detection of infection, which allows for an early link to social services and medical care. This helps to avoid the irreversible damage to the immune system that can be done if HIV is left unchecked until one develops recognizable symptoms. Early diagnosis also helps to prevent the spread of HIV, as people living with HIV who know their status are more likely to take protective measures to avoid passing on the virus [11].

In 2007, the Chinese government adopted the *Plan for HIV/AIDS Prevention and Control among Men Who Have Sex with Men in China, 2007–2010* (the Plan) [12] in response to the State Council's *China HIV/AIDS Containment, Prevention and Control Action Plan (2001–2005)*. Among its many objectives, the Plan called for increased cross-sector collaboration for HIV prevention, improved health education and specialty clinics, capacity building for volunteer groups, implementation of the Four Frees and One Care policy, and enhanced HIV testing among MSM.

To scale up HIV testing services for MSM, the Plan called on local centers for disease control and prevention (CDC) at all levels to establish HIV testing and counseling models contextualized to the features of MSM; provide technical support in training counselors; promote rapid testing and improve the quality of HIV testing and counseling services; designate 1–2 local voluntary counseling and testing (VCT) venues to provide HIV testing and counseling for MSM; and improve pre- and post-test counseling on a voluntary and confidential basis. It also called on MSM groups to work with CDCs to establish appropriate HIV testing and counseling models and to carry out HIV counseling, psychological support and referral services. The ultimate goal of the plan was to achieve a coverage of 85 % of the MSM population with HIV counseling and for the HIV testing rate to reach 60 %

among MSM who participate in counseling by the end of 2010.

HIV Testing Among MSM in China

HIV testing among MSM in China has not been well studied up to this point. A strong understanding of the current status of HIV testing among MSM is an essential component of any effective strategy to reduce HIV transmission among this population.

This article details the results of a systematic review of all published studies on HIV testing among MSM in China, including studies written in English and Chinese. This article also includes a meta-analysis of seven different groups of data over two distinct time periods. The data groups include (1) rates of lifetime HIV testing, (2) rates of HIV testing in the past 12 months, (3) rates of lifetime HIV counseling, (4) rates of HIV counseling in the past 12 months, (5) rates of lifetime retrieval of test results, (6) rates of retrieval of test result in the past 12 months, and (7) rates of knowledge of testing venue. Available data on post-test counseling was not sufficient to be included in this analysis. The two time periods compared were labeled period 1, from January 2000 up to the adoption of the Plan in 2007, and period 2, from the adoption of the Plan until July 2011 (January 2008–July 2011). Studies carried out in the year 2007 were included as belonging to period 1, as they were unlikely to be affected by the adoption of the plan.

Methods

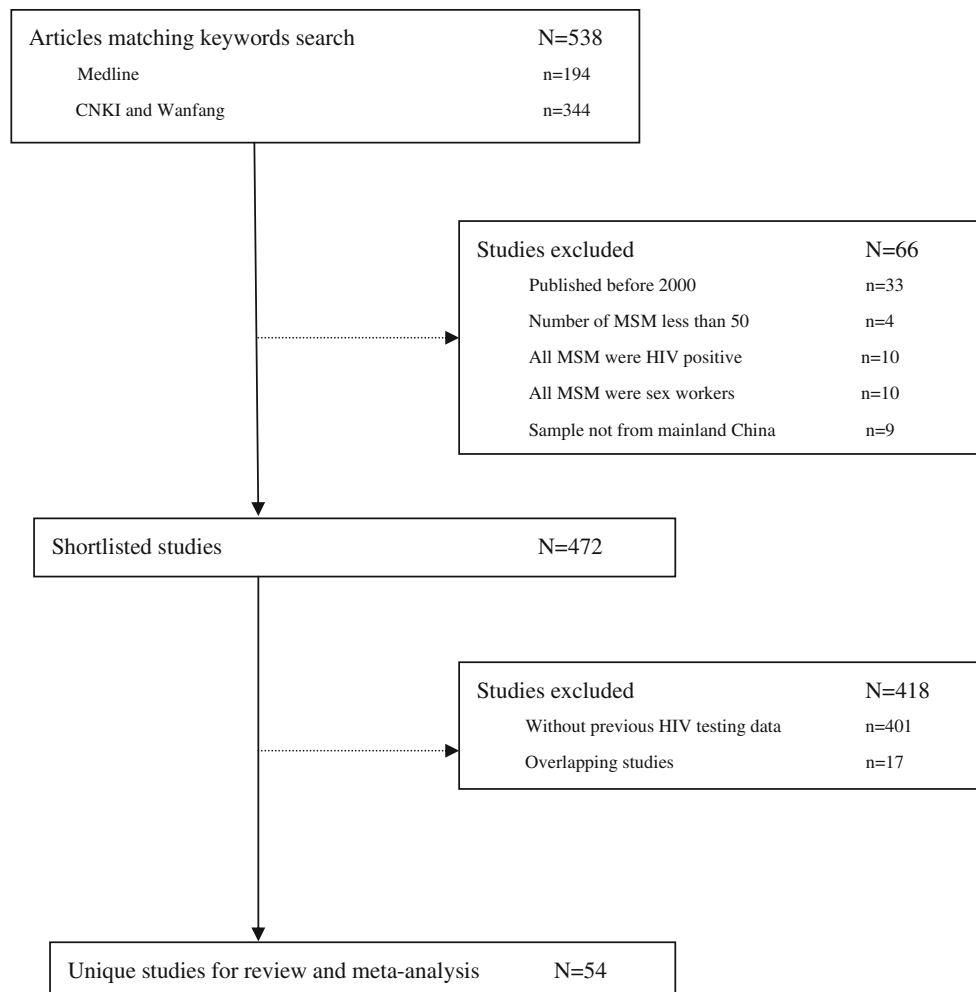
Literature Review

We conducted a systematic review by searching for English articles from the MEDLINE database and Chinese articles from the China National Knowledge Infrastructure (CNKI) and Wanfang Data. Keywords used in the database search included (“homosexual” or “gay” or “bisexual” or “men who have sex with men” or “MSM”) and “testing” and “China” in MEDLINE; (“Tong Xing Lian (homosexual)” or “Tong Zhi (gay)” or “Shuang Xing Lian (bisexual)” or “Nan Nan Xing Xing Wei/Nan Nan Xing Jie Chu (men who have sex with men or MSM)” and “Jian Ce (testing)” in CNKI and Wanfang Data.

Study Selection

Studies were selected if they met the following criteria: published between January 2000 and July 2011; reported rates of previous HIV testing among MSM; reported study location, period and sample size. We excluded studies that included fewer than 50 subjects; studies where all samples

Fig. 1 Selection procedure and outcome of systematic review for studies of previous HIV testing among MSM in China



were HIV positive; studies where all samples were HIV negative; studies where all samples were sex workers; and studies that included samples from locations outside mainland China. When a study was not cross-sectional, we only used baseline data. When a study was a randomized control trial, we used control data. If a study was case-control, we only used the controls. For detailed selection procedure please see Fig. 1.

Data Extraction

For all eligible studies, information was extracted about the study design, previous HIV testing history, pre-testing counseling and knowledge of testing venue among MSM. This data was further categorized into one of the two time periods established. Meta-analyses were performed on data associated with the prevalence of previous HIV testing.

Statistical Methods

STATA 11 (StataCorp, College Station, TX, USA) was used to assess publication bias and heterogeneity and to

conduct a meta-analysis on the prevalence of previous HIV testing. Data were stratified by period of time. The Begg's test was used to measure the potential presence of publication bias [$(P < 0.05)$ on the Kendall's score indicates statistically significant publication bias]. Random effects models were used for meta-analysis. Q test was used to test the heterogeneity between studies [$(P < 0.10)$ was considered indicative of statistically significant heterogeneity], and the I^2 statistic (values of 25, 50 and 75 % were considered to represent low, medium and high heterogeneity, respectively) was used to assess the level of heterogeneity. Meta regression was used to test for differences between variables in the two periods.

Results

Overview of Included Studies

We included 54 unique studies [7, 13–65], 14 of which were published in English and 40 of which were published in Chinese. Thirty-six studies were carried out before and

during 2007, and 18 were carried out afterward. Forty-five studies were conducted in a single province and nine were conducted in two provinces or more. Fifty studies were cross-sectional, three were randomized control trials and one was a cohort study. Eighteen studies used convenience sampling (CS), seven used respondent driven sampling (RDS), 15 used snowball sampling (SS), 2 used peer referring (PR), 1 used internet and 11 others used mixed sampling methods. Most (44, 81.5 %) studies provided age range and 14 (25.9 %) provided median age of participants. Median age was under 30 years in most studies (13, 92.9 %).

Twenty-seven studies reported rate of lifetime HIV testing; 22 reported rate of HIV testing in the past 12 months; 2 reported rate of HIV testing in the past 6 months; 2 reported rate of HIV testing in the past 3 months and 1 reported rate of HIV testing in the past month. Table 1 presents a summary of the 54 studies selected for inclusion.

HIV Testing and Counseling

The meta-analysis indicated that the rate of lifetime HIV testing increased significantly, from 24 % in period 1 to 47 % in period 2 ($P = 0.001$). Rate of HIV testing in the past 12 months also increased significantly, from 21 % in period 1 to 38 % in period 2 ($P = 0.005$) (Fig. 2).

Of the MSM who had previously tested for HIV, the rate of lifetime retrieval of test results among MSM experienced a statistically insignificant decrease from 85 % in period 1 to 82 % in period 2 ($P = 0.879$) and the rate of testing in the past 12 months also experienced a statistically insignificant decrease, from 92 % in period 1 to 90 % in period 2 ($P = 0.561$) (Fig. 2).

Six studies reported lifetime number of HIV tests among MSM. In four of the studies, the median number of HIV tests taken over one's lifetime among MSM was 1. In the remaining two studies, the median number of lifetime HIV tests was 2. Two studies reported number of HIV tests taken over the past 5 years. In one study, among MSM (median age 25) who had a sexual history of 5 years or more, 56 % had been tested for HIV over the past 5 years, and the median number of tests received was 2. The other study also reported the median number of HIV tests taken in the past five years to be 2.

Rate of lifetime pre-test counseling among MSM increased significantly from 72 % in period 1 to 90 % in period 2 ($P = 0.028$). However, pre-test counseling in the past 12 months experienced a statistically insignificant decrease from 51 % in period 1 to 50 % in period 2 ($P = 0.793$) (Fig. 2).

Three studies reported median amount of time that had passed since last HIV testing, ranging from 8 to 12 months.

Knowledge of HIV Testing Venue

The rate of MSM that knew the location of at least one testing venue increased from 55 % in period 1 to 75 % in period 2 ($P = 0.143$), although this increase was not statistically significant (Fig. 2).

Heterogeneity and Publication Bias

High heterogeneity was detected in the following groups of studies: studies with rates of lifetime HIV testing in both periods (period 1: $I^2 = 97.7$ %, $P = 0.000$; period 2: $I^2 = 97.1$ %, $P = 0.000$), studies with rates of HIV testing in the past 12 months in both periods (period 1: $I^2 = 99.0$ %, $P = 0.000$; period 2: $I^2 = 97.4$ %, $P = 0.000$); studies with rates of lifetime retrieval of test results among MSM in period 1 ($I^2 = 93.1$ %, $P = 0.000$); studies with rates of retrieval of test results in the past 12 months among MSM in period 2 ($I^2 = 73.2$ %, $P = 0.000$); and studies with rates of knowledge of testing venue in period 1 ($I^2 = 96.3$ %, $P = 0.000$). Publication bias was found in only 1 group: studies with rates of lifetime HIV testing in period 1 ($P = 0.016$) (Fig. 2).

Discussion

To our knowledge, this is the first systematic review of literature on HIV testing and counseling among MSM in China. The review reveals that rates of both lifetime HIV testing (24 % in period 1 and 47 % in period 2) and HIV testing in the past 12 months (21 % in period 1 and 38 % in period 2) among MSM have increased since the implementation of the *National Plan for HIV/AIDS Prevention and Control among MSM*. However, despite these gains, rates of testing among MSM remain unacceptably low, failing to meet the Plan's target rate of 60 % [12] by 2010. In addition, the review showed that the rate of lifetime retrieval of test results in period 2 had only reached 82 %, meaning that of the few of MSM that do get tested. This suggests that nearly 20 % of them remain unaware of their status.

The low rates of testing and retrieval among this population have led to a significant number of MSM living with HIV who do not know that they are HIV-positive. For example, in a study of 429 MSM in Beijing and Urumqi in 2007, 87.5 % of the HIV-positive participants had tested negative at their last test. Among the HIV-positive MSM who had never tested for HIV or who had a negative result at last HIV test, 44 % reported perception of very low or no risk of HIV infection [26]. Low risk perception has been correlated with higher levels of unprotected sex in a number of settings. Research has indicated that people who are unaware of their HIV infection can be over three times

Table 1 Studies reporting HIV testing and counseling among MSM in China

First author, publish year	Baseline period	Location	Study design	Sampling method	Age range (median)	Sample size	Proportion knowing testing venue, n/N ^a	Period ^b	Proportion previous HIV test, n/N	Proportion previous counseling before test, n/N	Proportion receiving test result, n/N	Median no. lifetime HIV testing	Median time from last HIV testing (months)
Zhang, 2001 [34]	1999	31 Provinces	CS	CV	n/a	729	n/a	Lifetime	62/729	n/a	n/a	1	8
Qu, 2002 [32]	2001	Heilongjiang	CS	CV	16–67 (29)	215	n/a	Lifetime	25/213	n/a	n/a	1	n/a
Shi, 2003 [33]	2001	30 Provinces	CS	CV	n/a	1,094	n/a	1 Year	44/1094	n/a	n/a	n/a	n/a
Zhang, 2003 [36]	2001	30 Provinces	CS	CV	21–57 (32)	1,109	n/a	Lifetime	69/1109	n/a	n/a	n/a	n/a
Choi, 2006 [27]	2001–2002	Beijing	CS	PR	18–69 (25)	482	212/482	Lifetime	88/481	n/a	n/a	1	n/a
Lan, 2004 [30]	2003	Sichuan	CS	CV	n/a	580	n/a	1 Year	105/575	n/a	n/a	n/a	n/a
He, 2006 [28]	2004	Guangzhou	CS	CV	16–66 (n/a)	201	n/a	p 6 mths	16/201	n/a	n/a	n/a	n/a
Li, 2005 [31]	2004	Shangdong	CS	CV	19–59 (n/a)	79	29/79	1 Year	7/79	n/a	4/7	n/a	n/a
Zhang, 2007 [35]	2004	6 Big cities	CS	SB	15–72 (25)	1,389	n/a	Lifetime	251/1389	n/a	n/a	1	12
Lai, 2006 [29]	2004–2005	Shenzhen	CS	CV	15–57 (n/a)	203	n/a	Lifetime	110/203	n/a	n/a	n/a	n/a
Ning, 2006 [43]	2004–2005	Shanghai	CS	RDS	18–56 (26)	477	n/a	Lifetime	74/475	n/a	n/a	n/a	n/a
Chen, 2007 [38]	2005	Hangzhou	CS	SB	18–70 (n/a)	365	240/365	Lifetime	105/365	70/105	70/105	n/a	n/a
Xing, 2008 [46]	2005	Changsha	CS	CV	14–64 (n/a)	372	217/372	Lifetime	45/372	n/a	n/a	n/a	n/a
Zhu, 2007 [52]	2005	Hefei	CS	RDS, PR, IN	18–29 (n/a)	122	n/a	Lifetime	23/122	n/a	n/a	n/a	n/a
Ma, 2007 [42]	2005	Beijing	CS	RDS	n/a	427	n/a	Lifetime	75/427	n/a	n/a	n/a	n/a
	2006				n/a	540	n/a	Lifetime	170/540	n/a	n/a	n/a	n/a

Table 1 continued

First author, publish year	Baseline period	Location	Study design	Sampling method	Age range (median)	Sample size	Proportion knowing testing venue, n/N ^a	Period ^b	Proportion previous HIV test, n/N	Proportion previous counseling before test, n/N	Proportion receiving test result, n/N	Median no. lifetime HIV testing	Median time from last HIV testing (months)
Zhang, 2008 [48]	2005–2006	9 Big cities	CS	SB	13–78 (n/a)	2,250	n/a	Lifetime	538/2186	n/a	n/a	n/a	n/a
Cai, 2008 [37]	2006	Zhejiang	CS	CV	16–46 (25)	152	120/149	Lifetime	64/149	50/64	52/64	n/a	n/a
Chen, 2008 [39]	2006	Nanning	CS	PR, IN	18–45 (n/a)	185	n/a	Lifetime	39/185	n/a	36/39	n/a	n/a
Dou, 2007 [40]	2006	Changchun	CS	SB	16–59 (25)	408	n/a	1 Year	34/408	19/34	29/34	n/a	n/a
Fu, 2007 [41]	2006	Shaoxing	CS	SB	19–41 (n/a)	55	n/a	Lifetime	11/55	n/a	n/a	n/a	n/a
Tao, 2007 [45]	2006	Shandong	CS	SB	16–82 (23)	1,617	n/a	1 Year	488/1617	n/a	451/488	n/a	n/a
Tang, 2007 [44]	2006	Harbin	CS	n/a	18–69 (27)	647	n/a	Lifetime	84/647	n/a	n/a	n/a	n/a
Zhang, 2008 [49]	2006	Jinan	CS	CV	17–66 (n/a)	656	n/a	Lifetime	203/656	n/a	n/a	n/a	n/a
Zhang, 2010 [50]	2006	Anhui	IE	RDS	18–61 (24)	218	n/a	p 2 mths	33/218	n/a	n/a	n/a	n/a
Zhou, 2008 [51]	2006	Guiyang	CS	n/a	15–49 (n/a)	406	n/a	1 Year	96/406	n/a	n/a	n/a	n/a
Zeng, 2009 [47]	2006	18 Big cities	IE	SB	≥ 18 (n/a)	5,178	n/a	1 Year	973/5170	n/a	n/a	n/a	n/a
Feng, 2009 [14]	2006	Chongqing	CS	SB	15–68 (n/a)	1,000	n/a	Lifetime	189/1000	130/189	n/a	n/a	n/a
Ruan, 2009 [19]	2007	Beijing	PC	CV	n/a	1,044	na	Lifetime	368/1044	n/a	n/a	n/a	n/a
Wang, 2007 [21]	2006–2007	Taiyuan	CS	SB	18–62 (26)	541	n/a	Lifetime	243/507	n/a	n/a	n/a	n/a
	2006–2007	Taiyuan	CS	SB	17–54 (24)	98	n/a	Lifetime	17/98	n/a	n/a	n/a	n/a

Table 1 continued

First author, publish year	Baseline period	Location	Study design	Sampling method	Age range (median)	Sample size	Proportion knowing testing venue, n/N ^a	Period ^b	Proportion previous HIV test, n/N	Proportion previous counseling before test, n/N	Proportion receiving test result, n/N	Median no. lifetime HIV testing	Median time from last HIV testing (months)
Xiao, 2009 [24]	2006–2007	Chongqing	CS	PR, IN, SB	18–68 (n/a)	1,692	n/a	Lifetime	500/1692	375/500	n/a	n/a	n/a
Nong, 2010 [18]	2007	Nanning	IE	CV	n/a	230	n/a	1 Year	65/230	n/a	n/a	n/a	n/a
Zheng, 2011 [25]	2007	Beijing	CS	IN, PR	17–32 (n/a)	157	n/a	Lifetime	70/157	n/a	69/70	n/a	n/a
Zou, 2010 [26]	2007	Beijing & Urumqi	CS	IN, PR	18–56 (25)	429	168/399	1 Year	191/399	95/191	180/191	2	9
Bai, 2010 [13]	2008	Liuzhou	CS	PR, IN	18–72 (n/a)	300	n/a	1 Year	93/300	n/a	82/93	n/a	n/a
Liu, 2009 [15]	2008	Chongqing	CS	SB	17–30 (n/a)	678	n/a	1 Year	355/678	169/355	313/355	n/a	n/a
Liu, 2010 [16]	2008	Heilongjiang	CS	SB	≥15 (n/a)	1,353	n/a	1 Year	555/1353	n/a	n/a	n/a	n/a
Mei, 2009 [17]	2008	Taiyuan	CS	SB	18–49 (n/a)	273	n/a	1 Year	104/273	n/a	94/104	n/a	n/a
Ouyang, 2009 [7]	2008	Chongqing	CS	RDS	≥18 (n/a)	617	n/a	1 Year	168/617	n/a	143/168	n/a	n/a
Wang, 2009 [20]	2008	Kunming	CS	CV	16–80 (29)	330	n/a	Lifetime	178/330	n/a	n/a	n/a	n/a
Wei, 2011 [22]	2008	Jinan	CS	RDS	n/a	500	n/a	1 Year	97/500	n/a	n/a	n/a	n/a
Xia, 2010 [23]	2008	7 cities	CS	CV	18–55 (n/a)	339	246/339	Lifetime	160/339	n/a	132/160	n/a	n/a
Yang, 2010 [62]	2008	Jinan	CS	RDS	19–78 (n/a)	185	n/a	1 Year	143/339	n/a	n/a	n/a	n/a
Zhang, 2010 [63]	2008	Yangzhou	CC	SB	19–68 (n/a)	66	n/a	1 Year	35/88	n/a	n/a	n/a	n/a

Table 1 continued

First author, publish year	Baseline period	Location	Study design	Sampling method	Age range (median)	Sample size	Proportion knowing testing venue, n/N ^a	Period ^b	Proportion previous HIV test, n/N	Proportion previous counseling before test, n/N	Proportion receiving test result, n/N	Median no. lifetime HIV testing	Median time from last HIV testing (months)
Zhong, 2011 [64]	2008	Guangzhou	CS	RDS	18–51 (n/a)	379	n/a	1 Year	56/379	n/a	n/a	n/a	n/a
Zhou, 2010 [65]	2008	Chongqing	CS	SB	17–25 (n/a)	300	n/a	1 Year	150/300	80/150	137/150	n/a	n/a
Li, 2010 [58]	2008–2009	Kunming	CS	CV	n/a	490	n/a	Lifetime	231/490	208/231	n/a	n/a	n/a
Ji, 2011 [56]	2008–2009	Anhui	CS	RDS, SB, CV	17–82 (n/a)	1,641	n/a	1 Year	727/1641	n/a	655/727	n/a	n/a
Wang, 2010 [61]	2008–2009	Yangzhou	CS	PR, IN	47–78 (n/a)	750	n/a	1 Year	318/743	n/a	n/a	n/a	n/a
Chen, 2010 [53]	2009	Nanning	CS	SB	16–54 (n/a)	469	n/a	Lifetime	231/469	n/a	n/a	n/a	n/a
Dai, 2011 [54]	2009	Guangzhou	CS	CV	15–61 (n/a)	1,315	n/a	p 3 mths	167/1231	n/a	146/167	n/a	n/a
Song, 2011 [59]	2009	Beijing	CS	IN, PR	18–29 (n/a)	307	n/a	Lifetime	222/307	n/a	n/a	2	n/a
Wang, 2010 [60]	2009	Harbin	CS	SB, RDS	19–73 (n/a)	450	n/a	1 Year	254/450	n/a	244/254	n/a	n/a
Jiang, 2011 [57]	2009–2010	Guangzhou	CS	CV	15–59 (n/a)	2,276	n/a	p 3 mths	535/2276	n/a	434/535	n/a	n/a
Hu, 2011 [55]	2010	Nanchang	CS	PR	16–45 (n/a)	106	84/106	Lifetime	45/106	n/a	n/a	n/a	n/a

CS cross sectional, IE intervention evaluation, PC prospective cohort, CC case control, CV convenience sampling, PR peer referral, SB snow-ball sampling, RDS respondent-driven sampling, IN internet, n/a not available

^a Proportion of MSM who know at least one HIV testing venue, including VCT

^b Period: period of previous HIV testing, counseling and testing result. p 3 mths: past 3 months; p 6 mths: past 6 months

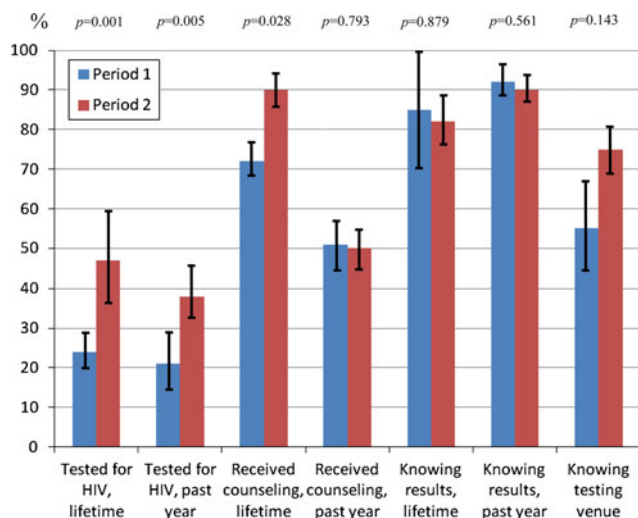


Fig. 2 Rates of HIV testing, counseling before test, knowledge of testing results and knowledge of testing venue between period 1 and 2 among Chinese MSM. Each column represents pooled estimate from meta-analyses over all studies in each period of time. The error bars represent standard deviations. *P* values from meta-regression for each variable are at the top of the figure

more likely to transmit HIV to another person than people who have been diagnosed [66]. It is essential that more efforts are made to increase the rate of HIV testing among MSM in China. Even though the Plan recommended that all sectors work together to increase HIV testing among MSM, setting the target HIV testing rate at 60 % among MSM who receive HIV counseling by 2010, it did not specifically outline how this objective should be achieved.

Reasons for the continued low rate of testing among MSM in China may include low levels of perceived HIV risk among members in this group and limited knowledge of testing options. Even though the rate of MSM who know about at least one testing venue increased from 55 % in period 1 to 75 % in period 2 ($P = 0.143$), this increase was not statistically significant. These numbers were rendered statistically insignificant due to the presence of a study in period 1 reporting a knowledge rate of 81 %, a figure much higher than all other studies in period 1, biasing the total figure for that period. Despite the importance of knowledge of testing venue to overall testing among MSM, the Plan neglected to mention this as a specific target issue. More efforts are needed to increase knowledge of testing venue.

Even when the location of a testing center is known, there are significant additional barriers to HIV testing in China, including fear of inappropriate disclosure of test results and concern about stigma and discrimination toward those who receive a positive diagnosis [67]. In addition, numerous barriers to STI testing have been documented at STI clinics: MSM experience discrimination from clinic doctors and nurses; test results can take days to come in; and the quality of clinical laboratory testing can be low,

with physicians often misdiagnosing STIs [68]. Because many MSM test for HIV at STI clinics, it is reasonable to assume that some of these barriers may apply to HIV testing as well. There are 9,475 VCT clinics in China providing HIV counseling and testing services [69]. If operated correctly, these VCT clinics can be a valuable resource to expand HIV testing services among high-risk populations. Despite the importance of addressing barriers like stigma and discrimination in health care settings, the Plan failed to mention these issues directly, missing an important opportunity to address these obstacles.

While increasing the number of MSM who get regular HIV tests is necessary, this must be accompanied by efforts to increase the number of MSM who actually return to retrieve their test results. By failing to retrieve one's results, one loses many of the important benefits provided by the HIV testing process. A number of factors can influence a person's decision to retrieve test results after the test is taken, including fear of receiving a positive diagnosis, scheduling conflicts, and simply forgetting to return for results [11, 70]. Our review showed that even though awareness of test result was high (lifetime: 85 % in period 1 and 82 % in period 2; past 12 months: 92 % in period 1 and 90 % in period 2), efforts are still needed to ensure that MSM who have tested for HIV actually obtain their results. The Plan recommended that annual surveillance should be carried out to explore the rate of MSM who test for HIV and know their results, however it did not mention a target rate for this indicator nor did it offer suggestions on how to achieve this goal.

Our review found the median number of lifetime HIV tests was only 1–2. Even though the samples had a large representation of young MSM (median age was under 30 in most studies), and young MSM may have only been sexually active for a limited number of years, a lifetime total of two tests remains a low rate for anyone with more than 2 years of sexual activity. Current guidelines in the United States and Australia recommend that MSM get tested for HIV at least once a year. However, data on the median number of HIV tests taken over the past 12 months is not available. For MSM with particularly high level of risk behaviors (unprotected anal sex, 10 or more sex partners, attending sex-on-premises venues, use of recreational drugs, or seeking sex partners via the Internet), recommendations are for HIV testing every 3–6 months [9, 10]. It is worthwhile to study the median number of HIV tests over the past 12 months among MSM, and it is essential to increase the frequency of HIV testing among MSM. The Plan did not suggest a target for the frequency of HIV tests for MSM, and it did not lay out any strategies contextualized to sub groups of MSM.

Pre-test counseling is a very important part of the testing process, helping people understand the potential negative

psychosocial consequences of testing, particularly if the result is positive. It also educates participants about reducing risk of transmission, regardless of HIV status [71]. Even though the rate of MSM receiving HIV counseling before receiving an HIV test in their lifetime significantly increased (72 % in period 1 and 90 % in period 2), there was only one study included in period 2 (160 participants). The rate of MSM receiving pre-test counseling in the past 12 months remained around 50 % in both periods. This figure may reflect actual rates of pre-test counseling more accurately, as it is less likely to be influenced by loss of memory detail over time. Even though the Plan recommended that all sectors work together to ensure HIV counseling services cover at least 85 % of MSM tested by 2010, it did not offer recommendations on how this objective should be achieved.

Most studies included in the review only reported on HIV testing, and the literature lacked substantial research into novel ways to increase HIV testing among MSM. However, a number of initiatives are currently underway that explore new options to increase testing among MSM in China. A study in Anhui Province in 2006 used four 1.5-h sessions of peer education to promote HIV testing and increase related knowledge. The study showed that HIV testing in the last 2 months increased from 15.1 % at baseline to 52.4 % post-intervention ($P < 0.001$) [50]. In another study in China, 2 MSM volunteers used the internet to share the information about testing in VCT clinics, leading to 429 MSM visiting VCT clinics to get tested for HIV within a 60 days period [72]. Novel ways such as text message, emails, and electronic prompts on clinic computers have shown an increase in STI testing among MSM. These measures may be equally effective in increasing HIV testing among MSM [73]. But there are currently no studies on these kinds of initiatives for HIV in China.

To make recommendations more practical and easier to follow, future guidance documents must clearly outline target indicators and define the numerators and denominators of the indicators. The Plan called on local CDCs at all levels to establish HIV testing and counseling models tailored to the needs of MSM, however modes that have been explored and proved effective are still lacking. Future guidelines must outline practical measures to evaluate models, especially those involving novel technologies.

The limitations of this article should also be considered. First, heterogeneity was detected in seven groups of data. Second, the 54 included studies used diverse sampling methods and had varied study environments, which could possibly affect the comparability of the studies. Third, even though significant publication bias was only found in one group of data, studies with more HIV positive cases tend to be more likely to be published, thus MSM in the published studies might exhibit higher levels of risk behaviors.

It is difficult to determine if the changes of the rates of testing and other variables were directly influenced by the Plan. The Plan sets targets and guidelines on how to achieve the targets. Different regions are expected to take various measures to follow the Plan and achieve its targets. However, because of local restrictions in human resources, epidemic uniqueness, etc., the extent to which different regions followed the Plan varies. It is nearly impossible to audit the extent to which various regions followed the Plan simply by this systematic review. Different regions may take different measures on top of those required by the Plan. Given that it is difficult to account for other factors, such as the extent to which different regions followed the Plan and the difference between various measures taken in different regions, it is hard to judge whether the difference of uptake of HIV testing and counseling among MSM between the two time periods was a result of the Plan itself. Despite increases, the testing rate among MSM is still low. More novel, contextualized and MSM-friendly HIV testing and counseling services are needed to increase HIV testing and decrease HIV transmission among MSM in China. Community-based organizations should be engaged in testing initiatives, as they have the strongest knowledge about local MSM communities and what kinds of tailoring will be most effective for this population.

Conclusion

Despite the fact that HIV rates among MSM in China are extremely high and still increasing, the rate of HIV testing and counseling among this population remains low. Future guidelines must clearly outline target indicators, define the numerators and denominators of the indicators, and make evidence-based suggestions on how to achieve these targets within the Chinese context. It is imperative to explore novel ways to increase HIV testing among MSM in China in order to reduce HIV transmission among this population.

Conflict of interest None.

References

1. National Bureau of Statistics of China. The sixth national population census 2010. <http://www.stats.gov.cn/zgrkpc/dlc>. Accessed August 27, 2011.
2. Zhang BC, Li XF, Shi TX. A primary estimation of the number of population and HIV prevalence in homosexual and bisexual men in China. *Chin J AIDS STD*. 2002;8(8):197–9.
3. UNGASS Country Progress Report China. 2010. http://data.unaids.org/pub/Report/2010/china_2010_country_progress_report_en.pdf. Accessed August 30, 2011.
4. Feng LG, Ding XB, Lu RR, et al. [HIV prevalence and its associated factors among men who have sex with men in Chongqing]. *Zhonghua Yu Fang Yi Xue Za Zhi*. 2008;42(12):870–4.

5. Feng Y, Wu Z, Detels R, et al. HIV/STD prevalence among men who have sex with men in Chengdu, China and associated risk factors for HIV infection. *J Acquir Immune Defic Syndr*. 2010; 53(Suppl 1):S74–80.
6. Zhang RZ. Study on HIV/AIDS prevalence and its related issues among men who have sex with men in Kunming. Master thesis, Kunming Medical University; 2008.
7. Ouyang L, Feng LG, Ding XB, et al. [A respondent-driven sampling survey on HIV and risk factors among men who have sex with men in Chongqing]. *Zhonghua Liu Xing Bing Xue Za Zhi*. 2009;30(10):1001–4.
8. Ministry of Health, People's Republic of China, Joint United Nations Programme on HIV/AIDS and World Health Organization. In: 2009 Estimates for the HIV/AIDS epidemic in China, Beijing, China, May 31, 2010.
9. Australasian Chapter of Sexual Health Medicine. Sexually transmitted infection testing guidelines for men who have sex with men (STIGMA guidelines). Sydney: Australasian Chapter of Sexual Health Medicine; 2005.
10. Centers for Disease Control and Prevention. Sexually transmitted diseases treatment guidelines 2010. *MMWR Recomm Rep*. 2010;59:1–116.
11. Valdiserri RO. Late HIV. diagnosis: bad medicine and worse public health. *PLoS Med*. 2007;4(6):e200.
12. Plan for HIV/AIDS Prevention and Control among Men Who Have Sex with Men in China, 2007–2010. National Center for AIDS/STD Control and Prevention, Chinese Center for Disease Control and Prevention. <http://www.chinaids.org.cn/worknet/download/2007/20071023001.doc>. Accessed August 30, 2011.
13. Bai Y, Feng WD, Wei QH. Analysis on ethological characters of MSM in Liuzhou, China. *J Med Pest Control*. 2010;26(2):103–5.
14. Feng L, Ding X, Lu R, et al. High HIV prevalence detected in 2006 and 2007 among men who have sex with men in China's largest municipality: an alarming epidemic in Chongqing, China. *J Acquir Immune Defic Syndr*. 2009;52(1):79–85.
15. Liu F. Study on investigation by network(web survey)on the knowledge and behavior toward HIV/AIDS among MSM in the universities in Chongqing, China. Master thesis, Third Military Medical University; 2009.
16. Liu S, Wang K, Yao S, Guo X, Liu Y, Wang B. Knowledge and risk behaviors related to HIV/AIDS, and their association with information resource among men who have sex with men in Heilongjiang province, China. *BMC Public Health*. 2010; 10:250.
17. Mei L, Han H, Che XW. [A survey of the first round AIDS integrate controlling work trial spot among men who have sex with man in Taiyuan]. *Zhonghua Liu Xing Bing Xue Za Zhi*. 2009;30(6):649–50.
18. Nong QX, Xu YF, Lin XQ, Chen SH, Zhu JJ, Zhou J. Evaluation on HIV/AIDS intervention among MSM. *J Prev Med Inf*. 2010;26(3):200–3.
19. Ruan Y, Jia Y, Zhang X, et al. Incidence of HIV-1, syphilis, hepatitis B, and hepatitis C virus infections and predictors associated with retention in a 12-month follow-up study among men who have sex with men in Beijing, China. *J Acquir Immune Defic Syndr*. 2009;52(5):604–10.
20. Wang M, Deng YH, Dong HY, Duan Y. Analysis report of the surveillance on MSM in 2008 in Kunming, China. *Soft Sci Health*. 2009;23(5):593–8.
21. Wang W. The research of the main affecting factors of the high risk behaviors of MSM in Tainyuan, China. Master thesis, Shanxi Medical University; 2007.
22. Wei C, Ruan S, Zhao J, Yang H, Zhu Y, Raymond HF. Which Chinese men who have sex with men miss out on HIV testing? *Sex Transm Infect*. 2011;87(3):225–8.
23. Xia JR. Survey on the high-risk sexual behavior and the quality of life among MSM in 7 cities in China. Master thesis, Anhui Medical University; 2010.
24. Xiao Y, Ding X, Li C, Liu J, Sun J, Jia Y. Prevalence and correlates of HIV and syphilis infections among men who have sex with men in Chongqing Municipality, China. *Sex Transm Dis*. 2009;6(10):647–56.
25. Zheng JD, Pang L, Xu J, Rou KM, Xiao D, Wu ZY. [Study on the prevalence of HIV and AIDS-related risky sexual behaviors among male university students who have sex with men in Beijing, China]. *Zhonghua Liu Xing Bing Xue Za Zhi*. 2011;32(4): 337–40.
26. Zou H, Wu Z, Yu J, et al. Sexual risk behaviors and HIV infection among men who have sex with men who use the internet in Beijing and Urumqi, China. *J Acquir Immune Defic Syndr*. 2010;53(Suppl 1):S81–7.
27. Choi KH, Lui H, Guo Y, Han L, Mandel JS. Lack of HIV testing and awareness of HIV infection among men who have sex with men, Beijing, China. *AIDS Educ Prev*. 2006;18(1):33–43.
28. He Q, Wang Y, Lin P, et al. Potential bridges for HIV infection to men who have sex with men in Guangzhou, China. *AIDS Behav*. 2006;10(4 Suppl):S17–23.
29. Lai YH, Cai YM, Zeng XC, et al. STD/HIV high risk behavior survey among MSM in Shenzhen. *S China J Dermato-Venereol*. 2006;13(2):146–9.
30. Lan YJ, Gu Y, Wang B, Zhou DL, Zhang JX. Behavioral features of men who have sex with men. *J Sichuan Univ (Med Sci Edi)*. 2004;35(3):372–5.
31. Li JZ, Xie LR, Li RY, Zhang HJ, Xiao HC. Survey on AIDS related behaviors among homosexual men in Weihai, China. *J Prev Med Inf*. 2005;21(6):721–2.
32. Qu SQ, Zhang DP, Wu YH, Zhu H, Zheng XW. Seroprevalence of HIV and risk behaviors among men who have sex with men in a northeast city of China. *Chin J AIDS STD*. 2002;8(3):145–7.
33. Shi TX, Zhang BC, Li JF, Cao NX. Risk sexual behaviors for AIDS among MSM in different areas of China. *Chin J Lepr Skin Dis*. 2003;19(4):335–7.
34. Zhang BC, Li JF, Hu TZ. [Survey on the high risk behaviors related to acquired immunologic deficiency syndrome and sexually transmitted diseases among men who have sex with men in mainland China]. *Zhonghua Liu Xing Bing Xue Za Zhi*. 2001;22(5):337–40.
35. Zhang BC, Zeng Y, Xu H, et al. [Study on 1389 men who have sex with men regarding their HIV high-risk behaviors and associated factors in mainland China in 2004]. *Zhonghua Liu Xing Bing Xue Za Zhi*. 2007;28(1):32–6.
36. Zhang JD, Yan HH, Li JF, Zhang BC. Survey of high risk behaviors related to AIDS among men who have sex with their regular male sex partner. *Chin J AIDS STD*. 2003;9(2):84–6.
37. Cai GF, Ma QQ, Pan XH, et al. HIV/AIDS related knowledge, attitude, practice and HIV/STD infection among MSM in two cities of Zhejiang Province, China. *Chin Prev Med*. 2008;9(6): 482–5.
38. Chen SC, Luo Y, Cheng J, et al. Analysis on results of MSM behavioral surveillance on HIV/AIDS. *Dis Surveill*. 2007;22(3):175–7.
39. Chen SH, Zhou J, Zhu JJ, Li KF. Analysis on ethological characters of MSM in Nanning, China. *Mod Prev Med*. 2008;35(5): 902–4.
40. Dou MY. Survey on AIDS related knowledge and behaviors among MSM in Changchun, China. Master thesis, Jilin University; 2007.
41. Fu L, Fang Y, Guo T. Investigation of the sexual behaviors among the MSM in Shaoxing City of Zhejiang Province, China. *Dis Surveill*. 2007;22(12):818–9.

42. Ma X, Zhang Q, He X, et al. Trends in prevalence of HIV, syphilis, hepatitis C, hepatitis B, and sexual risk behavior among men who have sex with men. Results of 3 consecutive respondent-driven sampling surveys in Beijing, 2004 through 2006. *J Acquir Immune Defic Syndr*. 2007;45(5):581–7.
43. Ning Z. Epidemiological study on men who have sex with men in Shanghai. Master thesis, Fudan University; 2006.
44. Tang HL. Characteristics of sexual network and HIV/AIDS related risk behaviors among MSM. Master thesis, Chinese Center for Disease Control and Prevention; 2007.
45. Tao X, Gai R, Zhang X, et al. Prevalence of HIV infection and HIV-related sex risk behaviors in men who have sex with men in Shandong Province, China. *Biosci Trends*. 2008;2(3):97–100.
46. Xing JM, Zhang KL, Chen X, Zheng J. A cross-sectional study among men who have sex with men: a comparison of online and offline samples in Hunan Province, China. *Chin Med J (Engl)*. 2008;121(22):2342–5.
47. Zeng G, Xiao Y, Xu P, Feng N, Jin CR, Lv F. Evaluation of effect of community-based HIV/AIDS intervention among MSM in eighteen cities. *Chin J Prev Med: China*; 2009.
48. Zhang BC, Li JF, Chu QS, et al. A survey of HIV/AIDS related behaviors among 2250 MSM in nine major cities in China. *Chin J AIDS STD*. 2008;14(6):541–7.
49. Zhang CQ, Ruan SM, Shi ZL, et al. Survey of HIV/AIDS related knowledge and behavior among high-risk population in Jinan City, China. *Chin J AIDS STD*. 2008;14(1):55–7.
50. Zhang H, Wu Z, Zheng Y, Wang J, Zhu J, Xu J. A pilot intervention to increase condom use and HIV testing and counseling among men who have sex with men in Anhui, China. *J Acquir Immune Defic Syndr*. 2010;53(Suppl 1):S88–92.
51. Zhou J, Zhu J, Huang B, et al. A survey of HIV/STD, HBV and HCV infections and risk behaviors among MSM in two central districts of Guiyang City, China. *Chin J AIDS STD*. 2008;14(1):47–51.
52. Zhu JL, Zhang HB, Wu HH. High risk sexual behavior and HIV/STD infection rate among 122 MSM from students. *Chin J AIDS STD*. 2007;13(4):350–2.
53. Chen SH, Yang NH, Zhu JJ. Survey on the MSM group of knowledge and related HIV/AIDS characteristics and STD/HIV infection in Nanning, China. *Mod Prev Med*. 2010;37(20):3929–32.
54. Dai LP. Behavioral characteristics and HIV infection among 1315 MSM in Guangzhou, China. *Chin J AIDS STD*. 2011;17(1):35–7.
55. Hu JF. HIV, syphilis and HCV infection and related risk behaviors among MSM in Donghu District, Hangzhou, China. *World Health Dig Med Period*. 2011;8(17):68–9.
56. Ji GP, Xu J. The utilization of HIV prevention services among MSM in Anhui, China. *Anhui J Prev Med*. 2011;17(1):1–3.
57. Jiang YH, Gong CH, Dai LP, Huang LJ, Liu Q. Research of high risk behaviors features among 2276 MSM in Guangzhou, China. *Med Inf*. 2011;24(4):366–7.
58. Li Z, Wang YZ, Wang ZY, Lv Y, Lei LH. An analysis of 490 HIV-infection MSM in Kunming, China. *J Kunming Med Univ*. 2010;31(10):127–9.
59. Song Y, Li X, Zhang L, et al. HIV-testing behavior among young migrant men who have sex with men (MSM) in Beijing, China. *AIDS Care*. 2011;23(2):179–86.
60. Wang ZF. The overview of traditional Chinese medicine treatment to AIDS and the investigation and analysis of the AIDS risk behavior of MSM in Harbin, China. Master thesis, Heilongjiang University of Traditional Chinese Medicine; 2010.
61. Wang ZJ, Sun L, Ma XG. Survey on AIDS/STD risk behaviors and prevalence among MSM in Guangling District, Yangzhou, China. *Jiangsu J Prev Med*. 2010;21(2):4–7.
62. Yang H, Wang MH, Ruan SM, et al. Investigation on bisexuality and infection of HIV, syphilis and HCV among MSM in Jinan, China. *Prev Med Tribune*. 2010;16(10):874–5.
63. Zhang J, Wang ZJ, Jiang H, et al. Analysis on risk factors of HIV/AIDS infection among MSM in Yangzhou, China. *Mod Prev Med*. 2010;37(1):4–9.
64. Zhong F, Lin P, Xu H, et al. Possible increase in HIV and syphilis prevalence among men who have sex with men in Guangzhou, China: results from a respondent-driven sampling survey. *AIDS Behav*. 2009;15(5):1058–66.
65. Zhou C, Ding XB, Liu F, Li P. Investigation on HIV/AIDS related knowledge and behavior among MSM of university students. *Mod Prev Med*. 2010;37(4):763–5.
66. Marks G, Crepaz N, Janssen RS. Estimating sexual transmission of HIV from persons aware and unaware that they are infected with the virus in the USA. *AIDS*. 2006;20(10):1447–50.
67. Ma W, Detels R, Feng Y, et al. Acceptance of and barriers to voluntary HIV counselling and testing among adults in Guizhou province, China. *AIDS*. 2007;21(Suppl 8):S129–35.
68. Liu H, Detels R, Yin Y, Li X, Visscher B. Do STD clinics correctly diagnose STDs? An assessment of STD management in Hefei, China. *Int J STD AIDS*. 2003;14(10):665–71.
69. Mark KE, Gunn RA. Gonorrhoea surveillance: estimating epidemiologic and clinical characteristics of reported cases using a sample survey methodology. *Sex Transm Dis*. 2004;31(4):215–20.
70. Sullivan PS, Lansky A, Drake A. Failure to return for HIV test results among persons at high risk for HIV infection: results from a multistate interview project. *J Acquir Immune Defic Syndr*. 2004;35(5):511–8.
71. Wolf LE, Donoghoe A, Lane T. Implementing routine HIV testing: the role of state law. *PLoS ONE*. 2007;2(10):e1005.
72. Zou H, Wu Z, Yu J, et al. Internet-facilitated and voluntary counseling and testing clinic-based active HIV testing among men who have sex with men in China (manuscript).
73. Zou H, Fairley CK, Guy R, Chen MY. The efficacy of clinic-based interventions aimed at increasing screening for bacterial sexually transmitted infections among men who have sex with men: a systematic review. *Sex Transm Dis*. 2012;39(5):382–7.