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Benefits and Potential Harms of HIV Self-Testing Among Men Who Have Sex With Men In China: An Implementation Perspective

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Abstract

Background—HIV self-testing (HIVST) holds great promise for reaching high-risk key populations who do not access facility-based services. We sought to characterize unsupervised HIVST implementation among men who have sex with men (MSM) in China.

Methods—We conducted a nationwide online survey in China. Eligible men were at least 16 years, had anal sex with a man, and had recent condomless sex. We assessed benefits (first-time testing, increased testing frequency, confirmatory testing) and potential harms (coercion, violence, suicidality) of HIVST. Among MSM who reported ever testing for HIV, we identified correlates of HIVST as first-time HIV test being a self-test using multivariable logistic regression.

Results—Among 1,610 men who met the eligibility criteria and started the survey, 1,189 (74%) completed it. 29% (341/1189) reported ever self-testing for HIV. HIV prevalence was 7% (24/341) among self-testers and 5% (15/306) among non-self-testers. 59% (200/341) of men who self-tested reported HIVST as a first-time HIV test. 31 men (9.1%) experienced coercion with HIVST. 78% (31/40) of men with positive HIV self-tests sought confirmation. Multivariable analysis revealed that HIVST as first-time HIV test was associated with younger age (OR=0.95, 95% CI 0.92, 0.99), not being “out” (OR = 2.28; 95% CI 1.60, 3.28), not using the internet to meet sex partners (OR=0.39, 95% CI 0.22, 0.69), and group sex (OR = 1.74; 95% CI 1.02, 2.9).

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Conclusions—HIVST reached high-risk individuals that had never received facility-based testing. Further implementation research is needed to better understand HIVST outside of research programs.

SHORT SUMMARY

A study of men who have sex with men in China found that HIVST is common and reaches individuals that have not previously tested.

Keywords

Men who have sex with men (MSM); HIV; self-testing; internet research

INTRODUCTION

Globally, an estimated 37 million people are living with HIV and around half remain unaware of their serostatus. HIV self-testing (HIVST) using rapid diagnostic kits has gained traction as a promising tool that could expand testing coverage and improve prevention and control efforts (1–3). HIVST is a process whereby a person who wants to know his or her HIV status collects a specimen, performs a test, and interprets the test result in private (1). Unlike conventional facility-based testing, self-testing procedures can be carried out privately and conveniently at the user's discretion. This may help facilitate HIV testing among hard-to-reach key populations such as men who have sex with men (MSM), particularly certain subsets with higher sexual risks (4, 5).

Concerns have been raised about the de-coupling of HIV testing from the healthcare system (1, 2, 6), as well as the implementation of HIVST in resource-limited settings (3, 7). Existing HIVST literature has focused on supervised HIVST (8), especially from projects nested within research settings (9–12). However, understanding the benefits and risks of implementing HIVST outside of research settings is crucial for responsible HIVST policy and practice. The gap between research settings and routine implementation is especially prominent in HIVST for the following reasons. First, HIVST research settings typically provide high quality pre- and post-test counseling (8). However, such types of counseling may not always be available during routine implementation (e.g., individuals administering HIVST at their homes). Second, HIVST research studies exclude subsets of individuals who may be more likely to experience adverse outcomes, such as people who inject drugs and those with untreated mental illness (13). Third, research studies provide a team of trained individuals who can prevent, mitigate and manage potential harms (10, 11). This level of support would also be uncommon in most low and middle-income country settings. As such, information on the benefits and risks of implementing HIVST outside of research settings is important.

China provides a unique opportunity to understand HIVST implementation because there is more widespread self-testing (14), especially among MSM (15, 16). Infrequent HIVST has been reported in high-income countries such as France (17), Australia (5), Italy (18), and Spain (19), where sale of HIVST kits to the public has been restricted. HIVST is not illegal in China (20) and there is no national policy regulating HIVST. Kits can be easily obtained

through e-commerce websites (21) or a number of online programs bringing together government and community-based organizations in China (22). The lack of regulation makes HIVST more accessible, which could expand first-time HIV testing rates among high-risk key populations that may otherwise not test due to stigma associated with facility-based testing. This study describes HIVST experiences among Chinese MSM from an implementation context and investigates correlates of HIVST as a first-time HIV test among MSM using online survey data.

METHODS

Study Design and Participant Recruitment

We conducted a nationwide online survey in November 2015. Links to the online survey were distributed on four popular social networking platforms: the largest lesbian, gay, bisexual, and transgender (LGBT) web portal in China (DanLan.org), a mobile dating app (Blue'D), a messaging app (WeChat), and a microblogging app similar to Twitter (Weibo). Interested participants clicked the banner link and were directed to the survey, which was hosted on Qualtrics (Provo, Utah). Initial screening criteria ensured that all participants were born biologically male, had anal sex with men at least once during their lifetime, had condomless anal/vaginal sex in the past three months, and were at least 16 years old (age of consent in China). Participants meeting eligibility criteria were directed to an informed consent page prior to beginning the survey where data collection began.

Survey Development

The survey instrument (available in supplemental materials) was adapted from a previous online survey that assessed sexual history, HIV/STI testing, and risk behaviors among Chinese MSM (15), which was developed with input from local stakeholders, sociologists, physicians, and 60 MSM. Survey items underwent modification following two rounds of field-testing, a comprehensive literature search, and input from researchers that contributed to the previous survey (15). A revised draft was piloted among 150 MSM prior to launching the final version.

Measures

HIVST was defined as an individual administering an HIV test to himself and interpreting the result in private rather than at a facility. Information was gathered about HIVST experiences: where kits were obtained, what type of kits (blood-based or oral fluid), if any other individuals were present during the test, and the self-test result. Men also reported on confirmation of self-test results (at a CDC or hospital), post-test counselling (online, over the telephone, in-person, none), subsequent changes in HIV testing frequency, and potential harms (coercion, feelings of suicidality, violence). Coercion was defined as being forced to HIV self-test.

First-time HIV test setting was defined by what an individual reported was their first test for HIV: a self-test or a facility-based test. Several potential correlates of first-time HIV test being a self-test were assessed. Sociodemographic characteristics included age, student status, education, income, marital status, sexual orientation, disclosure of sexual orientation

(being “out” regarding sex with other men) to a healthcare provider, and city of residence. Behavioral variables included HIV testing frequency in the last two years, venue for meeting sex partners, condomless sex in the last month, number of male sex partners in the last 3 months, sex under the influence of alcohol or drugs in the last 3 months, group sex in the past year, and receipt of payment for sex in the past year.

Statistical Analysis

The analysis was restricted to participants who had ever tested for HIV. First, we described sociodemographic characteristics and sexual behaviors for the whole sample of HIV testers as well as subgroups classified according to first-time HIV test setting (self-test vs. facility-based test). Differences between these two groups were evaluated using Pearson’s chi-square tests s for categorical variables and a *t*-test for age.

Logistic regression was used to investigate associations among sociodemographic and behavioral variables and first-time HIV test setting (self-test vs. facility-based test). Variables found to be marginally associated (a priori determined as $p<0.20$) with first-time HIV test setting in crude bivariate analysis were included in a multivariable logistic regression model. Statistical significance was defined as $p<0.05$. Analyses were performed using JMP Pro statistical software (version 12.1.0, ©SAS Institute Inc, Cary, NC).

A geographic pattern of first-time HIV test setting stratified by China’s 32 provinces was created in a geographic information system software (ArcGIS 10.3, ©ESRI) and open-source China administrative area data from http://www.gadm.org/country, available in supplemental figures.

Ethical Review

The Institutional Review Boards of the Guangdong Provincial Center for Skin Diseases and STI Control, the University of North Carolina at Chapel Hill, and the University of California San Francisco approved this study. Only participants who provided informed consent were directed to complete the survey and provided data that was analyzed for this study.

RESULTS

Of 1,610 MSM who started the survey, 1,197 (74%) completed it (participant flow in supplemental figure S1). After excluding invalid surveys, 1,189 potential participants remained. Among them, 542 reported never testing for HIV, leaving 647 participants for analysis. Of these, 341 (53%) men had ever used HIVST. HIV prevalence was 7% (24/341) among self-testers and 4.9% (15/306) among facility-based testers.

Sociodemographic and behavioral data are summarized in Table 1. Overall, around half (55%) were between 21 and 30 years of age (mean=25.8, range: 16–58), received less than a college-level education (52%), and had an annual income less than 6,000 USD (49%). A majority of men self-identified as gay (74.2%) and were never married (82%), but only half had ever disclosed sexual contact with other men to a healthcare provider (50%). Only 17% (109) had tested for HIV in the past three months. The most common venue for seeking sex

partners was the internet (90%). One hundred four men (16%) had sex under the influence of alcohol or drugs within the last three months, 76 men (12%) had engaged in group sex in the past year, and 75 (12%) had received payment for sex with money or gifts in the past year.

First-time HIV test

Among HIV testers, 200 (31%) reported HIVST as first-time HIV test whereas 447 (69%) received their first-time HIV test at a facility. A number of sociodemographic and behavioral characteristics differentiated MSM by first-time HIV test setting (Table 1). Men whose first HIV test was a self-test were younger ($p<.001$), more likely to be a student ($p=0.049$), and more likely to have never married ($p=.04$). Nondisclosure of sexual orientation to healthcare providers was significantly higher ($p<.001$) among men whose first-time HIV test was a self-test compared to men whose first-time HIV test was at a facility. Among men who used the internet to seek sex partners, first-time HIV test was more likely to be at a facility than a self-test ($p=.0009$). Geographically, occurrence of HIVST as first-time HIV test is present throughout the country (supplemental figure S2).

Description of the HIVST Experience

Among self-testers, more than half (59%) had never previously tested for HIV (Table 2). The most common place to obtain an HIVST kit was online (50%) and most men used a blood-based kit (71%). Most men were alone when they self-tested (65%). A quarter (24%) reported using HIVST in the presence of a partner and the remaining (11%) with a friend. Forty men reported a positive result on their HIV self-test (12%). Three-quarters of these men confirmed their test result (78%, 31) and received post-test counselling (75%, 30). A total of 31 men (9%) reported coercion in association with HIVST. Fourteen men with positive HIVST results reported subsequent suicidal thoughts (35%) and 2 reported violence (5%). Among 164 participants who received post-test counselling, more people received online (46%, 75) and in-person (47%, 77) counseling as opposed to over the telephone counseling (7%, 12). A quarter (23%) of men reported increased HIV test frequency after first using HIVST.

Factors Associated with HIVST as First-time HIV Test

Table 3 presents unadjusted and adjusted odds ratios of a first-time HIV test being a self-test as opposed to a facility-based test. In the adjusted model, the following characteristics were associated with HIVST as first-time HIV test: younger age (adjusted OR (aOR) = 0.95, 95% CI 0.92, 0.99), not being “out” to healthcare providers (aOR = 2.28; 95% CI 1.60, 3.28), not using the internet to meet sex partners (aOR=0.39, 95% CI 0.22, 0.69), and engaging in group sex within the past year (aOR = 1.74; 95% CI 1.02, 2.95).

DISCUSSION

HIVST provides an anonymous and confidential way to access HIV testing that could better reach high-risk groups (2, 3). Despite the public health benefit of expanding testing, there remain concerns associated with implementing HIVST (1, 2). Furthermore, there is limited empirical data on HIVST outside of supervised research settings. Our study extends the literature by HIVST in a location where it is already widely implemented, quantifying

adverse outcomes, and identifying correlates of first-time HIVST. We found that 59% of Chinese MSM who self-tested used HIVST as their first HIV test. Overall, 29% of Chinese MSM nationwide had ever self-tested for HIV, a figure similar to previous studies (15, 16), and a subset of self-testers (23%) reported increased HIV test frequency after first using a self-test. It is possible that participants increased their testing frequency by continuing to use HIVST. It is also possible that these MSM started going to conventional testing centers or augmenting facility-based tests with interim HIV self-tests. Although we were not able to assess this aspect, our findings demonstrate the capacity of HIVST to reach persons who would otherwise not test and/or increase testing frequency among this population. However, caution must be exercised. Although there is a large market for HIVST in China already, quality varies and little is known regarding the sensitivity and specificity (21). Not all vendors comply with national safety guidelines and there are no regulatory systems in place to monitor them (16), which is concerning because of the potential for inaccurate results to be rendered. Vendors are particularly inconsistent on the internet, which was the most common location that our participants obtained test kits, and generally provided scant support services (21). The current gap in literature regarding the characteristics of HIVST kits available in China is a limitation which highlights the need for further research in this area and the importance post-test follow-up.

Almost half of the men in our study went to a hospital or CDC to confirm their self-test results (44%). Current WHO standards stipulate that HIVST are not diagnostic, and require further confirmation (1). The ability of HIVST to not only reach but also link people into care is an important consideration for any scale-up efforts. Practically speaking, this means ensuring access to the high-quality post-test counseling and care resources, which are presently lacking in China (16). Around half of self-testers in our study reported post-test counseling, with most receiving it either in-person (47%) or online (46%). The high percentage of men receiving in-person counseling may be attributable to the increasing trend of informal grassroots groups and community-based organizations providing HIV counseling, support, and psychosocial services for the MSM population (23). Men with positive self-test results had especially high rates of post-test counseling (75%), which is promising given that some of them reported feelings of suicidality after receiving a positive result. In a prospective cluster-randomized trial comparing HIVST to facility-based testing in Malawi, no HIVST-associated suicides or violence were reported (9). This is the only study to investigate HIVST-associated harms to date. Coercion, however, was reported by 3% (288/10,017) of participants and associated with testing with a partner. We found 31 men (9%) who reported being forced to take an HIV self-test, but further information about the context of this coercion was not obtained and should be investigated in future studies. HIVST programs need to safeguard against potential harms by disseminating appropriate information about rights, confirmatory testing, follow-up care, and support services. Moving forward, community groups could be particularly helpful in providing systems to manage social harms.

Keeping these important concerns and issues in mind, we feel that HIVST demonstrates the capacity to reach untested Chinese MSM which warrant scale-up. Men whose first-time HIV test was a self-test tended to be younger and not "out" to their healthcare providers. Stigma against homosexuality remains a persistent barrier to HIV testing in China (24) due to the

fear that one's gay-identity might be exposed. Thus, HIVST may be particularly effective among more closeted Chinese MSM that might not otherwise test. Still, strategies to encourage and expand adoption are needed. A documented rise in HIV among young Chinese MSM (25), particularly students, has elicited concern from public health officials and spurred interest in developing targeted interventions for this group. The internet is an effective place to launch HIVST interventions, as it is an increasingly common venue for young MSM in China to find sexual partners (26), and provides a digital space that complements the privacy that is so attractive about HIVST. However, we found that among MSM who generally used the internet to meet sex partners, odds of first-time HIV test being a self-test were lower than a being a facility-based test. It is possible that internet-using MSM were more likely to have been exposed to information related to the quality of self-test kits and would opt not to use it as their first HIV test. One study of online Chinese MSM found that the majority of participants had low confidence in the accuracy of HIVST results and 72.8% perceived HIVST as less accurate than CDC or hospital provided testing (16). Therefore, successful implementation of HIVST programs requires more data on HIVST kits and devices in China, especially in terms of quality and accuracy.

This survey captured a convenience sample of online MSM in China, who tend to be younger and more active on the internet. Thus, our findings may not be generalizable to all MSM populations. As it was a cross-sectional observational study, no causal inferences can be drawn or evidence on actual follow-up. All results were based on self-report and cannot be confirmed. This study was not able to draw direct comparisons between facility-based testing and self-testing with regards to potential harms, linkage to care, and other aspects of the testing experience itself because certain questions were only asked to those who had ever self-tested. Correlates of first-time HIV test being a self-test were relevant to characteristics captured at the time of the survey, and the time elapsed since first HIV test was not measured.

CONCLUSION

In summary, our study showed that more than a quarter of Chinese MSM had self-tested and over half were first-time testers, demonstrating the capacity of HIVST to expand testing. The unsupervised nature of HIVST make it essential to ensure access to quality post-test counseling and care resources in conjunction with any type of scale-up efforts. More information about the quality of test kits in China and further implantation research is needed to better understand HIVST outside of research programs.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Table 1

Characteristics of Online MSM Survey Participants Who Have Tested for HIV in China, 2015 (n = 647)

		First-time HIV test		
	Total n = 647	**self-test n = 200**	**facility test n = 447**	***p*†**
Age, mean (SD), y	25.8 (6.7)	24.4 (6.3)	26.4 (6.8)	<0.001
Student status	214 (33%)	77 (39%)	137 (31%)	0.049
Highest level of education				0.86
High school or less	194 (30%)	62 (31%)	132 (30%)	
Some college	145 (22%)	46 (23%)	99 (22%)	
College or higher	308 (48%)	92 (46%)	216 (48%)	
Annual Income (USD)				0.24
<3K	149 (23%)	54 (27%)	95 (21%)	
3K–6K	165 (26%)	46 (23%)	119 (27%)	
>6K	333 (52%)	100 (50%)	233 (52%)	
Never married	530 (82%)	173 (87%)	357 (80%)	0.04
Identify as gay	480 (74%)	147 (74%)	333 (75%)	0.79
Not “out” to health provider	327 (51%)	127 (64%)	200 (45%)	<0.001
HIV test frequency last two years				0.31
Every three months or less	109 (17%)	31 (16%)	78 (17%)	
Every six months	169 (26%)	52 (26%)	117 (26%)	
Once a year	212 (33%)	75 (38%)	137 (31%)	
Less than once every two years	157 (24%)	42 (21%)	115 (26%)	
Venues for meeting sex partners				
Pub, disco, tearoom, or club	58 (9%)	20 (10%)	38 (9%)	0.54
Spa, bathhouse, sauna, massage	40 (6%)	13 (7%)	27 (6%)	0.82
Park, public restroom, public lawn	55 (9%)	19 (10%)	36 (8%)	0.54
Internet	584 (90%)	169 (85%)	415 (93%)	<0.001
High-risk sexual behaviors				
Condomless sex in last month	156 (24%)	51 (26%)	105 (24%)	0.58
Sex with alcohol or drugs *	104 (16%)	33 (17%)	71 (16%)	0.84
Group sex **	76 (12%)	29 (15%)	47 (11%)	0.15
Received payment for sex **	75 (12%)	30 (15%)	45 (10%)	0.07

Values are given in frequency (percentage) unless otherwise specified. Differences between these two groups were evaluated using Pearson’s chi-squared analysis for categorical variables and t-test for continuous.

* in the last 3 months;

** in the last 12 months

Table 2

Descriptors of the HIV Self-test Experience Among Online MSM Survey Participants in China, 2015 (n = 341)

Never previously tested for HIV	200 (59%)
Location where HIV self-test kit was obtained	
Online	171 (50%)
Hospital/Pharmacy	84 (25%)
Community-based organization	45 (13%)
Friend	41 (12%)
Type of HIV self-test kit specimen	
Blood-based	242 (71%)
Oral fluid	99 (29%)
Testing conditions	
Alone	222 (65%)
With a partner	83 (24%)
With a friend	36 (11%)
Positive result with HIV self-test	40 (12%)
Confirmed test results at CDC or hospital	31/40 (78%)
Received post-test counselling	30/40 (75%)
HIV positive *	24 (7%)
Post-test actions	
Confirmed test results at CDC or hospital	149 (44%)
Received post-test counselling	164 (48%)
Online	75/164 (46%)
Telephone	12/164 (7.3%)
In-person	77/164 (47%)
Increased HIV testing frequency	77 (23%)
Adverse outcomes	
Coercion	31 (9%)
Suicidality †, n = 40	14/40 (35%)
Violence †, n = 40	2/40 (5%)

Values are given in frequency (percentage) unless otherwise indicated

* HIV positive status among MSM survey participants who never self-tested (n = 306) was reported among 15 men (4.9%)

† Adverse outcomes regarding suicidality and violence were only asked among participants reporting a positive HIV self-test result

Table 3

Factors Associated with HIVST as First-Time HIV Test (Versus Facility-based Testing as First-Time HIV Test) Among Online MSM Survey Participants Who Have Tested for HIV in China, 2015 (n = 647)

	OR (95% CI)	*p*	aOR (95% CI)	*p*
Age (years)	0.95 (0.92, 0.98)	<.0001	0.95 (0.92, 0.99)	0.02
Student status	1.42 (0.99, 2.01)	0.05	1.03 (0.68, 1.55)	0.90
Education				—
High school or less	1.10 (0.62, 1.62)	0.62	—	
Some college	1.09 (0.71, 1.67)	0.69	—	
College or higher	1	0.86	—	
Annual Income (USD)				
<3K	1	0.25		—
3K–6K	0.68 (0.42, 1.09)	0.18	—	
>6K	0.76 (0.50, 1.14)	0.11	—	
Social factors			—	
Never married	1.62 (1.03, 2.62)	0.04	1.04 (0.57, 1.91)	0.90
Identify as gay	0.95 (0.65, 1.39)	0.79	—	—
Not “out” to healthcare provider	2.15 (1.53, 3.04)	<.0001	2.28 (1.60, 3.28)	<.0001
Use of internet to meet sex partners	0.42 (0.25, 0.71)	0.001	0.39 (0.22, 0.69)	0.001
High-risk sexual behavior				
Condomless sex in the last month	1.12 (0.75, 1.63)	0.58	—	—
Sex under influence of alcohol or drugs *	1.05 (0.66, 1.63)	0.84	—	—
Group sex **	1.44 (0.87, 2.36)	0.15	1.74 (1.02, 2.95)	0.04
Received payment for sex **	1.57 (0.95, 2.58)	0.08	1.47 (0.86, 2.49)	0.15
HIV testing frequency last two years				
At least once a year	1.30 (0.88, 1.96)		1.36 (0.89, 2.08)	
Less than once every two years	1	0.19	1	0.15

Effects test p-values are reported in the reference category for variables with more than 2 levels

* in the last 3 months;

** in the last 12 months

OR = crude odds ratio; CI = confidence interval; aOR = adjusted odds ratio