Title

Barriers to Expanding HIV Testing Among Male Students Who Have Sex with Men in Chengdu, China

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Barriers to Expanding HIV Testing Among Male Students Who Have Sex with Men in Chengdu, China

A dissertation submitted in partial satisfaction of the requirements for the degree Doctor of Philosophy in Epidemiology

by

Sitong Luo

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ABSTRACT OF THE DISSERTATION

Barriers to Expanding HIV Testing
Among Male Students Who Have Sex with Men
in Chengdu, China

by

Sitong Luo
Doctor of Philosophy in Epidemiology
University of California, Los Angeles, 2019
Professor Roger Detels, Chair

Background

In China, HIV transmission among students who are men having sex with men (MSM) is growing at an alarming rate. This study aimed to explore barriers to expanding HIV testing among student MSM in Chengdu City, China.

Methods

A mixed method was used in the study. We first conducted four anonymous focus group discussions with a total of 21 implementers of the HIV campaign in the city. Secondly, the anonymous face-to-face in-depth interviews were performed with 24 student MSM. At last, a cross-sectional survey was conducted among 536 student MSM.

Results

In the focus group discussions, barriers to promoting HIV testing among student MSM were summarized into four levels: 1) the target-level obstacles included fear of personal information being disclosed, lack of access to HIV testing promotions, and lack of HIV knowledge and risk perceptions; 2) the provider-level challenges were HIV stigma and discrimination, lack of professional training, and extra workload with low payment; 3) the institutional-level inhibitors comprised of manpower shortage with excessive turnover, lack of funding and flexible use of it, and lack of leadership support; and 4) the policy-level barriers contained lack of involvement of MSM communities, lack of emphasis on HIV testing, and ambiguity of implementation details. In the in-depth interviews, the barriers to HIV testing identified by the participants were lack of detailed HIV knowledge and risk perceptions, concerns of confidentiality and privacy, lack of availability of HIV testing information, inconvenient location and open time of HIV testing sites, perceived and internalized homosexuality stigma, and HIV stigma and discrimination. In the cross-sectional study, 68.0% and 59.8% of the student MSM reported having received an HIV test ever and in the past 12 months, respectively. The level of HIV knowledge (adjusted odds ratio=0.84; p-value=0.019) and no affiliation to MSM-oriented organizations (adjusted odds ratio =2.88; p-value<0.001) were significantly associated with not receiving an HIV test in the past 12 months.

Conclusion

The cooperation between governments, health facilities, schools, and MSM communities should be considerably strengthened to reinforce HIV health education in schools and to implement innovative strategies of promoting HIV testing among student MSM in China.

The dissertation of Sitong Luo is approved.

Li Li

Sung-Jae Lee

Warren S Comulada

Roger Detels, Committee Chair

University of California, Los Angeles

2019

To my dearest parents, Ningwen Luo and Li Yuan

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Li Li, Zunyou Wu, Li-Jung Liang, Chunqing Lin, **Sitong Luo**, et al. “Intervention Effects on Methadone Maintenance Treatment Retation in China.” *Drug and Alcohol Dependence* 194 (2019): 143-150.

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Chapter I: Background

1.1 HIV epidemic around the world

Since Professor Michael Gottlieb first reported unusual clusters of pneumocystis carinii pneumonia in five homosexual men in Los Angeles, our fight against human immunodeficiency virus (HIV) has lasted for over 35 years (Gottlieb, et al., 1981; US CDC, 1981). By the end of 2017, the virus has infected approximately 77.3 million people worldwide, and about 35.4 million of them have died from acquired immune deficiency syndrome (AIDS)-related illnesses (UNAIDS, 2018). When comparing different regions in the world, sub-Saharan Africa remains to be the most severely affected area, with an average HIV prevalence of 4.4% among adults (UNAIDS, 2016a). Asia-Pacific region has also suffered from HIV heavily (UNAIDS, 2013). Although the average prevalence of HIV is low, Asia-Pacific region has the second largest number of people living with HIV (PLH) in the world due to its huge population base, with 5.1 million PLH and 300,000 new infections in 2015 (UNAIDS, 2016a).

Over the past three decades, people have developed a variety of strategies to control HIV transmission, prevent AIDS-related deaths, and improve quality of life of PLH (WHO, 2016). In total, by the year of 2015, the HIV prevention and treatment programs had reduced the HIV incidence by 35% compared to 2000 and prevented AIDS-related deaths by 45% compared to 2005 (WHO, 2016). However, despite these great achievements, about 25% of HIV positive people around the world are still unaware of their infection, while 21% of people who knew their status have not initiated antiretroviral treatment (UNAIDS, 2018). To achieve the UNAIDS "90-90-90" goals for the year of 2020 (90% of PLH knowing their HIV status, 90% of people who know their status receiving treatment, and 90% of people on HIV treatment having a suppressed viral load), we still face many challenges (UNAIDS, 2018; WHO, 2016).

1.2 HIV epidemic in China

As the most populous country in the world, China is among the most active countries fighting against HIV/AIDS. The virus is believed to have entered mainland China in 1982, with the first infected case documented in 1985 (Zeng, et al., 1986). In 1998, HIV was documented in all 31 provinces in China (Wu, et al., 2007). At the end of 2014, the country reported 501,000 PLH and 159,000 cumulative AIDS-related deaths, yielding a national HIV prevalence of 0.037% (NHC, 2015a). Although the national prevalence of HIV remains low in China, the epidemic is severe in certain areas and among key subpopulations. On the one hand, according to the National Health Commission (NHC) in China, 12 out of 31 provinces reported 83.5% of the total number of PLH at the end of 2014 (NHC, 2015a). Yunnan, Sichuan, and Guangxi are the top three affected provinces, with each province reporting more than 50,000 PLH (Figure 1.1; NHC, 2015a). On the other hand, HIV prevalence is high among certain groups. According to the national sentinel surveillance data, the percentage of PLH among injection drug users (IDUs) and men who have sex with men (MSM) was 6.0% and 7.7% in 2014, respectively (NHC, 2015a). It is worth noting that the major transmission mode of HIV in China has changed dramatically in the past three decades. Until 2005, over 70% of all reported cases were infected via injecting heroin or donating blood products (NHC, 2015a). Since 2006, sexual transmission, including heterosexual and homosexual transmissions, has become the leading mode of HIV transmission in the nation, with 92.2% of newly reported cases infected through unprotected sex in 2014 (NHC, 2015a).

To respond to the HIV epidemic in the country, China has made substantial progress in multiple areas. In the area of HIV testing, 96.5% of the Chinese counties/districts are now equipped with HIV testing and counseling sites (NHC, 2015a). Reported by the National Center for AIDS/STD Control and Prevention (NCAIDS), Chinese Center for Disease Control and Prevention (China CDC), there were a total of 1.3 billion HIV tests performed under the hospital

system alone in 2014, resulting in 103,501 new identified cases (NCAIDS, 2014). In the area of treatment, 295,358 PLH were receiving ART in 2014, with a coverage of 59.0% (NHC, 2015a). Nevertheless, China now is also facing multiple challenges at each stage of HIV treatment continuum. First, a substantial proportion of people infected with HIV have not been diagnosed, which suggests reinforcing and expanding HIV testing is urgently needed (NHC, 2015a). Secondly, stigma and discrimination against PLH as well as people highly vulnerable to HIV, such as MSM and sex workers, are still pervasive, making HIV interventions and healthcare services harder to reach the target populations. Thirdly, both the high-risk and general populations have very limited knowledge of HIV/AIDS, including the young generations (NHC, 2015a; Yang, et al., 2015a; Yang, et al., 2015b). The knowledge they have acquired is far from enough to keep them from infection. The effort of HIV-related publicity and warning education needs to be further strengthened (NHC, 2015a).

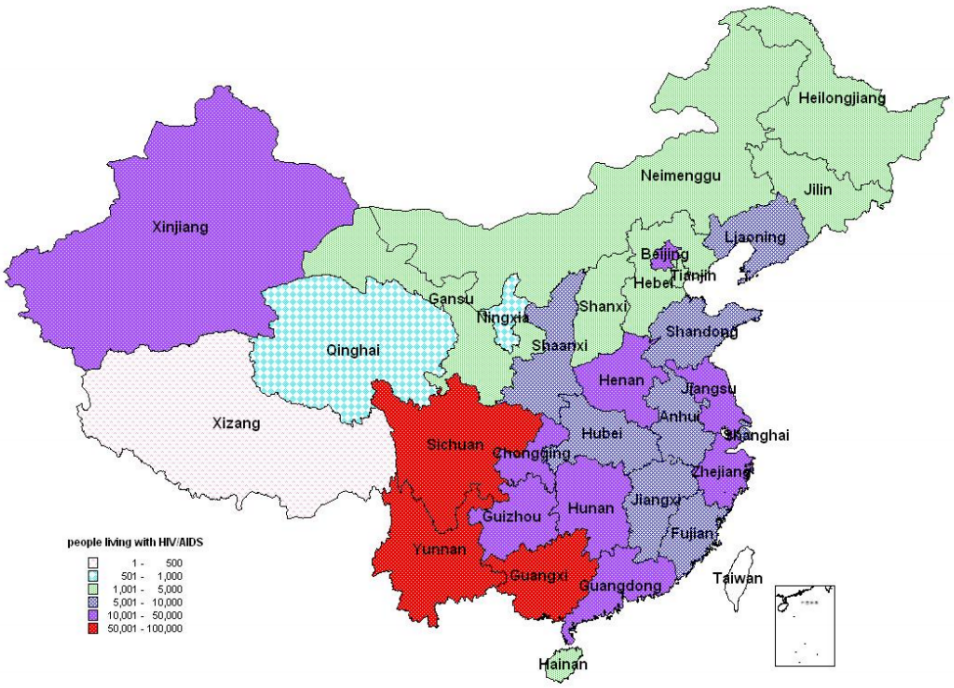

Figure 1.1 Geographic distribution of people living with HIV/AIDS in 2014 in China

1.3 MSM and HIV infection

The community of MSM is where the description of HIV/AIDS started (Gottlieb, et al., 1981; US CDC, 1981). More than 35 years later, the disease is still deeply influencing this population in most regions in the world (WHO, 2015b). According to the UNAIDS, in 2014, MSM contributed to 49% of new HIV infections in the western and central Europe and North America, 30% in Latin America, and 18% in Asia and the Pacific, respectively (UNAIDS, 2016a). Systematic reviews showed that the HIV prevalence in MSM was 17.7% in Sub-Saharan Africa, 15.3% in North America, 14.7% in South and Southeast Asia, and 5.2% in East Asia (Beyrer, et al., 2012). Moreover, the HIV incidence among MSM does not show evidence of declines (UNAIDS, 2016b). Particularly, in some Asian countries, like China and Thailand, where the same-sex transmission was not an initial driving reason for HIV, the HIV infection among MSM has increased disproportionally in recent time (UNAIDS, 2016b).

Factors leading to the remaining high risk of HIV infection among MSM are complex, including biological, behavioral, legal and cultural contributors (Beyrer, et al., 2013; US CDC, 2017). The major biological reason is the walls of the anus are thin and more easily torn, leading to a greater risk of transmission of anal sex than vaginal sex (Baggaley, White, & Boily, 2010). In behavioral aspects, having multiple sexual partners and inconsistent condom use are more common in homosexual groups than heterosexual groups, which results in a higher chance of HIV transmission (Paz-Bailey, et al., 2016; Scott, et al., 2014). In addition, homophobic stigma, discrimination, and violence represent significant drivers of the epidemic (Arreola, et al., 2015; Pachankis, et al., 2015; Wohl, et al., 2013).

1.4 MSM in China

As the oldest country in the world, the history of homosexuality in China can be traced back to more than 3,000 years ago (Li, 2009). In conflict with the Chinese traditional culture and social norms, homosexuality has been discriminated or even criminalized for thousands of years (Chen, et al., 2012; Zhang & Chu, 2005). In the past three decades, the Chinese society has become increasingly tolerant of the gay community, which is largely contributed by the "Open Door Policy" implemented in the late 1970s and the rise of global lesbian, gay, bisexual, and transgender (LGBT) social movements (Tao et al., 2013). Homosexual sex was decriminalized in China in 1997 and removed from the official list of mental disorders in 2001(International Gay and Lesbian Human Rights Commission, 2010). The estimated number of gay and bisexual men living in China varies from 5 to 20 million, and the majority of them are married to a woman under the pressure from the family and society (Lau, et al., 2008; Luo, et al., 2015; Tao et al., 2013; Wu & Wang, 2010; Zhang, et al., 2002).

In China, men who have same-sex behaviors are increasingly playing a critical role in the HIV epidemic. According to the China CDC, about 25.8% of newly diagnosed HIV/AIDS cases in 2014 were associated with MSM, yielding a significant increase from 12.2% in 2010; the percentage was over 50% in most provincial capital cities and even reached 70% in some cities in Southwest China, such as Chengdu and Chongqing (Figure 1.2; NHC, 2015a; Tang, et al., 2016; Wu, et al., 2013). Prior studies reported that the current HIV incidence among Chinese MSM ranged from 5 to 7 cases per 100 person-years (Cui, et al., 2016; Dong, et al., 2014; Zhang, et al., 2016b). According to the national sentinel surveillance data, the average prevalence of HIV in MSM across the nation was increased from 0.9% in 2003 to 7.7% in 2014, with some cities reaching 10% or higher (Dong, et al., 2014; NHC, 2015a).

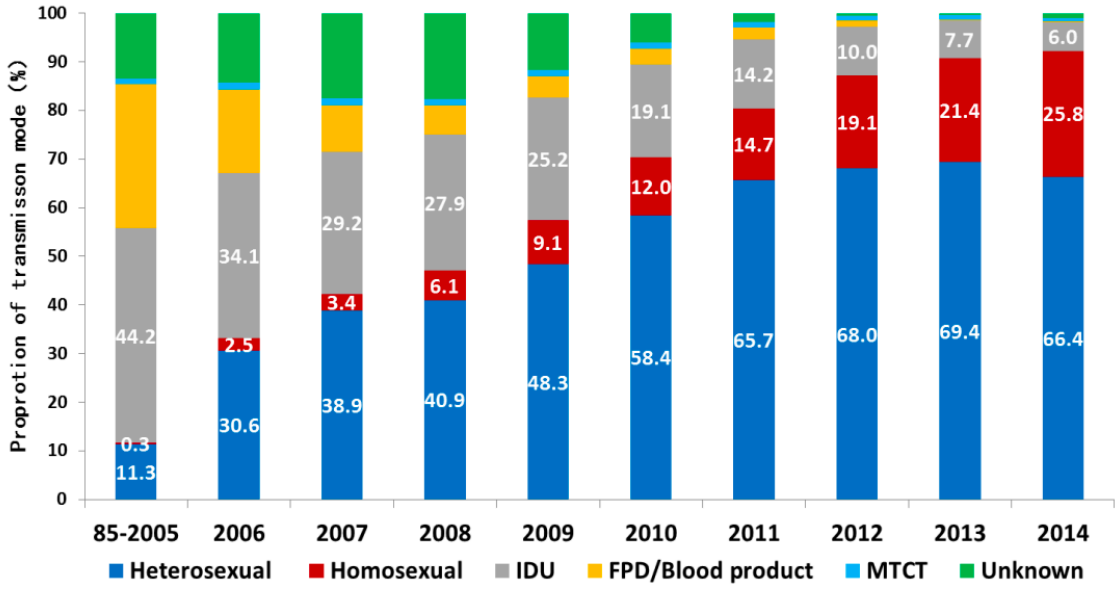

Figure 1.2 Transmission modes of newly diagnosed cases of HIV/AIDS in China by year

1.5 Student MSM in China

Along with homosexual men, another subgroup in China, young students, also raised public concerns recently for the rapid spread of HIV (Figure 1.3). According to the Ministry of Education (MOE), the country has the largest number of students in the world, with approximately 40.4 million high school students and 26.3 million undergraduate students in 2015, and about half of the students were males (MOE, 2016a; MOE, 2016b). Chinese students were not previously considered as a population at high risk for HIV infection (The State Council AIDS Working Committee Office, 2010). However, in recent years, the country has witnessed a dramatic rise in HIV transmission in young students. According to the China CDC, there were more than 9,200 students living with HIV at the end of 2015, accounting for 1.6% of all PLH in the country, rising from 0.96% in 2006 (China CDC, 2015). From 2011 to 2015, the newly reported HIV/AIDS cases in the 15-24 age group have increased by 35% after excluding the effect of HIV testing promotion (Zhang, et al., 2017). In 2016, the number of newly reported cases aged 15-24 reached 2,300 (NCAIDS, 2016).

Based on epidemiological surveys of the student cases of HIV/AIDS, it is found that unprotected homosexual behaviors caused most of the infections in students (Dong, et al., 2014; Li, et al., 2013; Wei, et al., 2014; Xu, et al., 2011; Xu, et al., 2013). According to the China CDC, MSM accounted for over 80% of newly reported cases aged 15-24 in recent years (China CDC, 2015; Dong, et al., 2014; Zhang, et al., 2017). Prior studies showed HIV prevalence among students or young MSM in China ranged from 3.0% to 6.8%, with an incidence of 4 to 7 cases per 100 person-years; and the prevalence of syphilis was about 4.8% - 6.7% among this population (Dong, et al., 2014; Li, et al., 2013; Wei, et al., 2014; Xu, et al., 2011; Xu, et al., 2013). It is reported that the proportion of student MSM having had unprotected anal intercourse in the last six months was 65.2% and the proportion of having more than one male partner in the last six months was about 58.2% (Yang, et al., 2015b; Zhang, et al; 2012). Efficient interventions are urgently needed to control HIV transmission among this population.

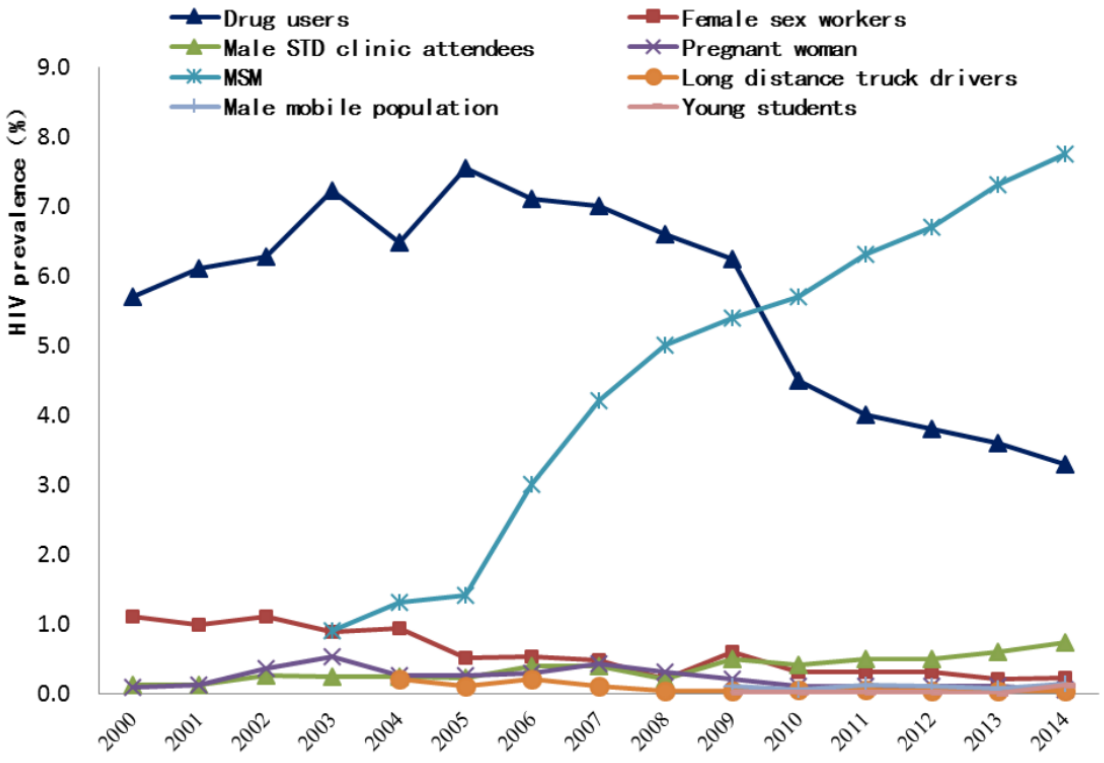

Figure 1.3 Changing trends of percentage of people living with HIV/AIDS in different groups in China, 2003-2014

1.6 Responses to the HIV epidemic among young students

To address the emerging problem of HIV transmission among young students, the NHC and MOE in China jointly issued "The Notice on Strengthening HIV/AIDS Prevention and Control in Schools" in 2015 (MOE, 2015c; NHC, 2015b). The Notice requires health agencies to inform local education departments about the HIV epidemic in local students every six months. Meanwhile, schools, health departments, non-governmental organizations (NGOs) and other related sectors should tightly cooperate to initiate HIV prevention and control activities targeting students, such as warning education, behavioral intervention, and HIV testing and treatment (MOE, 2015c; NHC, 2015b). The MOE has started to carry out publicity and intervention pilots in several colleges and universities, which aimed to provide a platform for Chinese students to acquire HIV prevention knowledge and to carry forward their volunteer spirit (NHC, 2015b). Moreover, the sentinel surveillance system of HIV transmission targeting college students has been established in some cities with large numbers of college students. From April to June each year, a total of 400 college students in each of the cities will be sampled and tested with HIV, which is under the supervision of local health and education agencies.

Since homosexual men account for the majority of student cases of HIV/AIDS, HIV prevention and intervention activities targeting student MSM are particularly important. HIV testing has been widely acknowledged as an effective strategy for preventing HIV transmission and improving treatment outcomes of PLH (US CDC, 2007). Since 2012, the universal HIV voluntary testing and immediate antiretroviral treatment strategy (Test-and-Treat) has been introduced and piloted among MSM in eight cities in China (NHC, 2016; Zhang, et al., 2016a). Mathematical models predicted that the Test-and-Treat policy would reduce new HIV infections among Chinese MSM by 50.6% - 70.9% by the year of 2022 (Luo, et al., 2015). At the beginning of 2017, the State Council of China issued the Thirteenth Five-Year Plan for HIV Prevention and

Treatment. One major aim of the national plan is to massively expand HIV testing to discover 90% of PLH in the country (The State Council, 2017). Undoubtedly, successfully expanding HIV testing among student MSM is crucial for achieving the goal. Meanwhile, only with the efficient collaboration between health agencies, schools, and MSM communities, could the HIV testing campaign succeed.

1.7 Potential associated factors of HIV testing expansion

According to the Social Ecological Theory, people's behavioral changes and health outcomes are determined by multifaceted and interactive effects of personal and environmental factors, and the public health practice should comprehensively address multi-dimensional determinants (Golden, & Earp, 2012; Sallis, Owen, & Fisher, 2015). In HIV prevention communities, successful HIV prevention strategies require effective integrations of evidence-based biomedical, behavioral, and structural interventions (Baral, et al., 2013; Latkin & Knowlton, 2005). Especially for the hidden population like MSM, prevention strategies should direct at the individual, family, general population, and mainstream gay community to reduce HIV risk (Choi, Yep, & Kumekawa, 1998; Latkin, et al., 2013). In addition, HIV epidemiologic studies are also required to collect data on multiple levels to inform combination of HIV prevention packages (Baral, et al., 2013).

To succeed in the HIV testing scaling-up among student MSM in China, individuals, schools, health departments, and gay communities all play essential roles. Correspondingly, challenges and difficulties of implementing the HIV testing campaign faced by each of the components should be fully learned and addressed. Previous studies showed that the individual-level factors associated with HIV testing behaviors of MSM included HIV risk perceptions, frequency of condom use, number of sexual partners, HIV disclosure by sexual partners, drug and alcohol use, stigma, peer support, and faith in trust (Balaji, et al., 2013; Brito, et al., 2015;

Li, et al., 2014; Mitchell & Horvath, 2013; Noble, et al., 2017; Persson, et al., 2016). The structural-level factors contained privacy of testing sites, attitude of service providers, skills of providers, insurance coverage, and convenience of HIV testing procedure (Huang, et al., 2012; Levy, et al., 2014; Reisen, et al., 2014; Persson, et al., 2016; Song, et al., 2011; Wong, et al., 2012). Nevertheless, prior studies collected information mostly from the single perspective of MSM, the side of service seeking, and rarely from the side of service provision or campaign implementation, such as leaders and staffs of local health agencies, schools, and gay communities. This study will be guided by the Social Ecological Theory to comprehensively explore the barriers to expanding HIV testing among student MSM in China.

1.8 Rationale of choosing Chengdu as the study site

Chengdu is the capital city of Sichuan Province, which is located in Southwest China (Figure 1.4). Sichuan occupies 5.1% (485,000 square km) of China's total area and is the fourth most populous province in the nation with 80,418,200 people at the end of 2010 (National Bureau of Statistics of China, 2011). The province has the second largest number of PLH among all Chinese provinces at the end of 2014, and the current leading transmission mode of HIV is unprotected heterosexual and homosexual behaviors (NHC, 2015a). The estimated HIV prevalence among MSM in Sichuan province is between 5 and 15% (Duan, et al., 2013). According to the Sichuan Provincial CDC, the number of students newly identified with HIV increased by more than 200% in 2014, compared to 2010 (Hu, et al., 2016). The student cases attributed to 1.8% of the total newly diagnosed HIV/AIDS cases in the province in 2014 (Hu, et al., 2016). Among all student cases newly identified, nearly 90% were infected through unprotected sex, and 64% were male students in college (Hu, et al., 2016). According to the

sentinel surveillance of students in Sichuan in 2014, only 28% of students had used condoms consistently when having sex with casual partners (Hu, et al., 2016).

Chengdu is the economic, cultural and education center of Southwest China. Often referred to the "City of Gay", Chengdu is noted for its tolerance and openness towards MSM (Feng, et al., 2010). There are estimated more than 70,000 sexually active MSM in the city (Feng, Wu & Detels, 2010). The sentinel surveillance data showed the HIV prevalence among MSM in Chengdu had increased from 0.5% in 2005 to 14.0% in 2014 (Duan, et al., 2016). Meanwhile, Chengdu has about 222 high school or equal level schools with 450,982 students, and 68 colleges and universities with 1,008,405 students, which witnessed a dramatic growth of HIV infection among student MSM in recent years (Dong, et al., 2014). According to Chengdu Municipal CDC, a total of 559 students were newly diagnosed with HIV from 2011 to 2015; 98.5% of them were males; 78.2% were infected through homosexual transmission; and about half were diagnosed in HIV Voluntary Counseling and Testing (VCT) sites (Peng, et al., 2016).

Due to the high prevalence of HIV among MSM and increasing HIV epidemic among students, Chengdu has been one of the pilot cities implementing various interventions to stop HIV, during which the NGOs and MSM community-based organizations (CBOs) have been highly involved (Feng, Wu & Detels, 2010). At the beginning of 2017, Sichuan Provincial People's Government issued the Thirteenth Five-Year Plan for HIV Prevention and Control, which required to strengthen the cooperation among health agencies, schools and MSM communities in order to find 90% of HIV/AIDS cases and reduce HIV risky behavior by at least 10% in MSM in Sichuan (Sichuan Provincial Government, 2017).

Figure 1.4 Map of Chengdu City, Sichuan Province, China

1.9 Study aims

The primary aim of this study is to identify barriers to promoting HIV testing among student MSM and to provide recommendations for future actions on scaling up HIV testing among student MSM in China. The specific objectives include:

1) To explore barriers to promoting HIV testing among student MSM from perceptions of implementers of the HIV campaign.
2) To identify perceived barriers to HIV testing from perspectives of student MSM.
3) To evaluate HIV testing behaviors of student MSM and the associated factors.
4) To provide suggestions for future cooperation among health departments, schools, and MSM communities to expand HIV testing among student MSM.

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Chapter II: Barriers to Promoting HIV Testing Among Male Students Who Have Sex with Men in Chengdu, China: A Qualitative Study

Abstract

Background: To respond to the rising HIV epidemic among students who are men having sex with men (MSM) in China, a school HIV campaign has been initiated across the country since 2015. The study aimed to understand the current barriers to scaling up HIV testing among student MSM from perspectives of the campaign implementers.

Methods: A total of four anonymous focus group discussions were conducted in Chengdu City, China in January 2018, each with five to six health professionals, school officers, student volunteers, and leaders of MSM-oriented organizations, respectively. A semi-structured guide was used to facilitate the discussion. Topics related to the current progress of promoting HIV testing among student MSM and the associated barriers were included in the guide. The analyses of the data were guided by the Grounded Theory.

Results: The barriers to scaling up HIV testing among student MSM were summarized into four levels. The target-level obstacles included fear of personal information being disclosed, lack of access to HIV testing promotions, and lack of HIV knowledge and risk perceptions. The provider-level challenges were HIV stigma and discrimination, lack of professional training, and extra workload with low payment. The barriers at the institutional level comprised of manpower shortage with excessive turnover, lack of funding and flexible use of it, and lack of leadership support. In the policy layer, lack of involvement of MSM communities, lack of emphasis on HIV testing, and ambiguity of implementation details were identified as barriers.

Conclusion: Findings suggest that barriers to promoting HIV testing among student MSM exist in every aspect of the campaign. Changes need to be made to improve policy development and

implementation in the future expansion of HIV testing. The cooperation between health agencies, education departments, schools, and MSM communities should be substantially reinforced.

Keywords: HIV testing promotion; student; men who have sex with men; barriers; China

Introduction

In recent years, China has witnessed a dramatic rise in HIV transmission in young students who are 15-24 years old (China CDC, 2015). From 2011 to 2015, the newly reported HIV/AIDS cases in the 15-24 age group had increased by 35% after excluding the effect of testing expansion in the country (Zhang, et al., 2017a). According to previous studies, unprotected male-to-male sex was the most common transmission route of HIV in young students (Li, et al., 2013; Wei, et al., 2013; Xu, et al., 2011; Xu, et al., 2013). Men who have sex with men (MSM) accounted for over 80% of the newly reported cases of HIV/AIDS who were students aged 15-24 years old (China CDC, 2015; Dong, et al., 2014; Zhang, et al., 2017a). To address the emerging problem of HIV transmission among young students, the National Health Commission (NHC) and Ministry of Education (MOE) in China jointly issued "The Notice on Strengthening HIV/AIDS Prevention and Control in Schools" in 2015, which required schools, health departments, non-governmental organizations (NGOs) and other related sectors to cooperate to initiate an HIV prevention and control campaign in schools (MOE, 2015; NHC, 2015).

Among all the strategies fighting against HIV/AIDS, HIV testing has been widely acknowledged as an efficient approach which can assist the patients in accessing to healthcare services in time, improve their treatment outcomes, and prevent HIV transmission (US CDC, 2007). At the beginning of 2017, the State Council of China issued the Thirteenth Five-Year Plan for HIV/AIDS Prevention and Control, one major aim of which is to find 90% of people living with HIV (PLH) in the country via HIV testing expansion (The State Council, 2017). To achieve the goal of case finding, some pilot actions have been taken to promote HIV testing among young students in China, including strengthening health education of HIV, establishing HIV counseling and testing sites in school hospitals, initiating MSM-friendly testing clinics in Community Health Service Centers (CHSCs) close to schools, and setting up vending machines

to sell HIV urine test kits on campus. However, there is still a gap between the current state of HIV testing uptake and the 90% goal in the population of student MSM in China.

To succeed in the HIV testing campaign among student MSM, all related dimensions including individuals, schools, health departments, and gay communities play essential roles (Choi, et al., 1998; Latkin, et al., 2013). Previous studies showed that the individual-level factors associated with MSM's HIV testing behaviors included HIV risk perceptions, frequency of condom use, number of sexual partners, HIV disclosure by sexual partners, drug and alcohol use, stigma, peer support, and faith in trust (Brito, et al., 2015; Li, et al., 2014; Mitchell & Horvath, 2013; Noble, et al., 2017; Persson, et al., 2016). Meanwhile, the structural-level factors comprised of privacy of HIV testing sites, attitude and skills of service providers, and convenience of testing procedure (Huang, et al., 2012; Levy, et al., 2014; Reisen, et al., 2014; Song, et al., 2011). Nevertheless, the findings of most prior research studying the barriers to HIV testing were from the perspectives of individuals who received the services, but few studies learned the challenges and difficulties of the testing expansion from the perspectives of the key persons participating in the campaign implementation.

This study aimed to comprehensively explore the barriers to expanding HIV testing among student MSM in China from the views of representatives of the related sectors involved in the school HIV campaign.

Methods

Study design

A qualitative study good at exploring rich experiences and opinions of interviewees was conducted in Chengdu City, China in January 2018. Chengdu is one of the education centers of China and noted for its tolerance and openness towards people with homosexual identity (Feng,

Wu, & Detels, 2010; Peng, et al., 2016). The anonymous focus group discussion (FGD) method with semi-structured guides was adopted to identify the current barriers to promoting HIV testing among student MSM from the perspectives of the implementers of the testing campaign. The study obtained ethical approvals from the Institutional Review Boards (IRBs) of the University of California, Los Angeles (UCLA) in the U.S. and the National Center for AIDS/STD Control and Prevention (NCAIDS), Chinese Center for Disease Control and Prevention (China CDC).

Study participants and recruitment

The sectors participating in the HIV testing promotion among student MSM mainly included health agencies, schools, NGOs and community-based organizations (CBOs) working for the MSM communities, and various student associations and groups. Therefore, a total of four FGDs were conducted during the study, each with five to six local health professionals, school officers, leaders of MSM NGO/CBOs, and student volunteers working in student associations, health clubs, or lesbian, gay, bisexual, and transgender (LGBT) groups, respectively. The inclusion criteria of the participants included being 1) at least 18 years old, 2) familiar with the HIV prevention programs and projects targeting students or MSM in the study site, and 3) willing to provide the oral informed consent.

All the participants in the study were recruited via the recommendation of the local municipal CDC in the study site which took the lead of the HIV campaign in the city. When approaching a prospective participant, a trained recruiter from the municipal CDC provided full disclosure of the study objectives, procedures, potential risks, benefits, and voluntary nature using a standard script. The recruiter made it explicitly clear to the participants that their decision about participation would have no effect on their employment or study status, the research team would not disclose their responses to anyone unrelated to the study, and all the participants

would be required to keep what they have discussed confidential. Oral informed consent was obtained from every participant before the data collection.

Data collection

Each of the four focus groups was conducted in a private conference room for approximately 90-120 minutes. A trained investigator and an observer were available to facilitate and record the discussion. A pre-determined semi-structured guide with open-ended probes was used to lead the discussion. The procedure of the discussion was 1) self-introducing job responsibilities and the role played by his sector in the HIV campaign in the city; 2) describing if his sector had organized any HIV testing promoting activities targeting student MSM or not, and how they organized or why they did not initiate; 3) what were the general barriers and challenges of promoting HIV testing among student MSM; 4) mapping the sequential and discrete steps that his sector passed through to organize HIV-related activities, and identifying difficulties faced in each step; and 5) summarizing the barriers to expanding HIV testing among student MSM and suggestions for improvement. The discussion was audio recorded, and each participant received 200 Chinese Yuan (approximately 30 USD) for his/her time and effort.

Data analysis

The audio recordings of the four FGDs were transcribed verbatim after the discussion by a third trained local staff. The facilitator of the discussion later read through the transcripts to ensure there were no vagueness and misunderstandings of the content. The analyses of the transcribed data were guided by the Grounded theory (Glaser & Strauss, 1967). The first draft of a code list was developed based on the discussion guide for each of the FGD. Themes around the research question were identified in the context of the information conveyed by the participants. The code

list for each of the FGD was then modified based on the themes that emerged from the transcripts during the analyses, and a final code list was developed by combining the content of the four code lists. All transcriptions, coding, and analyses were firstly completed in Chinese, and the results were later translated into English by the researcher. The ATLAS.ti software (Berlin, Germany) was used throughout the data analyses.

Results

A total of 21 participants were enrolled in the study and assigned into four focus groups. Table 2.1 showed the background information of the participants in each focus group. The barriers to scaling up HIV testing among student MSM were summarized into four levels: target, provider, institution, and policy level. The barriers in the layer of student MSM who were the target of the HIV testing campaign included 1) fear of personal information being disclosed, 2) lack of access to HIV testing promotions, and 3) lack of HIV knowledge and risk perceptions. At the provider level, the challenges consisted of 1) HIV stigma and discrimination, 2) lack of professional training, and 3) extra workload with poor payment. The barriers at the institutional level comprised of 1) manpower shortage with excessive turnover, 2) lack of funding and flexible use of the funding, and 3) lack of leadership support. In the policy layer, the participants identified the current policies guiding the HIV campaign in schools 1) lacked involvement of MSM communities, 2) lacked emphasis on HIV testing, and 3) had ambiguity of implementation details. Table 2.2 presented the barriers and the participants who identified each of the barriers.

1. Target-level barriers

a) Fear of personal information being disclosed

At the target level, the fear of disclosure of personal information was a significant barrier to promoting HIV testing among student MSM, identified by all the participants. Since most of the HIV testing sites in the city required people to provide identifiable information before receiving the test, such as the legal ID number and mobile phone number, student MSM were seriously concerned that their personal information, sexual identity, and testing results would be disclosed to their schools, families and classmates, and their studies and lives would be therefore destroyed. Not only the HIV testing sites operated by governmental and school-related agencies, such as CDCs and school hospitals, were not trusted by student MSM, but also the homosexuality-oriented NGO/CBOs were distrusted by a proportion of student MSM. In addition, due to the fear of sexual identity being disclosed, the number of student MSM who were willing to participating in the volunteer work in the HIV campaign was limited.

"(ID 3) According to a survey conducted in our school this year, about 90% of the students know that HIV testing should be taken after having unsafe behaviors. But I'm pretty sure most of them would not go if they really had unsafe behaviors. The main reason is students are afraid that HIV testing sites would leak their personal information to schools. In our survey, about 50% of the students thought the information would be disclosed to schools by HIV testing sites." (FGD for school officers)

"(ID 1) Some people don't trust us. The first reason is the privacy protection. In our CBO, people need to make an appointment for HIV testing. He can use a fake name, but he must leave his phone number. But, as we all know currently in China, the phone number is linked to the real name. (ID 3) I asked them (indicating student MSM) why they didn't take HIV testing. They said one reason was the privacy. They worried that if a person was diagnosed with HIV, his school would know it and he could not stay in the school anymore. This is the biggest concern of university students" (FGD for NGO/CBO leaders)

b) Lack of access to HIV testing promotions

Reported by all the focus groups, it was difficult for the implementers of the HIV testing campaign to approach the student MSM population, which made the student MSM lack access to the information, interventions and health services related to the HIV testing campaign. According to the participants, as MSM is still a hidden population in China, health professionals, school officers, and student volunteers not from LGBT groups were almost unable to reach the student MSM directly, while it was also hard to recruit student MSM in the team of volunteers and peer educators to assist in delivering HIV interventions. Furthermore, for MSM NGO/CBOs, although the staffs were from the homosexual community, their generation differences with the young students had brought many challenges to their work and considerably affected the efficiency of intervention activities, especially the traditional ones, such as outreach.

"(ID 3) The only thing we can do is to provide counseling and health education for students who came to receive HIV testing and to ask them to encourage their peers to come to test. But this didn't work well. The main reason why we haven't initiated any special activities targeting student MSM is we cannot infiltrate their community. They are very secret. We cannot intervene them at all. (ID 6) We tried to train some key persons in the student MSM network, but not succeeded. That's because many student MSM don't physically social with other student MSM, but with non-students. Among student MSM, they may have some connections on the social applications and can communicate online. But if you let the key person to conduct the service referrals face to face, it is also difficult." (FGD for health professionals)

"(ID 4) We plan to do something special for college students in 2018. But it will be difficult. Due to the generation difference, we will face many difficulties. (ID 2) We just started the HIV intervention and testing promotion for young students about half a year ago. There are about ten universities in our district. We have outreaching sites providing HIV testing in six gay

venues, and we go there every week. We also have a testing site located in the district CDC and provide services every Sunday morning. However, people visiting the venues are mostly middle- and old-age males as well as migrant workers, and few students love to come to these venues. For the testing site in the CDC, the number of students coming to take the test is also relatively smaller, very small." (FGD for NGO/CBO leaders)

c) Lack of HIV knowledge and risk perceptions

Indicated by the health professionals, school officers, and student volunteers, the HIV knowledge and risk perceptions of HIV infection among student MSM were deficient, which partially led to the inadequate uptake of HIV testing in the population. Although the health education of HIV/AIDS had been initiated in many schools, its effectiveness on increasing knowledge and risk perceptions of HIV was yet low. According to the participants, the frequency of HIV education was too limited to bring students' attention; the publicity strategy was too boring to attract students' interest; and the educating content was too simple to protect students from infection. Moreover, the health professionals mentioned that inside the MSM communities, the health consequences of HIV/AIDS were sometimes under-addressed to avoid stigma and discrimination, but it might spontaneously decrease the risk perception of MSM and increase the gap between their knowledge and risky sexual behaviors.

"(ID 1) Last year, my university organized many HIV/AIDS educating activities in a month around the "World AIDS Day". But in most of the activities, students were mandatary to participate, and I feel that the students' only purpose of participation was to get the credits. (ID 2) I participated in a big publicity activity held on "World AIDS Day" in my school, and my personal feeling was the content of publicity was too simple and too basic. (ID 3) In one HIV

knowledge seminar, the speaker was an old doctor, and many students became sleepy during his speech." (FGD for student volunteers)

"(ID 2) The gap between knowledge on HIV/AIDS and risky sexual behaviors is huge in the MSM population. They (indicating MSM-oriented organizations in Chengdu) don't do warning education in their communities. What they are advertising is that HIV/AIDS is a chronic disease; if a person is infected, it doesn't matter, because taking medication will make him fine; and people will not die from AIDS, at most living for fewer years. So, our focus of education are different. We want them to conduct warning education, but they say that it will increase stigma and discrimination." (FGD for health professionals)

2. Provider-level barriers

d) HIV stigma and discrimination

The stigma and discrimination towards HIV/AIDS from the campaign facilitators, especially school officials, was as an essential barrier to initiating HIV testing promotions in schools, reported by all the participants. HIV stigmatizing attitude was prevailing among school executives, which led to poor leadership engagement in HIV prevention activities. Some school leaders were concerned that if the school put a lot of effort into promoting HIV testing and diagnose many HIV positive students, the reputation of the school would be negatively affected. Moreover, some school officials had weak consciousness of protecting the privacy and rights of HIV infected students, which resulted in occurrence of HIV discriminatory events in schools. Due to the discriminatory events, student MSM became less willing to receive HIV testing.

"(ID 4) The biggest problem is the pressure from school leaders. I once contacted a university leader and suggested him to expand HIV testing among first year students. But the leader asked me: what if 30 students are diagnosed with HIV every year? Can my university

continue to run normally? Our university is so famous. If we find tens of students infected with HIV every year, how can we survive in the future?" (FGD for health professionals)

"(ID 5) I encountered a problem this year. There was a 17-year-old student who just entered the university. After being diagnosed with HIV, he told the result to his class advisor. But the advisor directly told him to transfer to another major and another school. Later, the advisor told the university president about this student's status. The university president then forced the student to quit. This means the fundamental problem is stigma and discrimination in schools I think we should eliminate HIV stigma in schools first, and then promoting HIV testing will be easier." (FGD for NGO/CBO leaders)

e) Lack of professional training

Lack of professional training was the most common barrier to implementing HIV testing campaign at the provider level, identified by all the participants. For health professionals, although skilled in clinical and preventive medicine, they found they lacked knowledge on sociology and psychology which could help them better understand the homosexual culture and deliver healthcare services to student MSM more efficiently. For school officers and student volunteers, both HIV and homosexuality-related training were in absence. For NGO/CBO staffs, they had few opportunities to systematically learn intervention development, implementation, evaluation, and project management.

"(ID 2) I think not only the public health people, but also the sociology professionals should engage in. I think implementing HIV prevention and intervention strategies targeting MSM are more related to sociology. For our public health people, we don't know what do MSM really care about. If we can have related training and ask the sociologist to help us analyze the problems, that should be better." (FGD for health professionals)

"(ID 1) The routine work of our school hospital is organizing publicity activities on special days, such as the "World Tuberculosis Day" and the "World AIDS Day". These publicities are very simple and basic, and never cover more professional and advanced knowledge and target the key populations. That's mainly because we don't have qualifications to do so, we don't have such abilities, and we don't have related training to support us." (FGD for school officers)

f) Extra workload with low payment

Extra workload with low payment was another challenge faced by people engaged in the HIV testing expansion, addressed by all the participants. For service providers working in HIV testing sites in health facilities and NGO/CBOs, they always needed to take the weekend time to offer testing and counseling services to students who were unable to come during weekdays. For student volunteers, the implementers of all school-wide events in the HIV campaign, they only had the after-class time to finish all the training and preparation work for the events. For NGO/CBO staff conducting outreach interventions at gay venues, their workload was also extremely heavy considering a limited number of MSM organizations and a large number of gay venues. In addition to the extra workload, the payment and welfare benefits for the staffs and volunteers were always low.

"(ID 3) For employees working in the testing sites in our center, they have to sacrifice one or half day in the weekend to wait for the people who have made reservations for HIV testing. But everyone wants to have a rest during weekends. What's worse, sometimes when there were 10 people making appointments and we excitingly prepared to provide them services and interventions, but eventually, only 1 or 2 might show up." (FGD for health professionals)

"(ID 1) There is no full-time teacher who specifically working on HIV-related events in our university. This made the student volunteers very very tired. The current supervisor wants to give student volunteers the opportunities to improve our abilities, but they don't know how tired we were. I feel hopeless every day." (FGD for student volunteers)

3. Institution-level barriers

g) Manpower shortage with excessive turnover

Manpower shortage with excessive employee/volunteer turnover was a common institution-level barrier to the HIV campaign implementation, identified by all the participants. First, as the basic unit to carry various HIV-related tasks, CHSCs had only one full-time staff on average to conduct HIV-related work. Secondly, regarding MSM NGO/CBOs, serious manpower shortage always came with a high turnover rate, which was primarily because the number of people willing to work in gay-oriented organizations was still limited and the payment was low. Thirdly, a university or college only had one part-time medical officer averagely to take in charge of all HIV prevention work on campus. In addition, compared to other student groups and clubs, fewer students had interests in health-related clubs. Moreover, in light of the mobility of students, it was challenging to maintain a sustainable student volunteer team.

"(ID 4) I'm from a community health service center, the grass-root (of the healthcare system). My job covers all the aspects of HIV/AIDS prevention and control, including the patient management, follow-up, medication prescription, monitoring treatment adherence, as well as interventions for MSM, FSW and general population. All HIV-related work in the community level are mine. I'm the only full-time staff in the center." (FGD for health professionals)

"(ID 4) We have a student team working on HIV projects, but the team has only been established for two years and we face many problems, especially the mobility of students. For

example, when a student volunteer just developed enough ability to run the project after receiving a lot of training from me, he was about to graduate and leave the school. However, the project has not been finished yet". (FGD for school officers)

h) Lack of funding and flexible use of it

Funding shortage and lack of flexible use of the funding was another common problem faced by all the sectors involved in the HIV campaign. For NGOs registered in the Ministry of Civil Affairs, the sources and amount of funding they could get were limited. For CBOs which was not registered in the national system, their survival was fully dependent on local CDCs, because they were not able to apply for funding independently. In many schools, there was no specific budget for HIV prevention work, and school medical officers had to apply for external funding to maintain their routine work. For health professionals, although they might not be in short of money, most of the funding was budgeted for HIV treatment but not for prevention, and they were not allowed to flexibly allocate the funding during the real work, which significantly impeded the implementation of the programs and projects.

"(ID 1) Money is always a problem. All civil society organizations are facing funding problems, right? Where do money come from? How can you pay salary to your staff? How can you complete so much work? All are problems. Our organization has been working in the HIV field for so many years. We got about 600,000 RMB from the Global Fund this year. Compared to other NGO/CBOs, it is already very good. But I still feel the money is not enough. Many of our employees quitted this year, because the salary is low." (FGD for NGO/CBO officers)

"(ID 1) When our parent agency allocated the government funds, the regulations for how to use the funding is so rigid and inflexible. It really impeded the implementation of our work. I thought they should just give us a rough guidance of how to use the money. (ID 2) The funding

for this disease, at least two-thirds of it are used for treatment. There is little left for prevention and intervention." (FGD for health professionals)

i) Lack of leadership support

The support from the leadership and other divisions of the institution was limited, identified by school officers, health professionals, and student volunteers. The inadequate leadership support had hindered the initiation and implementation of the HIV prevention work. Several participants mentioned that some school leaders had not realized the importance of the HIV campaign and thus poorly engaged in related work. As part of its consequence, it was difficult for school medical officers to seek assistance from other divisions in the school, such as the Office of Student Affairs, to organize HIV prevention activities. The student volunteers also indicated that the supervisors of the student associations/groups had not provided sufficient support and instructions to their work. In local CHSCs, leadership engagement was also insufficient, because the HIV projects could not bring economic profit to the center.

"(ID 2) To organize the sentinel surveillance of HIV in our school, we must work together with the Office of Student Affairs. However, the Office of Student Affairs is less and less cooperative in recent years…… Our school is so backward when compared to other universities. It is impossible for us to set up a machine to provide condoms on campus, not to mention selling HIV testing kit……Our school leaders do not support HIV related work at all. They have no interests on it." (FGD for school officers)

"(ID 2) There was an Anti-AIDS Meeting organized by the Provincial Department of Education which required the vice chancellor of the universities and colleges to participate, but many of them didn't show up and just let the school medical officers came instead. (ID 5) What

is considered more by our leaders is whether the project can bring economic profits and benefits to the center. If the profit is big, then the support will be big." (FGD for health professionals)

4. Policy-level barriers

j) Lack of involvement of MSM communities

Pointed out by the NGO/CBO leaders, school officers, and health professionals, the involvement of MSM communities in the school HIV campaign was not fully addressed in the current policies. Therefore, gay-oriented organizations were now completely rejected by schools and official student associations to participate in HIV-related events on campus, while the LGBT student groups were still secret societies and could not organize any public activities. Without explicit statements of involving MSM-NGO/CBOs in the HIV campaign in the policies, school officials were not willing to cooperate with MSM communities, because they thought it was an encouragement of homosexual culture which was against the mainstream in the society.

"(ID 1) We want to go into schools to do something. However, the schools do not support it at all. The schools have blocked the way, and we can't enter and do anything. (ID 3) In 2016, we were invited by the district CDC to set up VCT clinics in two universities. But one university reject us directly, while another university firstly agreed but confessed a few months later, both because of the school policies." (FGD for NGO/CBO leaders)

"(ID 4) We cannot support it. Our policy does not allow MSM NGO/CBOs to come in. This is a headache for us as well. There were NGOs who wanted to cooperate with us, but we don't dare to say yes, and we don't know how to balance it. It's our biggest headache.....The education in school should be the mainstream education. Schools must advocate the mainstream, but homosexuality is not the mainstream. If they come in, they may make the straight guys become gays. Their energy is particularly large." (FGD for school officers)

k) Lack of emphasis on HIV testing

During the discussion, the health professionals, school officers, and student volunteers reported that promoting HIV testing was not the priority in the current HIV prevention strategies implemented by schools, and it was not emphasized in the current governmental documents. Most HIV prevention events performed in schools were related to health education of basic HIV knowledge, safe sex and drug abuse, and only a few universities had taken some actions to promote HIV testing. Moreover, the HIV publicity and educating materials did not cover sufficient information of accessible HIV testing services, especially the MSM-friendly HIV testing sites. As a result, the perception of the necessity of taking HIV testing was still limited among students, and even there were MSM-friendly HIV testing sites close the school, few student MSM were aware of it.

"(ID 1) Regarding the policy support, after the Provincial Education and Health Departments jointly issued the document for strengthening HIV prevention in schools, it does have some effect. But the effect is only limited to the publicity of HIV knowledge. The part of HIV testing has not been focused on at all." (FGD for health professionals)

"(ID 4) Very little information of HIV testing was available (during the health education). Almost all of the education is about how to use condoms and what is HIV. But where can I get HIV testing, what is the procedure of testing, the telephone number and address of HIV testing sites are not available. The telephone number of CDCs will be provided, but they will not tell you the number is for HIV testing. A lot of students do not know HIV testing is the only way to diagnose HIV." (FGD for student volunteers)

l) Ambiguity of implementation details

Indicated by the health professionals and school officers, the current policies for the HIV campaign in schools issued by the central and local governments were too vague and lacked supportive documents providing specific objectives, technical strategies, implementation guidelines, evaluation indicators, and accountability standards. The ambiguity caused the deficient cooperation between related sectors participating in the HIV campaign and the inefficient implementation of the policies. In particular, since the local health department which took the lead of the HIV campaign in the city had no administrative power to supervise the work of schools, it was difficult for health professionals to establish cooperation with school leaders without a clear provision in the policy issued by higher-level agencies.

"(ID 1) Speaking of the policy, I feel it is still a formality. For example, the university leaders should take the responsibility of launching the HIV campaign on campus, but they didn't do that. And our local governments have no administrative power to push and supervise them. (ID2) In the current system, it is the local health department who propose and coordinate all the specific things. The actions from the higher-level government were only around December 1st, the "World AIDS Day". So, I think the essential problem is the lack of policy support." (FGD for health professionals)

"(ID 2) Our leaders didn't do the work that required by the Provincial Health Department. In the national policy of HIV prevention in schools, I didn't see any specific content which clarify the things we need to do, and there are only goals. (ID 3) I think the most ideal situation is the Ministry of Education can develop a comprehensive strategy for the HIV campaign in schools, and then the Provincial Education Department can add more details for the implementation of the strategy." (FGD for school officers)

Discussion

This study is among the earliest qualitative studies that comprehensively explore barriers to scaling up HIV testing among student MSM in China. It provides an understanding of the current progress of the HIV campaign in schools in the country and the difficulties and challenges encountered by the campaign facilitators from multiple dimensions. The public health implications derived from the study may contribute to future enhancement of policy development, intervention implementation, service delivery, and multi-sectoral cooperation in promoting HIV testing among student MSM in China.

The study found that at the target level, student MSM's concern of privacy issues was consequential and hindered the utilization of healthcare services. Previous studies in China and other countries have demonstrated that the confidentiality breach might cause test refusal of people at high risk of HIV infection, while ensuring confidentiality would encourage more MSM to receive an HIV test (Logie, et al., 2017; Pharr, et al., 2016; Witzel, et al., 2016; Zhao, et al., 2015). It implies that anonymous facility-based HIV testing and innovative testing strategies with greater convenience and privacy, such as HIV home-based testing, should be urgently promoted in the future HIV testing campaign in schools and MSM communities (Estem, et al., 2016; Lui, et al., 2018). In addition, the study identified the segregation between student MSM and the current HIV testing promotion activities, which might be explained by the hidden nature of the population and the generational differences between student MSM and campaign implementers. To increase student MSM's access to promotion activities of HIV testing, the study suggests that non-traditional strategies including social media and online interventions should be utilized to better approach this secret community and deliver HIV interventions (Cao, et al., 2017; Knight, et al., 2017). At last, lack of HIV knowledge and risk perceptions, a common factor negatively associated with HIV testing reception in prior research, was also

identified to impede the scaling-up of HIV testing in this study (Leblanc, et al., 2015; Lee, et al., 2015; Persson, et al., 2016). We recommend that future HIV education in schools and MSM communities should have a higher frequency, cover more detailed and explicit knowledge of prevention, and incorporate appropriate warning education. Meanwhile, the empowerment of student volunteers and MSM-NGO/CBOs should be continued to fill the generation and culture gap during the HIV prevention activities targeting student MSM.

Our study identified that the provider-level barriers had brought significant challenges to the implementation of the testing campaign targeting student MSM. In particular, the study found stigmatization of HIV was overwhelming among school officials, which contributed to the poor leadership engagement in the school HIV campaign and the occurrence of HIV discriminatory events in schools. In China, HIV remains a disease linked to immoral behaviors against traditional cultural norms, and the general population still has substantial misconceptions about the disease (Qian, et al., 2007; Yang & Kleinman, 2008; Yeo & Chu, 2017). The study demonstrates an urgent need for HIV stigma reduction interventions targeting key persons working in schools and education agencies, in order to improve their awareness of the disease and the prominence of the HIV campaign in schools. Furthermore, the study showed that the lack of professional training was prevalent among people working in the local HIV fields, and people from different sectors had different demands for training based on their occupational background. The insufficient training limited their ability to invent efficient interventions, approach the targeted people, provide healthcare services with high qualities, and maintain a sustainable working team. To address this issue, the study calls for targeted training with specific aims for local health professionals, school medical officers, student volunteers, and NGO/CBO staffs. Additionally, extra workload with poor payment was found to negatively impact the working efficiency of the campaign implementers in the study. It implies that more human and

financial resources should be devoted to the school HIV campaign in China, and actions that can reduce workload and improve working efficiency, such as integrating HIV testing services with other services provided for student MSM, should be considered by all the sectors in the school HIV campaign (Sweeney, et al., 2014; Topp, et al., 2012).

Changes should also be made at the institutional level to ensure the efficiency and sustainability of the testing campaign implementation among student MSM. With respect to the challenge of manpower and funding shortage, again, more human and financial resources need to be allocated to the HIV prevention work in health agencies, schools, and MSM communities, especially in the basic healthcare units, such as CHSCs, because a significant proportion of HIV-related tasks in China have gradually been downgraded to the community level (Ma, et al., 2015). Moreover, due to the high mobility of students, special efforts must be put into the maintenance of the student volunteer teams working in student associations and MSM-NGO/CBOs. For example, a city-wide volunteer alliance which includes students from different schools can be established to break the boundaries between schools and serve for the HIV testing campaign across the city. It may help solve the problems of shortage and mobility of student volunteers. Regarding the inflexible use of funding, the study suggests that future budgeting of HIV funding should be more adaptable considering the complex situations in real-world HIV interventions, while compensation for employees' extra working effort and volunteers' contribution must be taken into account. In regard to the lack of support from leadership and other divisions in schools and CHSCs, several strategies can be considered to change the situation: 1) setting indicators of engagement in HIV work in the evaluation system of leadership, 2) holding local implementers accountable to monitor the campaign implementation, and 3) establishing reward and punishment mechanisms (Wu, et al., 2010).

In China, policy commitment has been considered as the first step for succeeding in the fight against HIV/AIDS, and policy-level obstacles can significantly impede the implementation of commitments (Wu, et al., 2010; Yan, et al., 2012). The central government's declaration of strengthening HIV prevention work in schools was made in 2015 (MOE, 2015; NHC, 2015). However, by the time of the study, details of policy implementation had not been well clarified yet, which made the multi-sectoral coordination extremely difficult during the real-world work. Therefore, supportive documents illustrating specific objectives, techniques, evaluation, and accountability of the policy implementation are urgently needed. Furthermore, without emphasis on HIV testing in the policies, the current HIV prevention work only focused on the publicity of basic knowledge on HIV/AIDS and few actions on promoting HIV testing had been initiated in schools. Although health education is always the first step for disease prevention, it is far from enough to protect student MSM from HIV infection and achieve the 90% goal of case finding, considering the rising HIV epidemic in this population (NHC, 2016; The State Council, 2017). The study highly suggests that policies addressing the urgency of promoting HIV testing among student MSM should be developed in the coming future. Finally, the study found that the involvement of MSM communities had not been explicitly stated in the current policies. The main explanation may be policies for stigmatized communities, such as MSM, are politically sensitive in China (Wu, et al., 2010). Although gay-oriented civil society organizations have made great contributions to HIV/AIDS programs in the past decade in China and have been endorsed by the national and local health departments, schools and education agencies still have not authorized their participation in the school HIV campaign (Li, et al. 2010; Zhang, et al., 2017b). The study calls for more policy support to introduce civil societies and MSM communities to the school HIV campaign.

Several limitations should be noted when interpreting the findings of the study. First, the representativeness of the participants might be compromised, because all the participants in the study were recruited via the recommendation of the local municipal CDC. Opinions of stakeholders who did not work closely with the local CDC might not be collected, and barriers perceived by them might be different from the participants. Secondly, social desirability bias was expected in the study. Although the participants were notified that the discussion was anonymous and confidential, they might still have not shared all the difficulties and challenges they met during their work. Thirdly, since the study was conducted in a single city which is famous for its openness towards MSM, we should be very cautious when generalizing the study findings to the whole country. However, as Chengdu is an education center in China and encountering a typical HIV crisis among student MSM, the study may still be able to provide evidence and suggestions for the future HIV testing campaign in the whole country.

In conclusion, barriers to scaling up HIV testing among student MSM existed in every step and every sector of the campaign. Policy makers, health professionals, school officials, student volunteers, gay community leaders, and researchers should give special considerations to these challenges and devote sufficient effort in addressing the barriers.

Table 2.1 Background characteristics of the participants in different focus groups

Occupational background	Total	Male	Female
Total	21	14	7
FGD for health professionals			
District CDC	3	0	3
CHSC	3	3	0
FGD for school officers			
Comprehensive university	1	1	0
University of science and technology	2	1	1
University of finance and economics	1	1	0
College of art	1	0	1
FGD for student volunteers			
Official student association	1	1	0
Health-related student clubs	2	0	2
MSM underground society	2	2	0
FGD for MSM-NGO/CBOs officers			
NGOs registered in the Ministry of Civil Affairs	2	2	0
CBOs affiliated to local CDCs	3	3	0

Abbreviations: FGD, focus group discussion; CDC, Center for Disease Control and Prevention; CHSC, Community Health Service Center; MSM, men who have sex with men; NGO, non-governmental organizations; CBO, community-based organizations

Table 2.2 Identified barriers to promoting HIV testing among student MSM by the participants

Level	Barriers	Participants identifying the barriers
Target	a) Fear of personal information being disclosed	• All the participants
	b) Lack of access to HIV testing promotions	• All the participants
	c) Lack of HIV knowledge and risk perceptions	• Health professionals, school officers and student volunteers
Provider	d) HIV stigma and discrimination e) Lack of professional training f) Extra workload with low payment	• All the participants
Institution	g) Manpower shortage with excessive turnover	• All the participants
	h) Lack of funding and flexible use of it	• All the participants
	i) Lack of leadership support	• Health professionals, school officers and student volunteers
Policy	j) Lack of involvement of MSM communities	• Health professionals, school officers, and NGO/CBO leaders
	k) Lack of emphasis on HIV testing	• Health professionals, school officers, and student volunteers
	l) Ambiguity of implementation details	• Health professionals and school officers

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Chapter III: Barriers to HIV testing: Perceptions from Male Students Who Have Sex with Men in Chengdu, China

Abstract

Background: Few studies have learned obstacles of HIV testing uptake perceived by young students who are men having sex with men (MSM) in China. This specific group has experienced a rapid increase in HIV epidemic in recent years. The aim of this study was to explore perceived barriers to HIV testing among student MSM and provide preliminary knowledge for future studies.

Methods: The study used a qualitative design. The anonymous face-to-face in-depth interviews were conducted among 24 student MSM aged 18-24 in Chengdu City, China in March 2018. A semi-structured guide was used to lead the interview, which mainly included topics of socio-demographics, past experiences of HIV testing and perceived barriers or concerns about receiving a test. The data analyses were guided by the Grounded Theory.

Results: A total of six barriers in three levels were identified. At the individual level, the inhibitors included lack of detailed HIV knowledge and risk perceptions and concerns of confidentiality and privacy. The structural barriers contained lack of availability of HIV testing information and inconvenient location and open time of HIV testing sites. The challenges from the environmental level were perceived and internalized homosexuality stigma as well as HIV stigma and discrimination.

Conclusion: The study suggests that interventions are urgently needed to improve student MSM's awareness of HIV/AIDS and HIV testing and to provide private, convenient, and less stigmatized environment for student MSM to receive HIV testing.

Key words: HIV testing; barriers; students; men who have sex with men; China

Introduction

Recently in China, a disproportional increase in HIV epidemic in young students who are men having sex with men (MSM) has raised significant public attention. From 2011 to 2015, the newly reported HIV/AIDS cases in the 15-24 age group had increased by 35% after excluding the effect of testing expansion, while unprotected male-to-male sex was the most common transmission route in the group (Dong, et al., 2014; Li, et al., 2013; Wei, et al., 2013; Zhang, et al., 2017). According to the Chinese Center for Disease Control and Prevention (China CDC), MSM accounted for over 80% of newly reported HIV cases aged 15-24 in recent years (China CDC, 2015). Prior studies showed HIV prevalence among student MSM or young MSM in China ranged from 3.0%-6.8%, with an incidence of 4 to 7 cases per 100 person-years, and the prevalence of syphilis was about 4.8% - 6.7% among this population (Dong, et al., 2014; Li, et al., 2013; Wei, et al., 2013; Xu, et al., 2013). Considering the alarming increase in HIV transmission, HIV prevention and intervention strategies targeting student MSM are urgently needed in the country. In 2015, the National Health Commission (NHC) and Ministry of Education (MOE) in China jointly issued "The Notice on Strengthening HIV/AIDS Prevention and Control in Schools", which required schools, health departments, non-governmental organizations (NGOs) and other related sectors to cooperate to initiate an HIV campaign in schools (MOE, 2015; NHC, 2015)

Since the early stage of the world's fighting against HIV/AIDS, expanding HIV testing has been acknowledged as an efficient strategy for case finding, linkage to care, and preventing transmissions (US CDC, 2007). The universal HIV voluntary testing and immediate antiretroviral treatment strategy (Test-and-Treat) has been introduced and piloted among MSM in eight cities in China since 2012 (NHC, 2016; Zhang, et al., 2016). A mathematical model study predicted that the Test-and-Treat policy would reduce new HIV infections among Chinese

MSM by up to 70.9% by 2022 (Luo, et al., 2015). However, previous studies reported that the rate of a lifetime HIV testing was ranging from 47%-72%, and the rate in the past 12 months was just about 38%-63% among MSM in China (Li, et al., 2014; Zhang, et al., 2013; Zhang, et al. 2017; Zhou, et al., 2018; Zou, et al., 2012). At the beginning of 2017, the State Council of China issued the Thirteenth Five-Year Plan for HIV Prevention and Treatment, one major aim of which is to discover 90% of people living with HIV (PLH) in the country (The State Council, 2017). Undoubtedly, there is still a huge gap between the current HIV testing coverage and the national goal, and a rigorous action should be taken to promote HIV testing among key populations of HIV prevention, including student MSM, in China.

Factors associated with MSM's uptake of HIV testing services may be various and from multiple levels. Previous studies showed that the individual level factors associated with HIV testing behaviors included HIV risk perceptions, frequency of condom use, number of sexual partners, HIV disclosure by sexual partners, drug and alcohol use, stigma, peer support, and faith in trust (Balaji, et al., 2013; Brito, et al., 2015; Li, et al., 2014; Mitchell & Horvath, 2013; Noble, et al., 2017; Persson, et al., 2016). In the meanwhile. the structural level factors are composed of privacy of testing sites, attitudes of service providers, skills of providers, cost of a test, insurance coverage, and convenience of the testing procedure (Huang, et al., 2012; Levy, et al., 2014; Persson, et al., 2016; Reisen, et al., 2014; Song, et al., 2011; Wong, et al., 2012). To our knowledge, there have been few studies which learned factors, especially inhibitors, associated with utilization of HIV testing services among student MSM in China, and previous studies were either focusing on general MSM populations or on HIV positive student MSM.

Since students are a population with unique features in behaviors, life patterns, and community cultures, compared to non-student MSM, understanding factors associated with HIV testing behaviors in this specific group is necessary for promoting HIV testing in China. The aim

of the study was to explore barriers associated with receiving HIV testing services from perspectives of student MSM in China.

Methods

Study design

The study adopted a qualitative design which was widely used in HIV fields to get preliminary knowledge from an under-studied population. The anonymous in-depth interviews with a semi-structured guide were conducted face-to-face between an interviewer and the student MSM in Chengdu City, China in March 2018. Chengdu is one of the education centers in China and noted for its tolerance and openness to people with homosexual identity (Feng, Wu, & Detels, 2010; Peng, et al., 2016). The study was approved by the Institutional Review Boards (IRBs) of the University of California, Los Angeles (UCLA) and the National Center for AIDS/STD Control and Prevention (NCAIDS), China CDC.

Participants and recruitment

To be eligible for the study, the participants should be 1) 18-24 years old, 2) male, 3) having had homosexual behaviors (including anal or oral sex) in the past 12 months, 4) a registered full-time student in Chengdu at the time of study, and 5) providing oral informed consent. To fully understand the factors hindering student MSM taking an HIV test, the study recruited the participants with various backgrounds in school type, school year, study major and past HIV testing experiences. The sampling was terminated when no new information was collected from the new sampled units.

To enroll the participants, five recruiters were invited in the study, including a staff of a local MSM-oriented community-based organization (CBO), a local CDC staff, and three student

MSM who were identified as key persons in the local student MSM community. They were trained and asked to post an invitation flyer in their internal network which had a connection with student MSM or online social platforms preferred by local student MSM (e.g. Wechat, QQ, and Blued). In addition, the participants already enrolled in the study were encouraged to send the invitation flyer to their peers. The flyer described the study as a "Health Service Study" with eligibility criteria for participation and contact information of the researcher, so that student MSM who were interested in the study could contact the researcher for more information and screening for eligibility. The researcher would arrange a time and location to meet with the eligible participant for the in-depth interview.

Data collection

Each of the in-depth interviews was conducted by a trained interviewer in a private space where the participants felt comfortable in, like a quiet corner on campus and a small study room. When meeting with the participant, the interviewer firstly provided full disclosure of the study procedures, explained potential risks and benefits, and ensured confidentiality and voluntary participation. Oral informed consent was obtained from each participant prior to any data collection. Each interview was audio-recorded with the agreement of the participant and lasted approximately 40-60 minutes. After the interview, the participant received 100 Chinese Yuan (approximately 15 USD) for his/her time and effort.

A semi-structured interview guide with open-ended probes was used in the interview, which focused on topics of 1) socio-demographics, 2) school life and affiliation to gay communities, 3) sexual behaviors and psychoactive substance use, 4) HIV knowledge and perceived risk of HIV, 5) awareness of current HIV testing services and past testing experiences,

6) perceived barriers to HIV testing, and 7) suggestions to improve current HIV testing services. No name or other identifiable information were asked during the interview.

Data analysis

The audio records of the in-depth interviews were transcribed verbatim by a third trained researcher after the discussion. The interviewer would read through the transcripts to ensure there was no vagueness and misunderstanding of the content. The analyses of the transcribed data were guided by the Grounded theory (Glaser & Strauss, 1967). A set of *a priori* codes were developed based on the interview guide. The code list was modified based on the themes emerged from the transcripts throughout the coding procedure. Themes relevant to the research question were extracted from the data. All transcriptions, coding, and analyses were firstly completed in Chinese, and the results were later translated into English. The ATLAS.ti software (Berlin, Germany) was used during the analyses.

Results

Demographic and background characteristics

A total of 24 student MSM were included in the study. Table 3.1 showed the socio-demographic characteristics of the participants. The median age of the sample was 20 years old (range: 18-24), and most of them (n=23, 95.8%) were Han Chinese. Before entering the current school in Chengdu, about 66.7% (n=16) of the participants had been living in urban regions, with the others in a suburban or rural area such small counties, townships, and villages. Regarding the school type, 11 (45.8%), 11 (45.8%), and 2 (8.3%) participants were from the top, second, and third level universities and colleges, respectively. The study major of the participants varied and was categorized into two types, social sciences and arts (n=14, 58.3%) and natural sciences and

technologies (n=9, 37.5%). About 58.3% (n=14) of the sample reported a monthly income of 1,500 Chinese Yuan (approximate 220 USD) or above after excluding the rent for housing. More than 80% (n=20) of the participants were living in a school dormitory. The median age of the first homosexual behavior of the sample was 18 years old, with a range of 8 to 20 years old. About two-thirds of the participants (n=16) reported having more than one male sex partner in the past 12 months. And three-quarters of the participants (n=18) reported using condoms all the time during their anal sex behaviors in the past 12 months. Among the participants, half of them (n=12, 50%) had been tested with HIV in the past 12 months.

Perceived barriers to HIV testing

A total of six themes at individual, structural, and environmental levels emerged around barriers to HIV testing. The individual-level barriers to HIV testing included lack of detailed HIV knowledge and risk perception and concerns of confidentiality and privacy. The structural-level barriers comprised of the limited availability of HIV testing information as well as inconvenient location and open time of HIV testing sites. The environmental-level barriers were perceived and internalized homosexuality stigma and HIV-related stigma and discrimination.

1. Individual-level barriers

a) Lack of detailed HIV knowledge and risk perceptions

Most of the participants (n=18) addressed that lack of detailed HIV knowledge and risk perceptions of infection had led to student MSM's inadequate seek of HIV testing services. On the one hand, several participants acknowledged that their perceptions about HIV/AIDS was very limited and not enough to help them realize the necessity of taking HIV testing. Moreover, some participants showed substantial misconceptions of the disease during the interviews, which

also resulted in the refusal of an HIV test. On the other hand, many participants indicated that their perceived risk of HIV infection was low, because they either trusted their sexual partners to be HIV negative or pushed their luck, especially when the partners were also students. Nevertheless, when being asked how to know the HIV status of their partners, most participants answered they judged it by the appearance, personality, and behaviors of the partners, but not the report of HIV testing results.

"My first boyfriend was a sporty man. I felt he was strong and impossible to have HIV. So, I did not ask (if he had been tested for HIV) …… I didn't do an HIV test because I didn't find any symptoms in my body which should appear in the window period of HIV infection, and in the meanwhile, my weight hasn't changed since the high school. So, I don't think it's necessary." (ID 19, age 19, 2nd-year undergraduate, never tested)

"Generally speaking, my sexual partners are college students. Then, my safety awareness was a bit low. I thought few college students would have been infected with HIV…… Another reason (of not taking HIV testing) is sometimes I would love to take chances and push my luck. If I felt I was safe, I would think there was no need for me to do an HIV test." (ID 5, age 20, 3rd-year undergraduate, never tested)

b) Concerns of confidentiality and privacy

Several participants (n=10) indicated that one reason for not receiving an HIV test of student MSM was that they worried their personal information and testing results would be disclosed by testing sites. According to the participants, HIV testing sites at CDCs, general hospitals, and school hospitals were less trusted than the sites in MSM communities, because most hospital- and CDC-operated HIV testing sites currently required the testers to provide the legal identity number. Since the cooperation between health agencies and schools had been strengthened due

to the HIV campaign, many student MSM had a concern that their personal information and testing results would be disclosed to their schools, families, and governmental agencies. In addition, the environment of some facility-based HIV testing sites was not private enough to avoid other people around seeing the process of HIV testing.

"A main reason (of not taking HIV testing) is the privacy. Many people don't want to do the test, because they think their information will not be well protected……. Personally, I don't trust CDCs. If I trust them, I would have chosen CDCs to do the test at the very beginning, but not the gay CBO…… I am concerned that my testing result may be disclosed to my family and school. Actually, the whole country does not have a good environment of privacy protection" (ID 2, age 21, 4th-undergraduate student, tested in the past 12 months)

"I prefer NGOs. For CDCs and hospitals, I feel very afraid. Because the disease is still a taboo in China. I am afraid that if I go there to do a test, no matter whether I have this disease or not, the government may steal my information. If you go to a hospital, you must show your ID card. If you go to a local CDC, the municipal CDCs may report your information to the provincial CDC and the national CDC. But NGOs have no rights to do that, and I can use a pseudonym name. All in all, I have concerns about the confidentiality of my information." (ID 16, age 21, 4th-undergraduate student, not tested in the past 12 months)

2. Structural-level barriers

c) Limited availability of HIV testing information

Several participants (n=8) indicated that the poor availability of HIV testing information was a barrier to HIV testing for student MSM. The current publicity of HIV testing services was insufficient, no matter in schools or on public media. Students felt it difficult to find comprehensive information about available HIV testing services, even from the internet. During

the interviews, only one participant knew all types of organizations that could provide HIV testing services. Buying HIV self-testing kit online was the most commonly known method to get a test. Reported by the participants, most of their limited knowledge on HIV testing were from MSM communities. However, when being asked whether they knew the MSM-friendly clinics in community health service centers (CHSCs) close to schools which were established to serve for student MSM, few participants answered yes.

"The process and location of HIV testing services are not very clear to me. I don't know whom to ask and who can give me the right answer. I searched it online once, when I felt urged to take an HIV test. But after searching online for a long time, I still didn't find where to do the test." (ID 18, age 20, 2nd-year undergraduate, never tested)

"When I was a 1st-year undergraduate student, I thought that HIV testing could only be conducted in CDCs. This misunderstanding had been lasted until my 3rd year in college, when a local MSM NGO approached the student group I participated in……The publicity of HIV testing is really poor. If a person searched it online, before finding the useful information, he might first see some posts describing AIDS as a terrible disease. Then, he would not dare to go to do a test." (ID 15, age 23, 5th-year undergraduate, tested in the past 12 months)

d) Inconvenient location and open time of HIV testing sites

Nearly half of the participants (n=11) identified that the location and open time of the HIV testing sites they knew were inconvenient for student MSM. According to the participants, the universities and colleges were mostly sitting in the suburban area in the city, but the HIV testing sites they knew were in the downtown, including the ones operated by MSM NGO/CBOs. Therefore, some student MSM might not be willing to receive HIV testing due to the long geographic distance. Again, even though there existed several HIV testing clinics in the

neighboring area of some universities and colleges, few student MSM knew it. Moreover, the open time of some HIV testing sites, especially the CDC-operated ones, was limited to weekdays when students had classes to take. Additionally, some participants reported that it took a long time to wait for a testing result in CDC-operated testing sites.

"In my daily life, I am too busy and cannot find a time to receive HIV testing. Also, I am not a local person in Chengdu, but just a student coming here for study. When I am in the school which is in the suburban area of Chengdu, I feel very inconvenient to travel to the downtown to take an HIV test, because I am not a local and unfamiliar with the city." (ID 20, age 19, 2nd-year undergraduate student, not tested in the past 12 months)

"Going to the CDCs (to receive an HIV test) is super inconvenient for me. First, it takes a long time to wait for the testing result. Secondly, the CDC-operated HIV testing sites are open in one or two weekdays only per week. For a student like me, I have classes to take during the weekdays, so it is inconvenient for me." (ID 12, age 20, 3rd-year undergraduate, tested in the past 12 months)

3. Environmental-level barriers

e) Perceived and internalized homosexuality stigma

Most of the participants (n=20) indicated that perceived and internalized homosexuality stigma was a significant inhibitor of utilizing HIV testing. On the one hand, student MSM fear that their homosexual identity might be disclosed if other people discovered their HIV testing behavior, because HIV was considered as a "gay disease" among young males in China, and that they would be therefore stigmatized and discriminated, as the general population still thought homosexuality was a conflict with the traditional culture and social norms. On the other hand, a considerable proportion of student MSM had been suffered from internalized homosexuality

stigma. As a result, they might feel ashamed about their identity, avoid any connections with homosexual communities, and refuse to seek related healthcare services.

"If you buy an HIV testing kit and use it in the dormitory and your roommates discover it, they would definitely ask you what it is for. If you tell them it is just a medical test, they will definitely know why you do it. I am afraid that they know it……. I am mainly afraid that how people around would look at me……. I have a roommate who is homophobic. (ID 19, age 19, 2nd undergraduate, never tested)

"Some schools still have a kind of atmosphere of stigmatizing and discriminating homosexuality, which caused a psychological shadow on gays and made them afraid to go to take HIV testing. They did not dare to do the test. Because if I am discovered by them (indicating schoolmates and teachers) when doing the test, they will look down on me." (ID 1, age 21, 3rd-year undergraduate, tested in the past 12 months)

"I feel many student MSM have sufficient knowledge on HIV, but a substantial proportion of them don't have enough self-identity and are embarrassed by their sexuality. Then, they may be afraid to go to take an HIV test……Some student MSM would not disclose their homosexual identity to others, and they might thus refuse to receive related information about HIV." (ID 16, age 21, 4th-year undergraduate, not tested in the past 12 months)

f) HIV stigma and discrimination

A majority of the participants (n=18) identified that HIV-related stigma and discrimination from friends, families, schools, and the society significantly impeded the uptake of HIV testing. Student MSM were afraid their testing results would be positive and his health, study, career, and family would be therefore destroyed. Even the participants showed stigmatizing and avoidant attitudes towards HIV/AIDS patients during the interviews. Several participants acknowledged

that although they knew HIV was uneasy to spread, they might keep away from a person who was diagnosed with HIV. And all the participants said they might not accept sexual partners who were infected with HIV.

"Because now under the entire societal environment, AIDS patients are greatly discriminated. In fact, many people don't understand the disease. Even though they know it's not easy to spread, they still feel scared. They are afraid to be infected. So, the current environment is not friendly to AIDS patients. After considering this, they (student MSM) will not go to take the test." (ID 14, age 19, 3rd-year undergraduate student, not tested in the past 12 months)

"Most people did worry about their HIV testing results after they had unsafe behaviors. They can't face and bear a positive test result. They think that a positive result means his life is sentenced to death and his career, family, and all other things will be affected. So, he would rather not do the test and conceal the fact of infection as long as possible" (ID 15, age 23, 5th-year undergraduate student, tested in the past 12 months)

"They (student MSM peers) are very worried. There was a case occurred before. The student MSM friend I mentioned earlier accidentally revealed his positive test result to his roommates who later told their parents. The parents of his roommates then asked the school to require my friend to leave the school for one year. The school gave my friend a lot of pressure and threatened him that his parents would be notified if he did not agree to leave." (ID 9, age 20, 2nd-undergraduate, tested in the past 12 months)

Discussion

As one of the first few studies that explored barriers to HIV testing from perspectives of student MSM in China, the study revealed several important factors that might negatively affect the

utilization of HIV testing of student MSM and provided preliminary knowledge for further research and interventions on HIV healthcare services targeting student MSM.

The study found that the lack of detailed HIV knowledge intersected with misconceptions about the disease as well as the low perceived risk of HIV fundamentally hindered the HIV testing uptake of student MSM. The finding was consistent with previous studies in China and other countries which demonstrated that low health literacy and inadequate risk perceptions were significantly associated with MSM's health behaviors (Li, et al., 2017; Liu, et al., 2015; Persson, et al., 2016; Sharma, et al., 2017; Song, et al., 2011; Zhang, et al., 2013). Based on our knowledge on current HIV education and publicity in China, the low awareness of the disease of student MSM may be mainly caused by the compromising education in schools and MSM communities. First, although schools have started to enhance HIV health education in response to the governmental commitment, the knowledge included in the education are limited to general perceptions, such as what is HIV and how HIV can be transmitted, which may not be able to help student MSM obtain enough awareness of infection risk and necessity of taking HIV testing. Moreover, the frequency of HIV education in schools is limited and the way of education is not attractive to students, which may furtherly reduce the effectiveness of health education. Secondly, as the main source for student MSM to learn HIV and sexual health knowledge, MSM communities have provided more specialized publicity of health knowledge targeting student MSM, compared to schools (Li, et al., 2010). Nevertheless, the health consequences of the disease are sometimes under-addressed by MSM communities to moderate stigmatization towards HIV and homosexuality, which may contribute to the misconceptions about the disease and a low HIV risk perception of student MSM. The findings imply that future health education of HIV in schools and MSM communities should be intensified and incorporate more detailed knowledge of HIV prevention, epidemiologic information, as well as warning education at an

appropriate level (Sharma, et al., 2017). Meanwhile, student volunteers should be continually empowered to participate in the development and implementation of innovative HIV interventions which can attract students' attention (NHC, 2015).

The confidentiality breach and a concern of privacy was found to be another individual factor negatively associated with HIV testing behaviors of student MSM. Prior studies have indicated that fear of information leakage and open environment in the testing site might make MSM less likely to take an HIV test (Logie, et al., 2017; Pharr, et al., 2016; Witzel, et al., 2016; Zhao, et al., 2015). Reported by the participants, several types of HIV testing sites, such as the hospital- and CDC-operated ones, require the testers to provide their identification numbers before receiving the service. Since hospitals and CDCs are considered as governmental agencies, and their cooperation with schools has been strengthened in recent years due to the HIV campaign, student MSM may have a serious concern about the disclosure of their testing results and sexual identity to schools. In addition, in some health facilities, the environment of HIV testing clinics may not be private enough, which makes testers uncomfortable during reception of counseling and testing (Logie, et al., 2017). Even in MSM-friendly settings, people may be worried that their acquaintances would discover their testing behaviors (Logie, et al., 2017). The finding illustrates that there is an urgent need to improve the confidentiality and privacy of the current testing services in China. Multiple strategies, such as promoting anonymous testing in healthcare settings, improve the privacy of the whole process of HIV testing services, enhancing pre-testing counseling to ensure confidentiality can be adopted. In addition, promotion of innovative testing techniques with better convenience and privacy, such as in-home testing and oral testing, should be increasingly intensified among student MSM.

The study identified that barriers derived from the structural level also play essential roles in impeding student MSM's uptake of HIV testing services. First, little HIV testing information

could be obtained either from health education or the internet, according to the participants. Another qualitative study conducted by Liu et al. (2015) in a sample of MSM in China also showed that not knowing where to get a free test was a challenge to HIV testing. The finding of the study adds to the evidence that the current publicity of HIV testing information is suboptimal and needed to be reinforced on various platforms, especially the social media preferred by student MSM. Secondly, consistent with prior studies, inconvenient location and time of the current testing sites were also considered as inhibitors of HIV testing uptake by the participants in the study (Chen, et al., 2017; Liu, et al., 2015). A spatial epidemiological study in China reported an inverse relationship between geographic distance and ever being tested for HIV (Chen, et al., 2017). Since students spend most of their time in schools and live a collective life, the issues of location and open time of testing sites may contribute to a test refusal in a larger proportion for student MSM, compared to non-students. Therefore, services that can raise the accessibility of HIV testing services, such as non-facility-based HIV testing and self-testing, are suggested to be expanded in the future HIV testing campaign. In addition, although several MSM-friendly testing clinics have been established in community health service centers near schools in Chengdu, few student MSM were aware of it. Again, the study calls for publicity of available HIV testing services, especially the ones friendly to student MSM, should be substantially strengthened.

The study found that stigma and discrimination towards homosexuality and HIV pose a negative effect on student MSM's uptake of HIV testing services. On the one hand, although the Chinese society has become increasingly tolerant of the gay community, homophobia has still been prevailing among the general population (Tao, et al. 2013). In schools, homosexual culture is considered to be against the mainstream of school education, therefore, the fear of disclosure of sexual identity is common among student MSM. In addition, the study found that except for

perceived stigma, student MSM also suffered from the internalized stigma of homosexuality, which might result in avoidant attitudes to their health risk and less utilization of HIV testing services. Prior studies revealed that internalized homophobia was associated with negative outcomes including minimal participation in HIV testing and other health promoting behaviors (Pyun, et al., 2014; Wei, et al., 2016; Xu, et al., 2017). On the other hand, HIV/AIDS remains a health problem linked to immoral behaviors against traditional culture norms in China, and the general population still has substantial misconceptions about the disease (Qian, et al., 2007; Yeo & Chu, 2017). The stereotype and misconceptions have made people living with HIV continually stigmatized and discriminated (Song, et al., 2011; Zhao, et al., 2015). Furthermore, since HIV has been increasingly considered as a "gay disease" among young males in the country, homosexuality stigma may be added to HIV stigma, which may further lead to the refusal of HIV testing (Liu, et al., 2011; Logie, et al 2017; Zhang, et al., 2013). To address the stigma issues, we strongly call for an anti-stigma campaign in schools, while HIV testing services friendly to the MSM population should be rigorously promoted.

Several limitations should be noticed when interpreting the study findings. First, as HIV and homosexuality are still sensitive topics in China, social desirability bias was expected during the in-depth interviews. Secondly, since most of the participants were recruited by the CDC or CBO staff or the key persons in the local student MSM community, they were more likely to have a higher level of HIV knowledge, know more about HIV testing, and perceive less stigma. Therefore, the representativeness of the participants might be limited. Thirdly, the study was conducted in one city which is famous for its tolerance to gay communities and has been in the front line of the HIV campaign in schools. Therefore, we should be very cautious when generalizing the study findings to other areas in China.

In conclusion, this qualitative study provided scientific evidence of the barriers to HIV testing perceived by student MSM in China. To succeed in the HIV campaign in schools and achieve the 90% goal of case identification of the national plan, the government, health facilities, schools, and MSM communities should collaborate to address the challenges.

Table 3.1 Demographic and background characteristics of the participants, overall and by HIV testing behavior in the past 12 months

Characteristics	Overall n (column %)	Being tested in the past 12 months	
		No	Yes
Total	24	12	12
Age			
Median (range)	20 (18-24)	20 (19-24)	20.5 (18-23)
Ethnicity			
Han	23 (95.8)	11	12
Other	1 (4.2)	1	0
Hometown			
Urban region	16 (66.7)	10	6
Small county/township/village	8 (33.3)	2	6
School type			
Top level university	11 (45.8)	5	6
Second level university	11 (45.8)	7	4
Third level university/junior college	2 (8.3)	0	2
School year			
Undergraduate year 1-2	9 (37.5)	5	4
Undergraduate year 3-5	11 (45.8)	4	7
In graduate school	4 (16.7)	3	1
Study major			
Social sciences and arts	14 (58.3)	7	7
Natural sciences and technologies	9 (37.5)	5	4
Refused to answer	1 (4.2)	0	1
Monthly income (RMB)			
<1000	2 (8.3)	1	1
1000-1499	6 (25.0)	3	3
1500-1999	11 (45.8)	6	5
2000 or above	3 (12.5)	2	1
Inestimable	2 (8.3)	0	2
Living in a school dormitory			
Yes	20 (83.3)	10	10
No	4 (16.7)	2	2
Age of the first homosexual behavior			
Median (range)	18 (8-20)	18 (8-19)	17.5 (16-20)
No. of male sex partners in the past 12m			
=1	8 (33.3)	3	5
>1	16 (66.7)	9	7
Condom use during anal sex in the past 12m			
Every time	18 (75)	7 (58.3)	11 (91.7)
Not every time	6 (25)	5 (41.7)	1 (8.3)

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Chapter IV: HIV Testing Behaviors and Associated Barriers: A Survey of Male Students Who Have Sex with Men in Chengdu, China

Abstract

Background: To achieve the UNAIDS "90-90-90" goal of ending HIV, expanding HIV testing among key populations is crucial. China recently witnessed a rising HIV epidemic among students who are men having sex with men (MSM). The aim of the study was to evaluate HIV testing behaviors of student MSM in China and examine the barriers to HIV testing.

Methods: A cross-sectional survey of 536 student MSM aged 18-24 was conducted from May to June 2018 in Chengdu City, China. A convenient sampling strategy was used to recruit the participants based on the social network of 15 investigators who were key persons in the local student MSM community. The participants were asked to use their own mobile phones to self-administer the anonymous questionnaire. Descriptive analyses were performed to understand the HIV testing behaviors, perceived barriers to HIV testing, and other characteristics of the sample. Bivariate and multivariable logistic regression analyses were conducted to examine the factors associated with not receiving an HIV test in the past 12 months.

Results: Among the participants, 68.0% and 59.8% reported having received an HIV test ever and in the past 12 months, respectively. Barriers to HIV testing agreed by the participants mainly included fear of being diagnosed with HIV (80.9%), inconvenient location of testing sites (74.9%), fear of negative attitudes from people around (74.9%), inconvenient open time of testing sites (67.3%), and fear of testing results being disclosed to schools (64.3%). The level of HIV knowledge (adjusted odds ratio=0.84; p-value=0.019) and no affiliation to MSM-oriented organizations (adjusted odds ratio =2.88; p-value<0.001) were associated with not receiving HIV testing in the past 12 months.

Conclusion: The uptake of HIV testing services is suboptimal in the student MSM group in China. The government, health facilities, schools, and MSM communities should cooperate to strengthen HIV education in schools and MSM communities and to promote HIV testing among student MSM.

Key words: HIV testing; students; men who have sex with men; China; survey

Introduction

Since the first report of unusual clusters of pneumocystis carinii pneumonia in five homosexual men in Los Angeles, our fight against HIV/AIDS has lasted for more than 35 years (US CDC, 1981; Gottlieb, et al., 1981). Among the various strategies developed to control the HIV epidemic during the past three decades, HIV testing has been considered as one of the most important techniques, because it can help identify HIV infections, enable timely treatment, and ultimately prevent HIV transmission (Granich, et al., 2009; US CDC, 2007). More than 174,000 health facilities in global are currently providing HIV testing and counseling services, while innovative HIV testing methods, such as community- and home-based testing, are thriving, which have done a great help to the promotion of testing and linkage to care among hidden populations (Suthar, et al., 2013; WHO, 2015; WHO, 2016). However, despite the great effort in expanding HIV testing throughout the world, there were still 25% of the people living with HIV (PLH) did not know their status (UNAIDS, 2018). To achieve the first goal of the "90-90-90" targets (90% of PLH knowing their HIV status, 90% of people who know their status receiving treatment, and 90% of people on HIV treatment having a suppressed viral load), we still face many challenges (UNAIDS, 2018; WHO, 2016).

Similar to many other health behaviors, people's uptake of HIV testing is determined by multifaceted factors (Golden, & Earp, 2012; Sallis, Owen, & Fisher, 2015). On the one hand, motivators of the uptake of HIV testing services at the individual level mainly included higher HIV risk perceptions, less frequently use of condom, a higher number of sexual partners, HIV disclosure by sexual partners, use of drugs and alcohol, less perceived stigma, greater peer support (Balaji, et al., 2013; Brito, et al., 2015; Li, et al., 2014; Mitchell, & Horvath, 2013; Noble, et al., 2017; Persson, et al., 2016). On the other hand, the structural-level factors associated with people's seek for HIV testing services were at least composed of privacy of

testing site, attitudes and skills of service providers, cost of a test and insurance coverage, and convenience of the testing procedure (Huang, et al., 2012; Levy, et al., 2014; Persson, et al., 2016; Reisen, et al., 2014; Song, et al., 2011; Wong, et al., 2012).

As the largest developing country in the world, China had about 501,000 PLH at the end of 2014, yielding a national HIV prevalence of 0.037% (NHC, 2015a). Notably, in recent years, the country has witnessed a dramatic rise in HIV transmission among young students aged from 15 to 24. The newly reported HIV cases in the 15-24 age group have increased by 35% after excluding the effect of testing expansion from 2011 to 2015 (Zhang, et al., 2017a). Moreover, indicated by prior investigations on student HIV/AIDS cases, unprotected anal sex between males was the most common transmission route of HIV in this group (Dong, et al., 2014; Li, et al., 2013a; Wei, et al., 2014; Xu, et al., 2011; Xu, et al., 2013). It has been reported that men who have sex with men (MSM) accounted for over 80% of newly reported HIV cases aged 15-24 in recent years (China CDC, 2015; Dong, et al., 2014; Zhang, et al., 2017a). Prior studies in China showed an HIV prevalence among students or young MSM ranging from 3.0-6.8%, with an incidence of 4-7 cases per 100 person-years (Dong, et al., 2014; Li, et al., 2013a; Wei, et al., 2014; Xu, et al., 2011; Xu, et al., 2013). To respond to the alarming HIV epidemic, a school HIV campaign has been initiated by the country since 2015 (MOH, 2015; NHC, 2015b).

At the beginning of 2017, the State Council of China issued the Thirteenth Five-Year Plan for HIV Prevention and Treatment, and one major aim of the plan is to discover 90% of the HIV/AIDS cases in the country (The State Council, 2017). To achieve the goal, understanding the uptake of HIV testing services of student MSM is important, considering the increasing HIV epidemic in this population. The aim of this study was to evaluate the HIV testing behaviors of a sample of student MSM in one city in China and examine the barriers associated with the uptake of HIV testing services of this specific group.

Methods

Study design

The study used a quantitative design. A cross-sectional survey was conducted among a sample of student MSM in Chengdu City, China from May to June 2018. Chengdu is one of the education centers of China and noted for its tolerance and openness towards people with homosexual identity (Feng, Wu, & Detels, 2010; Peng, et al., 2016). The study was approved by the Institutional Review Boards (IRBs) of the University of California, Los Angeles (UCLA) in the U.S. and the National Center for AIDS/STD Prevention and Control (NCAIDS), Chinese Center for Disease Control and Prevention (China CDC).

Study participants and recruitment

The source population of the quantitative study was the student MSM who were 18-24 years old at the time of the study in Chengdu, China. People eligible for the study were those who were 1) male, 2) 18-24 years old, 3) having had homosexual behaviors (including anal or oral sex) in the past 12 months, 4) a registered full-time student in Chengdu at the time of enrollment, and 5) providing oral informed consent. Since the homosexual people is still a hidden population in China, a convenience sampling strategy was adopted to recruit the participants due to the lack of a sampling frame.

First, 15 student volunteers who were identified as key persons in the student MSM network in Chengdu were recruited and trained as investigators of the study. The investigators were then asked to post the invitation flyer of the survey on popular online social platforms used by student MSM (e.g. Wechat, QQ, and Blued). The flyer described the study as a "Health Service Study" with eligibility criteria for participation and contact information. If a potential participant was interested in the study, an investigator was available to be contacted for more

information and to provide screening for eligibility, either through online chatting or meeting in a private space, like a corner on campus. For eligible participants, the investigator would continue to provide full disclosure of the study procedures, explain potential risks and benefits, and ensure voluntary participation and confidentiality. After obtaining the oral informed consent from the participant, a link and a password of the e-questionnaire was sent to the participant's mobile phone by the investigator.

Data collection

The study used an anonymous survey system (https://www.wjx.cn/) to collect the data. The participant was able to self-administer the e-questionnaire using his own mobile phone and submit it to the online system directly. The investigator was available to help with any problems or clarifications during the survey. No name or other identifiable personal information was asked during the survey. Each assessment lasted about 10 minutes, and the participant who submitted the questionnaire successfully would receive an electronic "red packet" valued of 15 Chinese Yuan (about 2.25 USD) from the system for their time and effort. A total of 689 people responded to the investigators and 153 of them were either ineligible for the study, or refused to participate in the study, or failed to submit the questionnaire. Finally, 536 student MSM were enrolled, with a recruitment rate of 77.8%.

Quality control

Due to the fact that the investigator might not be able to meet the participant in person and the e-questionnaire was accessed and self-administered via the participants' mobile phone, ensuring the quality of participant recruitment and data collection was essential. We adopted several strategies to conduct quality control during the survey, including 1) giving a professional training

to the investigators and teaching them the standard recruitment procedure and language; 2) requiring the investigators to take screen shots of their online communication records with the participants after de-identifying the personal information and send it back to the study team to prove they had followed the standard recruitment procedure and language; 3) assigning a unique login password of the e-questionnaire for each participant and limiting the valid Internet Protocol (IP) address of the participants' mobile phones to be in Chengdu to avoid ineligible people accessing the survey link; 4) setting a restriction in the survey system that one mobile phone could only successfully submit the e-questionnaire once to prevent repeated participation; 5) ensuring the questionnaire could be finished within 10 minutes on average to avoid the impatience and carelessness of the participants; and 6) setting up trap questions and a minimum time of completion to ensure the respondents were reading the questions thoroughly.

Measures

1. Socio-demographics

The socio-demographics collected in the study included age, ethnicity, hometown (urban or rural region), school type, school year, study major, monthly income, and housing status (living in a school dormitory or not) of the participants.

2. Awareness and past experiences of HIV testing

To assess the awareness of HIV testing services, the participants were first asked to rate their overall awareness of HIV testing from "excellent" to "poor". They were then asked whether they knew the HIV testing services provided in different types of settings, such as CDCs, Community Health Service Centers (CHSCs), and NGOs, and whether they knew the different types of HIV testing methods (e.g. finger-prick blood test, venous blood test, oral test, and urine test).

Questions about past HIV testing behaviors included whether they had been tested for HIV ever and in the past 12 months. For those who had received HIV testing ever, detailed information including the total number of testing ever taken, the frequency of testing, settings to receive HIV testing, and types of testing ever chose were further documented.

3. Perceived barriers to HIV testing

Based on our prior knowledge on barriers to HIV testing obtained from the in-depth interviews, we developed a ten-item list of potential structural and individual barriers associated with taking HIV testing and asked the participants how they agreed with those barriers. Sample items included fear of being diagnosed with HIV, the location of HIV testing sites is inconvenient, fear of homosexual identity being disclosed to other people, and fear of testing results being disclosed to schools. The responses were categorized in to 1 = "strongly disagree", 2 = "disagree", 3= "agree", and 4 = "strongly agree".

4. Affiliation to gay communities

The participants were asked whether or not they knew any MSM-oriented non-governmental organizations (NGOs) or community-based organizations (CBOs) in China and whether they had participated in any events held by the organizations. The participants who had participated in any events of the MSM NGO/CBOs were categorized as "being affiliated to MSM NGO/CBOs". In addition, the frequency of using gay social applications, visiting gay bars, and visiting gay bathhouses were also assessed.

5. Sexual orientation, disclosure of sexual identity, and homosexuality stigma

The self-identified sexual orientation and extent of disclosure of the sexual orientation were asked in the survey. For homosexuality stigma, an 18-item scale developed by Liu et al. (Liu, Feng, & Rhodes, 2009) was adopted to evaluate the perceived and internalized homosexuality stigma of the participants. The scale was previously used in MSM populations in China and showed good validity and reliability (Liu, et al., 2011). The scale contained ten questions related to perceived homosexuality stigma (e.g. many people are unwilling to accept MSM; many employers would look down upon an effeminate man, regardless of his qualification for the job) and eight questions associated with internalized stigma (e.g. sometimes I wish I were not an MSM; sometimes I feel ashamed of my sexual orientation). Participants were asked to respond to each of the questions on a 4-point Likert scale from 1 = "strongly disagree" to 4 = "strongly agree". The score of each item was summed up to create a final score of the scale ranging from 18-72, with a higher score indicating a higher level of homosexuality stigma. The Cronbach's alpha of the scale of homosexuality stigma in the study equaled to 0.86.

6. Sexual behaviors and substance use in the past 12 months

The participants were asked about their homosexual behaviors in the past 12 months, including whether they had oral and anal sex, the sexual role (insertive at most of the time, receptive at most of the time, or both), whether they had regular and casual sexual partners (including commercial sex partner), the total number of sexual partners, identity of sexual partners (students vs. non-students), frequency of condom use during anal sex (every time, always, occasionally, never), and whether they had bleeding during anal sex. We also asked the participants if they used any psychoactive drugs (e.g. amphetamine-type stimulants, hallucinogens, cannabis, and inhalants) and whether they had been diagnosed with other sexually transmitted diseases (STDs) in the past 12 months.

7. HIV knowledge, risk perceptions, and related stigma

HIV knowledge of the participants was assessed using an eight-item scale developed for the Chinese MSM population by NCAIDS, China CDC. Sample questions included "MSM is the most affected population by HIV/AIDS", "infection of other STDs can increase the risk of HIV infection", and "using psychoactive drugs or recreational stimulants can increase the risk of HIV infection". The participant could obtain one score only if he answered correctly to the question, and no point was given if he answered incorrectly or uncertain. A final score of HIV knowledge was constructed by adding up the scores of each item, with a range of 0 to 8. A higher score indicated a higher level of knowledge on HIV. The extent of perceived risk of HIV infection (high, medium, low, and none), whether they had an HIV positive partner, and whether they were aware of the post-exposure prophylaxis (PEP) were also asked in the survey.

For HIV stigma, a previously developed scale was used in the study, which presented a good reliability in assessing public HIV stigma in the Chinese MSM population in prior studies (Liu, Feng, & Rhodes, 2009; Liu, et al., 2011). The scale consisted of seven items with a 4-point Likert response (from 1 = "strongly disagree" to 4 = "strongly agree"). The sample questions included "HIV infected people would lose their friends if they knew their HIV status", "HIV infected people should not have the same rights to education and employment as others", and "HIV infected people's family would not care for him". After summing up the score of each item, a final score ranging from 7 to 28 was constructed as the indicator of HIV stigma, with a higher score indicating a higher level of HIV stigma of the participants. The Cronbach's alpha of the scale in this study was 0.84.

Data analysis

First, descriptive analyses were conducted to describe the socio-demographics, background information, and other interesting characteristics of the sample, in total and by the HIV testing behavior in the past 12 months (tested vs. not tested). We used frequencies and percentages to demonstrate the distribution of categorical variables as well as means/medians and standard deviations (SD) /inter quintile ranges (IQRs) to show the distribution of continuous variables.

Secondly, bivariate analyses were performed to examine the crude association between the HIV testing behavior in the past 12 months and the selected variables. The Chi-square test or the Fisher's exact test was utilized for categorical variables, and analysis of variances (ANOVA) or Wilcoxon rank test was adopted for continuous variables. Moreover, the Pearson's correlation analysis was conducted to explore the crude association between interesting variables after dichotomizing the variables with more than two categories.

Thirdly, a multivariable logistic regression analysis was conducted to examine the adjusted association between not being tested of HIV in the past 12 months and interesting factors including HIV knowledge, HIV stigma, and other covariates. Notably, independent variables in the final regression model were selected based on prior knowledge on potential barriers to HIV testing but not the p-values obtained in the bivariate analyses. Full statistics including the point estimate of the adjusted odds ratio (OR), 95% confidence interval (CI), and p-value were reported in the study.

In addition, as there existed missing values of some variables in the multivariable logistic regression model, the missing data problem needed to be addressed. We first checked the number and pattern of the missing values and found that 1 observation had missing value of the outcome variable and 31 observations had missing values of the independent variables. And the pattern of missing values followed a form of missing at random (MAR). Therefore, the multiple imputation (MI) technique was used to fill in the missing values of the independent variables. Since the rates

of missing rata were modest (<20%), the number of multiple imputation repetitions were set to 10 (Berglund & Heeringa, 2014). All the data analyses were conducted using the SAS 9.4 software (Cary, NC, USA).

Results

Table 4.1 presented the socio-demographics of the participants. A total of 536 student MSM were included in the study, with a mean age of 21.5 years old (SD=1.7). Most of the sample were Han people (n=484, 90.3%). Approximately 72.0% (n=385) of the participants grew up in urban areas. About 69.0% (n=370), 20.0% (n=107), and 9.7% (n=52) of the student MSM were from the top-level, second-level, and third-level universities and colleges, respectively, and the others were from high school or secondary technical schools (n=7, 1.3%). The majority of the participants were undergraduate students (n=450, 83.9%) at the time of the study, and the others were either high school students (n=4, 0.8%) or graduate school students (n=82, 15.3%). The participants studying social science and art composed 44.8% (n=236) of the sample, while those studying natural science and technology accounted for 51.0% (n=269). About two-thirds of the participants (n=363, 68.0%) reported a monthly income of 1000-1999 Chinese Yuan. Approximately 80.9% (n=432) of the student MSM were living in a school dormitory.

Table 4.2 showed the awareness and past experiences of HIV testing of the participants. Regarding the awareness of HIV testing, about 13.8% (n=74) and 43.3% (n=232) of the participants reported an excellent and good awareness of HIV testing, respectively. Approximately 89.2% (n=478), 69.8% (n=374), 67.9% (n=364), 60.3% (n=323), and 10.1% (n=54) of them knew HIV testing services provided by CDCs, MSM NGO/CBOs, physical or online stores selling HIV self-testing kit, hospitals, and CHSCs, respectively. HIV testing using

finger-prick blood and venous blood were the most known HIV testing types, with 79.9% (n=428) and 63.1% (n=338) of the participants aware of them.

Among the participants, 68.0% (n=364) reported having taken HIV testing before and 59.8% (n=320) reported being tested for HIV in the past 12 months (Table 4.2). Among the participants who had ever taken HIV testing, the median number of HIV testing ever taken was 3 (IQR=3). In addition, buying HIV self-testing kits, taking HIV testing at MSM NGO/CBOs and CDCs were the top three channels to do an HIV test, with 35.1% (n=188), 28.6% (n=153), and 26.4% (n=141) of the sample reporting having such experiences, respectively. About 51.4% (n=275) and 32.2% (n=172) of the participants had ever taken a finger-prick blood test and a venous blood test, respectively. A total of 3 participants (0.6%) reported being diagnosed with HIV and 18.4% (n=98) of the sample reported having taken HIV testing frequently.

Table 4.3 demonstrated the number of participants who agreed with the potential barriers to HIV testing. “Fear of being diagnosed with HIV” was the mostly agreed barrier to HIV testing by the participants, with 80.9% (n=433) agreeing with it, while “the price of taking HIV testing is high” was the least agreed item (n=266, 49.7%). The agreement with the items of “fear of attitudes from people around” and “fear of homosexual identity being disclosed” were significantly higher in the participants who had not taken HIV testing in the past 12 months, when compared to those who had taken a test in the past 12 months (80.9% vs. 70.7%, p=0.008; 69.2% vs. 58.0%, p=0.009).

Table 4.4 exhibited the results of sexual orientation, the disclosure of sexual identity, homosexuality stigma, and affiliation to MSM communities of the participants. The majority of the sample identified their sexual orientation as homosexual (n=412, 76.9%). About 17.2% (n=92), 12.3% (n=66), 60.1% (n=322), and 10.5% (n=56) of the participants disclosed their sexual orientation to most, half, a few, and none of the people around, respectively. The median

score of the homosexuality stigma scale was 45 out of 72 (IQR=9), with median scores of perceived stigma of 27 (IQR=6) and internalized stigma of 18 (IQR=5). No more than half of the participants (n=215, 40.2%) reported being affiliated to MSM NGO/CBOs in the country. Approximately 22.1% (n=118) and 30.3% (n=162) of the sample had used gay social applications every day and always, respectively. The participants who had visited gay bars and gay bathhouse accounted for 34.0% (n=182) and 10.2% (n=55) of the sample, respectively. The bivariate analyses showed that compared to the participants who had taken an HIV test in the past 12 months, those who had not taken were less likely to being affiliated to MSM NGO/CBOs (26.5% vs. 49.2%, $p<0.001$), used gay social applications with a lower frequency ($p=0.002$), and were less likely to visit a gay bathhouse (7% vs. 12.2%, $p=0.050$).

The homosexual behaviors, STD infection, and substance use in the past 12 months of the participants were presented in Table 4.5. About 95.3% (n=509) and 86.0% (n=459) of the sample reported having had oral and anal sex in the past 12 months, respectively. The participants who played the receptive sexual role at most of the time accounted for 43.2% (n=227) of the sample. Approximately 68.3% (n=366) and 48.2% (n=257) of the participants reported having regular and casual sexual partners in the past 12 months, with a median number of sexual partners of 2 (IQR=2). There were about half (n=252, 50.7%) of the participants reporting their sexual partners were students only. About 65.6% (n=324) of the sample reported every-time condom use during anal sex in the past 12 months and 27.7% (n=148) reported having had bleeding conditions during anal sex in the past 12 months. There were 15 participants (2.8%) who had been infected with STDs in the past 12 months and 103 (19.3%) participants who had used psychoactive substances in the past 12 months. In the bivariate analyses, not having anal sex ($p<0.001$), having no casual sexual partners ($p<0.001$), a smaller number of sexual partners ($p<0.001$), the identity of sexual partners being students only ($p<0.001$), no bleeding during anal

sex (p=0.005), not being infected with STD (p=0.014), and not using psychoactive substance (p=0.031) were associated with not being tested of HIV in the past 12 months.

As shown in Table 4.6, the median score of HIV knowledge was 6 out of 8 (IQR=1). More than 80% of the participants (n=438) reported a low or none perceived risk of HIV infection. There were 23 participants (4.3%) who had an HIV positive partner. About 71.3% (N=381) of the sample were aware of PEP but never used it, and 1.7% (N=9) reported having used PEP before. The median score of the HIV stigma scale was 11 out of 28, with an IQR of 5. Not being tested in the past 12 months was found to be associated with a lower score of HIV knowledge (p=0.011), a lower perceived risk of HIV infection (p=0.002), not having an HIV positive partner (p=0.003), and being unaware of PEP (p<0.001) in the bivariate analyses.

The results of correlation analyses were presented in Table 4.7. Statistically significant correlations were identified between several pairs of interesting variables, such as HIV stigma and perceived homosexuality stigma (r=0.16; p<0.001), HIV stigma and internalized homosexuality stigma (r=0.35; p<0.001), perceived risk of HIV infection and having casual sexual partners (r=0.27; p<0.001), perceived HIV risk and HIV knowledge (r=0.12, p<0.005), and being affiliated to MSM NGO/CBOs and always using gay social apps (r=0.20; p<0.001).

Tables 4.8 and 4.9 exhibited the results of the multivariable logistic regressions using the complete case method and the MI technique. In the model using the complete case method, a total of 504 participants were included in the analysis. Not being tested in the past 12 months were found to be statistically associated with currently studying in high schools or equivalent schools (adjusted OR=6.29; 95% CI=1.04, 37.99; p=0.045), not being affiliated to MSM NGO/CBOs (adjusted OR=2.90; 95% CI=1.94, 4,34; p<0.001) and HIV knowledge score (adjusted OR=0.85; 95% CI=0.73, 0.98; p=0.027). When using the MI technology, the regression model on being not tested in the past 12 months showed similar results, with adjusted ORs for

currently studying in high schools or equivalent schools, not being affiliated to MSM NGO/CBOs, and HIV knowledge score of 6.26 (94% CI=1.04, 37.61; p=0.045), 2.88 (95% CI=1.94, 4.27; p<0.001), and 0.84 (95% CI=0.72, 0.97; p=0.019), respectively.

Discussion

This study is one of the first few quantitative studies to learn the HIV testing behaviors and associated barriers among student MSM in China. The study found about 68% of the student MSM had received HIV testing ever and 60% took a test in the past 12 months. A recent online survey of university male students who have sex with men on a popular gay social application reported an HIV testing rate in the past 12 months of 47% (Jin, et al., 2017). Other studies on HIV testing among MSM in China in the past decade showed the rate of a lifetime HIV testing ranged from 47% to 72%, and the rate in the past 12 months was about 38%-63% (Chow, et al., 2012; Li, et al., 2014; Luo, et al., 2015; Song, et al., 2011; Zhang, et al., 2013; Zhang, et al. 2017a; Zhou, et al., 2018; Zou, et al., 2012). The relatively higher testing rate found in this study implies that the effectiveness of current HIV strategies on promoting HIV testing among student MSM is promising. However, to achieve the 90% goal of HIV/AIDS case finding, there is still a huge gap needed to be filled (The State Council, 2017; UNAIDS, 2018). Notably, there were about 43% of the participants in the study who reported a fair or poor awareness of HIV testing. And although buying HIV self-testing kit in physical or online stores and receiving HIV testing at MSM NGO/CBOs were the most common ways to take a test in the study, about 32% and 30% of the participants still did not know the two types of services. The findings add to the evidence that the publicity of HIV testing services in the society, schools, and MSM communities is still compromising and needed to be intensified immediately.

The study revealed several barriers to HIV testing in multiple dimensions. At the individual level, when considering uptake of HIV testing, the majority of the student MSM had fears and concerns of being diagnosed with HIV, negative attitudes from other people, leakage of testing results, and disclosure of sexual identity. A possible explanation of why student MSM had fear of an HIV positive result may be that they still have misconceptions of the disease, and people infected with HIV remain to be severely stigmatized and discriminated by the society (Song, et al., 2011; Zhao, et al., 2015). Furthermore, since HIV has been increasingly considered as a "gay disease" among young males in the country, homosexuality stigma may be aggregated to HIV stigma, which may further result in the refusal of the test, especially when testers' privacy is not well protected (Liu, et al., 2011; Zhang, et al., 2013). The demonstration is supported by our findings that compared to the testers, non-testers were more likely to have fears of other people's attitudes and disclosure of homosexual orientation. To address the above concerns, innovative testing strategies with better privacy, such as in-home test and oral test, should be continually promoted in China. Meanwhile, the study calls for a national anti-stigma campaign to build the society more open to the homosexual populations.

At the structural level, inconvenient location and open time of the HIV testing sites were identified as barriers to HIV testing in the study. Previous studies showed that accessibility issues, such as longer geographic distance and inconvenient clinic time, might contribute to inadequate utilization of HIV testing services in China (Chen, et al., 2017; Liu, et al., 2015). It is worth mentioning that based on our knowledge, there have been several MSM-friendly HIV testing clinics in CHSCs which are close to schools and opening during the after-school time in the city, however, only 10% of the participants were aware of the clinics. The finding implies that along with enhancing the accessibility and convenience of HIV testing services, an improvement of the publicity of the student MSM-friendly testing sites is urgently needed. In

addition, more than half of the participants indicated stigma from healthcare providers was a barrier to HIV testing. Studies in China and other countries have revealed that perceived stigma from healthcare providers would lead to inadequate or delayed access to HIV services (Kinsler, et al., 2007; Li, et al., 2013b; Logie, et al., 2017). In the future HIV testing campaign targeting student MSM, special consideration should be given to HIV and homosexuality stigma issues of service providers working in testing and counseling facilities.

The study identified that the average score of HIV knowledge of the participants was 6 of 8, and a lower score was significantly associated with not taking an HIV test in the past 12 months. The finding was consistent with previous studies in China and other countries which demonstrated the association between health literacy and MSM's health behaviors (Liu, et al., 2015; Persson, et al., 2016; Sharma, et al., 2017; Zhang, et al., 2013). Since the eight questions in the survey covered HIV/AIDS knowledge specialized for homosexual populations, the compromising knowledge score depicts that student MSM's perceptions of how to protect themselves from HIV are still suboptimal. Since 2015, an HIV campaign has been initiated nationwide in China, in which strengthening HIV health education is the primary strategy (MOE, 2015; NHC, 2015b). Nevertheless, according to our knowledge, the current HIV education in schools are mostly held around some special time in a year, such as the "World AIDS Day", and lack attractiveness to students, which lead to limited effectiveness. Moreover, the content covered in the education is too general and lack specialized knowledge on preventing HIV transmission for MSM. Therefore, the study highly suggests that future HIV education in schools should be held with a higher frequency and incorporate more detailed knowledge on HIV prevention, transmission dynamics and homosexual health (Sharma, et al., 2017). Meanwhile, student volunteers should be continually enlarged and empowered to participate in the

development and implementation of innovative health education strategies which can attract students' attention (NHC, 2015b).

In the study, about 40% of the student MSM reported an affiliation to MSM NGO/CBOs in the country, and not being affiliated to the communities was significantly associated with not receiving an HIV test in the past 12 months. The finding implies that the engagement of MSM communities has played a positive role in promoting HIV testing among student MSM (Zhang, et al., 2017b). In the past two decades, MSM-oriented civil society organizations have been empowered to perform health educations, behavioral interventions, and health service provisions using specially designed strategies targeting gay men, which have made great contributions to the fight against HIV and other STDs in China (Li, et al., 2010; Wu, et al., 2010). Accordingly, we call for that the MSM civil societies should be further involved in the future HIV campaign in schools, and an intensified cooperation between MSM communities, schools, and health departments should be established to deliver specialized interventions and healthcare services to student MSM.

The findings of the study should be interpreted in light of potential limitations. First, the study used a convenient sampling strategy, in which the participants were recruited based on the social networks of the 15 investigators. Therefore, student MSM outside the networks were not approached by the study, which limited the representativeness of the study sample. Secondly, information bias was expected in the study. On the one hand, recall bias might occur as some questions were about behaviors in the past time. On the other hand, social desirability bias might exist due to the sensitive questions. Thirdly, the causal inference could not be drawn in the study because of the nature of the cross-sectional design. Last but not least, the study was conducted in one city in China, so we should be very cautious when generalizing the study findings. However, as Chengdu is a major education center in the country and encountering a typical HIV crisis

among student MSM, the study can still provide a glimpse of the uptake of HIV testing and potential barriers to the service among student MSM in the whole country.

In conclusion, the utilization of HIV testing services of student MSM in China is still suboptimal, and barriers to the testing services are existing in multiple layers. To achieve the "90-90-90" goal of stopping HIV, a more rigorous multi-sectoral action should be taken to promote HIV testing among student MSM in China.

Table 4.1 Socio-demographic and background characteristics of the participants

Characteristics	Frequency	Column %
Total	536	100.0
Age		
Mean ± SD	21.5 ± 1.7	-
Ethnicity		
Han	484	90.3
Minority	52	9.7
Hometown		
Urban region	385	72.0
Rural region	150	28.0
School type		
Top level university	370	69.0
Second level university	107	20.0
Third level university/junior college	52	9.7
High school/secondary technical school/vocational senior school	7	1.3
School year		
In high school or equivalent	4	0.8
Undergraduate year 1-2	228	42.5
Undergraduate year 3-5	222	41.4
In graduate school	82	15.3
Study major		
Social science and art	236	44.8
Natural science and technology	269	51.0
Other major or in high school	22	4.2
Monthly income (Chinese Yuan)		
Less than 1000	54	10.1
1000-1499	198	37.1
1500-1999	165	30.9
2000 or above	117	21.9
Housing		
Living in school dormitory	432	80.9
Other	102	19.1

Abbreviation: SD, standard deviation.

Table 4.2 Awareness of HIV testing and HIV testing behaviors of the participants

Variables	Frequency	Column % [a]
Overall awareness of HIV testing by self-report		
Excellent	74	13.8
Good	232	43.3
Fair	155	28.9
Poor	75	14.0
Aware of HIV testing services at [b]		
1) provincial/municipal/district CDCs	478	89.2
2) MSM NGO/CBOs	374	69.8
3) physical/online stores selling HIV self-testing kit	364	67.9
4) hospitals (including general and specialty hospital)	323	60.3
5) community health service centers	54	10.1
Aware of HIV testing method of [b]		
1) finger-prick blood test	428	80.0
2) venous blood test	338	63.1
3) oral test	254	47.4
4) urine test	134	25.0
Had taken HIV testing ever		
Yes	364	68.0
No	171	32.0
Took HIV testing in the past 12 months		
Yes	320	59.8
No	215	40.2
Total number of HIV testing ever taken (N=348)		
Median ± IQR	3 ± 3	-
Had taken HIV testing via [b]		
1) buying HIV self-testing kits in physical/online stores	188	35.1
2) MSM NGO/CBOs	153	28.6
3) provincial/municipal/district CDCs	141	26.4
4) hospitals (including general and specialty hospital)	98	18.3
5) community health centers	15	2.8
6) others	79	14.8
Had taken HIV testing using [b]		
1) finger-prick blood test	275	51.4
2) venous blood test	172	32.2
3) oral test	86	16.1
4) urine test	10	1.9
The last HIV testing result		
Positive	3	0.6
Negative/uncertain/never tested	531	99.4
Had taken HIV testing frequently		
Yes	98	18.4
No	434	81.6

[a] Missing value were excluded.
[b] The total percentage exceeded one, because a participant could choose multiple answers.
Abbreviation: IQR, interquartile range; MSM, men who have sex with men.

Table 4.3 Perceived barriers to HIV testing, overall and by HIV testing behaviors

Barriers	Participants who agreed with the barriers, n (%) [a]			*P*
	Overall	Being tested in the past 12 months		
		Yes	No	
Fear of being diagnosed with HIV	433 (80.9)	251 (78.7)	181 (84.2)	0.113
Location of testing sites is inconvenient	401 (74.9)	244 (76.5)	156 (72.6)	0.304
Fear of attitudes from people around	400 (74.9)	225 (70.7)	174 (80.9)	**0.008**
Open time of testing sites is inconvenient	360 (67.3)	224 (70.2)	135 (62.8)	0.073
Fear of testing results disclosed to schools	344 (64.3)	201 (63.0)	142 (66.1)	0.473
Fear of homosexual identity disclosed	334 (62.5)	185 (58.0)	148 (69.2)	**0.009**
Fear of stigma from healthcare providers	329 (61.5)	199 (62.4)	129 (60.0)	0.579
Fear of testing results disclosed to families	325 (60.7)	188 (58.9)	136 (63.3)	0.316
Fear of testing results disclosed to friends	323 (60.4)	185 (58.0)	137 (63.7)	0.185
The price of taking test is high	266 (49.7)	163 (51.1)	103 (47.9)	0.470

[a] Missing value were excluded from the analyses.

Table 4.4 Sexual identity, disclosure of sexual identity, related stigma, and affiliation to MSM communities of the participants, overall and by HIV testing behaviors

Characteristics [a]	Overall n (%)	Being tested in the past 12 months, n (%)		*P*
		Yes	No	
Sexual identity				0.310
Homosexual	412 (76.9)	243 (75.9)	168 (78.1)	
Bisexual	94 (17.5)	55 (17.2)	39 (18.2)	
Other	30 (5.6)	22 (6.9)	8 (3.7)	
Disclosure of sexual identity				0.448
To most of the people around	92 (17.2)	58 (18.1)	34 (15.8)	
To half of the people around	66 (12.3)	39 (12.2)	26 (12.1)	
To a few people around	322 (60.1)	185 (57.8)	137 (63.7)	
To nobody	56 (10.4)	38 (11.9)	18 (8.4)	
Homosexuality stigma scale score (Median ± IQR)				
Total	45 ± 9	44 ± 10	45 ± 8	0.128
Perceived stigma	27 ± 6	27 ± 6	28 ± 5	0.366
Internalized stigma	18 ± 5	17 ± 6	18 ± 4	0.095
Affiliated to MSM NGO/CBOs				**<0.001**
Yes	215 (40.2)	157 (49.2)	57 (26.5)	
No	320 (59.8)	162 (50.8)	158 (73.5)	
Using gay social network apps				**0.002**
Everyday	118 (22.1)	79 (24.8)	38 (17.6)	
Always	162 (30.3)	107 (33.6)	55 (25.6)	
Sometimes	127 (23.7)	63 (19.7)	64 (29.8)	
Little of the time	101 (18.9)	60 (18.8)	41 (19.1)	
Never	27 (5.0)	10 (3.1)	17 (7.9)	
Have ever visited a gay bar				0.285
Yes	182 (34.0)	114 (35.6)	67 (31.2)	
No	354 (66.0)	206 (64.4)	148 (68.8)	
Have ever visited a gay bathhouse				**0.050**
Yes	55 (10.2)	39 (12.2)	15 (7.0)	
No	481 (89.8)	280 (87.8)	200 (93.0)	

[a] Missing values were excluded from the analyses.

Table 4.5 Homosexual behaviors, STD infection, and substance use in the past 12 months of the participants, overall and by HIV testing behaviors

Characteristics [a]	Overall n (%)	Being tested in the past 12 months, n (%)		*P*
		Yes	No	
Had oral sex				0.142
Yes	509 (95.3)	307 (95.5)	201 (93.5)	
No	25 (4.7)	11 (3.5)	14 (6.5)	
Had anal sex				**<0.001**
Yes	459 (86.0)	290 (91.2)	168 (78.1)	
No	75 (14.0)	30 (8.8)	47 (21.9)	
Sexual role				0.712
Insertive at most of the time	129 (24.5)	80 (25.4)	48 (22.9)	
Receptive at most of the time	227 (43.2)	132 (41.9)	95 (45.2)	
Both insertive and receptive	170 (32.3)	103 (32.7)	67 (31.9)	
Had regular sexual partners				0.146
Yes	366 (68.3)	226 (70.6)	139 (64.6)	
No	170 (31.7)	94 (29.4)	76 (35.4)	
Had casual sexual partners				**<0.001**
Yes	257 (48.2)	174 (54.7)	83 (38.8)	
No	276 (51.8)	144 (45.3)	131 (61.2)	
Number of sexual partners				**<0.001**
Median ± IQR	2 ± 2	2 ± 3	1 ± 1	
Identity of sexual partners				**<0.001**
Students only	252 (50.7)	131 (43.1)	120 (62.5)	
Both students and non-students	245 (49.3)	173 (56.9)	72 (37.5)	
Condom use during anal sex				0.114
Every time	324 (65.6)	206 (68.2)	117 (62.3)	
Not every time	170 (34.4)	96 (31.8)	74 (38.7)	
Had bleeding during anal sex				**0.005**
Yes	148 (27.7)	103 (32.2)	45 (21.0)	
No	387 (72.3)	217 (67.8)	169 (79.0)	
STD infection				**0.014**
Yes	15 (2.8)	12 (3.7)	3 (1.4)	
No	472 (88.1)	287 (89.7)	184 (85.6)	
Don't know	49 (9.1)	21 (6.6)	28 (13.0)	
Substance use				
Yes	103 (19.3)	71 (22.4)	32 (14.9)	**0.031**
No	430 (80.7)	246 (77.6)	183 (85.1)	

[a] Missing values were excluded from the analyses.
Abbreviation: STD, sexually transmitted disease.

Table 4.6 HIV knowledge, risk perceptions, and related stigma of the participants, overall and by HIV testing behaviors

Characteristics [a]	Overall n (%)	Being tested in the past 12 months, n (%)		*P*
		Yes	No	
HIV knowledge score				**0.011**
Median ± IQR	6 ± 1	7 ± 1	6 ± 2	
Perceived HIV risk				**0.002**
High or medium	98 (18.3)	72 (22.5)	26 (12.1)	
Low or none	438 (81.7)	248 (77.5)	189 (87.9)	
Had HIV positive partner				**0.003**
Yes	23 (4.3)	21 (6.6)	2 (0.9)	
No	329 (61.4)	190 (59.4)	139 (64.7)	
Not sure	184 (34.3)	109 (34.0)	74 (34.4)	
Awareness of PEP				**<0.001**
Don't know	144 (27.0)	64 (20.1)	80 (37.4)	
Know but never used	381 (71.3)	247 (77.4)	133 (62.2)	
Know and have used	9 (1.7)	8 (2.5)	1 (0.4)	
HIV stigma scale score				0.463
Median ± IQR	11 ± 5	11 ± 6	12 ± 5	

[a] Missing value were excluded from the analyses.
Abbreviation: PEP, post-exposure prophylaxis.

Table 4.7 Correlation matrix of interested variables

Variables		1	2	3	4	5	6	7	8	9	10	11	12
1	Older age	1		-	-	-	-	-	-	-	-	-	-
2	Affiliated to MSM NGO/CBOs	0.03	1	-	-	-	-	-	-	-	-	-	-
3	Always used gay social apps	0.02	0.20***	1	-	-	-	-	-	-	-	-	-
4	Higher perceived homosexuality stigma	-0.02	-0.09*	0.05	1	-	-	-	-	-	-	-	-
5	Higher internal homosexuality stigma	0.01	-0.04	0.04	0.31***	1	-	-	-	-	-	-	-
6	Had casual sex partner	0.03	0.08	0.22***	0.00	-0.04	1	-	-	-	-	-	-
7	Sexual partners were students only	-0.05	-0.14**	-0.18***	-0.04	0.01	-0.46***	1	-	-	-	-	-
8	Had bleeding during anal sex	0.09*	0.04	-0.00	0.00	0.02	0.07	-0.16***	1	-	-	-	-
9	Infected with other STDs	0.02	-0.00	0.03	-0.01	0.03	0.09*	-0.08	0.05	1	-	-	-
10	Used psychoactive substance	0.10*	-0.06	0.13**	-0.04	-0.03	0.24***	-0.23***	0.21***	0.03	1	-	-
11	Higher HIV knowledge score	0.01	-0.01	0.07	0.11*	0.14***	0.06	-0.07	-0.02	0.02	-0.01	1	-
12	Higher perceived HIV risk	0.07	-0.04	0.13**	0.10*	0.03	0.27***	-0.20***	0.15***	0.07	0.13**	0.12**	1
13	Higher HIV-related stigma	-0.00	-0.08	0.03	0.16***	0.35***	0.01	0.06	-0.03	0.00	-0.02	0.10*	0.01

*p<0.05; **p<0.01; ***p<0.001.

Table 4.8. Logistic regression analysis on not having HIV testing in the past 12 months using the complete case method (n=504)

Variables	Not tested in the past 12 months		
	Adjusted OR	**95% CI**	***P***
Age	0.90	0.81, 1.01	0.071
Ethnicity			
Han (ref.)	-	-	-
Minority group	1.75	0.92, 3.34	0.089
Hometown			
Urban region (ref.)	-	-	-
Rural region	1.00	0.64, 1.55	0.998
School type			
Top level university (ref.)	-	-	-
Second level university	1.05	0.63, 1.76	0.841
Third level university/junior college	0.73	0.36, 1.50	0.391
High school/ technical secondary school	6.29	1.04, 37.99	**0.045**
Study major			
Social science and art (ref.)	-	-	-
Natural science and technology	1.11	0.75, 1.65	0.590
Other	0.43	0.14, 1.37	0.155
Monthly income (RMB)			
<1000	0.92	0.43, 1.98	0.838
1000-1499	0.88	0.51, 1.51	0.633
1500-1999	0.97	0.57, 1.66	0.911
2000 or above (ref.)	-	-	-
Housing			
Living in school dormitory	1.09	0.64, 1.84	0.758
Other (ref.)	-	-	-
Affiliated to MSM NGO/CBOs			
Yes (ref.)	-	-	-
No	2.90	1.94, 4.34	**<0.001**
HIV knowledge score	0.85	0.73, 0.98	**0.027**
HIV stigma scale score	1.01	0.95, 1.07	0.851

Abbreviation: OR, odds ratio; CI, confidence interval.

Table 4.9 Logistic regression analysis on not having HIV testing in the past 12 months using the multiple missing data imputation technology [a]

Variables	Not tested in the past 12 months [b]		
	Adjusted OR	**95% CI**	***P***
Age	0.90	0.81, 1.01	0.065
Ethnicity			
Han (ref.)	-	-	-
Minority group	1.58	0.85, 2.92	0.145
Hometown			
Urban region (ref.)	-	-	-
Rural region	1.04	0.68, 1.59	0.869
School type			
Top level university (ref.)	-	-	-
Second level university	1.02	0.62, 1.67	0.948
Third level university/junior college	0.70	0.35, 1.41	0.322
High school/ technical secondary school	6.26	1.04, 37.61	**0.045**
Study major			
Social science and art (ref.)	-	-	-
Natural science and technology	1.15	0.78, 1.69	0.481
Other	0.45	0.14, 1.40	0.166
Monthly income (RMB)			
<1000	0.88	0.41, 1.85	0.730
1000-1499	0.89	0.52, 1.51	0.669
1500-1999	0.93	0.55, 1.58	0.800
2000 or above (ref.)	-	-	-
Housing			
Living in school dormitory (ref.)	0.98	0.59, 1.63	0.936
Other	-	-	-
Affiliated to MSM NGO/CBOs			
Yes (ref.)	-	-	-
No	2.88	1.94, 4.27	**<0.001**
HIV knowledge score	0.84	0.72, 0.97	**0.019**
HIV stigma scale score	1.01	0.96, 1.08	0.653

[a] The number of imputation was set to 10.

[b] The observation with missing value of the outcome variable was excluded from the analysis.

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Chapter V: Summary

This is the first study in China to comprehensively examine barriers to scaling up HIV testing among student MSM from perspectives of student MSM and implementers of the HIV campaign. The qualitative and quantitative studies together provide evidence of the compromising uptake of HIV testing services by student MSM and the multi-level barriers existing in the promotion of HIV testing among this population. The findings of this study may provide preliminary knowledge for future research on student MSM and support further efforts to improve HIV healthcare services for student MSM. Potential implications and suggestions for future HIV testing campaign in schools and MSM communities are proposed as follows:

1) Changes need be made to current HIV/AIDS education in schools and MSM communities. HIV/AIDS education in schools is suggested to be continually intensified and incorporated into teaching plans. More detailed knowledge on HIV prevention should be included in all educating events to eliminate misconceptions of the disease and increase risk perceptions of students. Warning education in an appropriate manner is highly recommended in HIV/AIDS education in schools and MSM communities.
2) Student volunteer teams should be enlarged and empowered to develop and implement attractive HIV interventions. An effort needs to be made to encourage more student MSM to join the volunteer team and participate in HIV prevention work. Innovative strategies, such as internet techniques, which can better approach hidden populations, should be utilized to provide more accessible HIV interventions and services for student MSM.
3) The availability of HIV testing information should be rigorously reinforced. All available HIV testing services, including the MSM-friendly ones, should be included in the educating material. The health agencies and MSM-oriented organizations should take the responsibility

of posting comprehensive and professional information about available HIV testing services on social media, especially the internet platforms preferred by student MSM.

4) More MSM-friendly clinics close to schools should be established to provide convenient healthcare services for student MSM. Meanwhile, the publicity of these testing sites should be greatly enhanced among student MSM.
5) Anonymous HIV testing should be promoted in health facilities. The privacy of the physical environment of testing sites in health facilities should be improved. Non-facility-based HIV testing strategies which bring more convenience and better privacy, such as selling urine test packages in vending machines on campus and mailing self-testing kits to home, should be continually developed, piloted and promoted.
6) Targeted training covering different topics in medicine, sociology, psychology, and implementation science should be provided to health professionals, school officers, NGO staff, and student volunteers involved in the HIV campaign based on their needs.
7) More human and financial resources should be devoted to the school HIV campaign. Future budgeting of HIV funding should be more adaptable considering the complex situations in real-world HIV interventions, while compensation for employees' extra working effort and volunteers' contribution must be taken into account.
8) The policies need to be tailored to address the importance of expanding HIV testing in schools and support the involvement of MSM communities in the school HIV campaign.
9) Documents supporting the policy implementation which clarify the specific aims, technical strategies, implementation guidelines, evaluation procedure, and accountabilities should be jointly developed by the national health and education departments immediately.
10) An HIV and homosexuality stigma reduction campaign should be initiated and reinforced in the society, especially among school officials and healthcare providers.

Limitation

Several limitations should be noticed when interpreting and generalizing the study findings. First, as the recruitment of the participants in the qualitative and quantitative studies were based on some specific occupational or social networks, opinions and information of campaign implementers and student MSM who were not in the networks might be under-addressed, which limited the representativeness of the study sample. Secondly, social desirability bias was anticipated, because all information collected in our study were self-reported and some interview topics and survey questions were sensitive to answer. Thirdly, in the in-depth interviews and the cross-sectional survey, the participants were sometimes asked to describe their behaviors in the past time, which might lead to the recall bias. Fourthly, the causal inference could not be drawn in the quantitative study considering the nature of the cross-sectional design. Last but not least, the study was conducted in a single city which is famous for its tolerance of gay communities and in the front line of the HIV campaign in schools and MSM communities. Therefore, we should be very cautious when generalizing the study findings to a broader student MSM population and other areas in China.

Even with the limitations noted above, findings from the study can still provide insightful information and practical suggestions to the future fight against HIV/AIDS in China.