

BMJ Open Rapid HIV antibody testing among men who have sex with men who visited a gay bathhouse in Hangzhou, China: a cross-sectional study

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ABSTRACT

Objective: To understand the prevalence and correlates of rapid HIV antibody testing (RHT) among men who have sex with men (MSM) clients of gay bathhouses.

Design: Cross-sectional questionnaire survey.

Setting: This study was conducted in a gay bathhouse in Hangzhou, China.

Participants: 354 MSM were validly recruited from October to December 2012. Inclusion criteria were (1) men who visited the gay bathhouse, (2) men who had engaged in sex with men during the previous 6 months, (3) first-time participants in this survey and (4) men who were HIV-negative if already tested.

Measures: Sociodemographic measures included factors related to sexual behaviour and HIV risk perception, and the scales of HIV-related knowledge and behavioural intervention that each participant received.

Results: Of the 354 participants, 222 (62.7%) were rapid tested during the previous 6 months; of them, 66.2% were tested at the Centers for Disease Prevention and Control (CDC), and 46.8% at gay venues. The following factors were independently associated with rapid testing within the previous 6 months: sexual initiation at 20–29 years of age, ever having undergone standard testing, ever having seen a sexually transmitted disease doctor, consistent use of condom during the past 6 months, familiarity with RHT and perception of possible HIV infection.

Conclusions: Publicity of RHT and risk education for HIV infection are necessary to promote RHT among MSM who visit gay bathhouses. The characteristics of sexual behaviours among those who do and do not undergo RHT should be taken into consideration while promoting the service in this group.

INTRODUCTION

China is experiencing a rapid increase in HIV infection among men who have sex with men (MSM). The proportion of homosexual transmission among annually reported HIV

Strengths and limitations of this study

- Our findings first assessed the prevalence of, and factors associated with, rapid HIV antibody testing (RHT) among men who have sex with men (MSM) who visited gay bathhouses in China.
- Our findings provide important information that can be used to improve the RHT service among MSM clients of gay bathhouses in China.
- Selection bias is inevitable in this survey due to the sampling methods, which might restrict the representativeness of the study.
- The sensitive nature of sexual behaviour questions may make participants uncomfortable disclosing this information, which may have affected the magnitude of the association between RHT and other risk behaviours.

cases increased from 2.5% in 2005 to 25.8% in 2014.^{1 2} Of the estimated 48 000 newly infected individuals in 2011, homosexual transmission accounted for 29.4%.¹ Surveillance data from national sentinels also clearly demonstrate a rapid increase in the prevalence of HIV among MSM.¹ Moreover, data from many parts of China suggest that HIV and other sexually transmitted diseases (STDs) are significantly high among MSM; the prevalence of HIV and syphilis are approximately 6–10% and 15–20%, respectively.^{3–5} Zhejiang province is a coastal area in eastern China. The first case of HIV contracted by homosexual intercourse was detected recently, in 2004. Since then, homosexual transmission has increased each year, and the rate has reached approximately 41% of all reported cases of HIV. The prevalence of HIV among MSM, according to data from sentinels, has been maintained at around 8%.⁶ MSM who visit gay bathhouses often engage in a specific profile of risky HIV-related and STD-related behaviours

including having commercial sex, multiple sexual partners, group sex and unprotected anal sex.^{7–9} The reported prevalence of HIV in this population is very high in Hangzhou and Tianjin (both approximately 16%).^{7, 8} This high prevalence of HIV among bathhouse clients has posed substantial challenges to the public health sectors of China.

HIV testing is one of the most important strategies with which to prevent HIV transmission. Increasing the number of HIV-positive patients who are aware of their HIV status could reduce the occurrence of risky sexual behaviours and substantially decrease HIV transmission.^{10–12} Patients who are diagnosed with HIV can be linked to medical care and free antiretroviral treatment provided by the Chinese government. The reduced viral load of HIV-infected patients receiving treatment greatly reduces the probability of transmission of the virus to others.¹³ However, it has been reported that less than 55% of MSM have been tested for HIV,^{14–16} representing many missed opportunities for intervention in this population. Rapid HIV antibody testing (RHT) has several advantages, such as minimally invasive specimen collection, simple testing procedures, the ability to perform the test anywhere and availability of the preliminary results 20–40 min after specimen collection. Thus, RHT can increase the number of people who undergo HIV testing,^{17, 18} and increase the likelihood that HIV seropositive individuals will enter care¹⁹ compared with those who undergo standard HIV testing. Therefore, promotion of rapid testing is critical to the expansion of HIV testing among MSM.

RHT, in tandem with standard testing, has been offered in many clinical and public health testing settings in Zhejiang province. Both methods have been used at hospitals and various levels of the Centers for Disease Prevention and Control (CDC), but RHT at hospitals has mainly been performed on an emergency basis. To respond to the ongoing HIV epidemic among MSM, the Zhejiang Provincial CDC has required strengthening the HIV testing programme among MSM, and promoting the use of RHT to increase the testing coverage in this group.^{20, 21} The CDC system in Zhejiang province has made great efforts to implement HIV testing among MSM. Rapid testing as an alternative testing method is advocated and widely performed by local CDCs at voluntary counselling and testing (VCT) centres and gay venues such as bathhouses, bars and parks, since 2011. In 2012, the Central and Zhejiang provincial governments both issued documents to promote the establishment of RHT services in community health service centres and thus expand HIV testing among various populations.^{22, 23} With the expanded HIV epidemic among MSM, it is expected that the uptake of RHT among this group will increase. However, only one study has evaluated RHT among Chinese MSM,²⁴ and data are sparse on RHT among MSM who visit gay bathhouses, who are deeply affected by HIV. The lack of knowledge in this respect may prevent the optimal use

of RHT in this group of Chinese MSM. The present study was conducted in a bathhouse in Hangzhou, Zhejiang province, to understand the correlates of RHT among MSM who visit gay bathhouses and to evaluate the effects of rapid testing services provided to this group.

METHODS

Study site and participants

This study was conducted among MSM who visited one gay bathhouse in Hangzhou from October to December 2012. Hangzhou, the capital of Zhejiang province, is a municipality located in the northern part of this province, and has a population of 8.7 million.²⁵ Hangzhou is one of the most developed areas in China; approximately half of all reported HIV cases among MSM in this province originate from this city, and half of the reported cases of HIV in this city involve MSM.⁶

There was one gay bathhouse that ran business normally in Hangzhou during the time of research. Gay clients from local and adjacent areas would visit this venue, but it was usually poorly attended apart from on weekends. Based on observations of the most visits by MSM clients to this bathhouse, the present survey was conducted every Saturday.

All potential participants were required to (1) be men who visited the gay bathhouse, (2) have engaged in sex with men during the previous 6 months, (3) be first-time participants in this survey (eg, MSM previously contacted by the research team during the research period were not recruited again to the present survey) and (4) be HIV-negative if a participant was already tested and had known his HIV serostatus before the survey. During the survey period, 453 MSM who visited the gay bathhouse were reached, 358 of them met the requirement for recruitment and agreed to participate in the research, and 354 provided valid responses.

Recruitment

Staff members of the local CDC who engaged in behavioural intervention for MSM were trained by the research team prior to the survey. The recruitment was permitted by the manager of the bathhouse, and conducted by the staff of the local CDC. The questionnaires were self-administered by the participants in a private space at the bathhouse. The definitions of RHT and standard HIV testing were explained to the participants before the survey. The participants received a small monetary incentive of ¥25 (approximately US\$4) for their participation, which was equal to the price of admission to the bathhouse at the research period.

Three methods were used to recruit participants. One method involved training and hiring of members of an MSM community-based organisation by the local CDC to approach MSM. The second method involved the recruiting of MSM by other MSM in the bathhouse. The third method involved putting up posters at the bathhouse to

deliver the message about this study, encouraging MSM to participate.

Ethical considerations

Once an MSM who visited the gay bathhouse was referred to the study, staff members from the local CDC approached the individual to verify his eligibility, and to explain the purpose and method of the survey. The MSM were also assured of the confidentiality of their participation. Participants were not required to provide their names or other personal identifiers as a condition for participation. Informed consent was obtained before the survey was started.

Measures

The original questionnaire was developed based on a review of domestic and foreign documents, and was subsequently modified according to repeated counselling sessions and discussions among the staff from the local CDC engaged in HIV prevention among MSM, the research team and MSM communities.

The participants were asked, "Have you ever received RHT in the past half year?". The possible responses were 'Yes' and 'No'. RHT during the past half year was used as a dependent variable in the analysis. Because saliva rapid testing was largely unavailable in this city during the study period, RHT in this survey mainly refers to blood rapid testing. The independent variables were sociodemographic measures, standard testing during the previous half year, age at first sex initiation, number and types of homosexual partners, gender of sexual partner, condom use with homosexual partners during the previous half year, history of visiting an STD doctor and reported STD diagnosis during the previous half year, knowledge of RHT, HIV risk perception, and scales of HIV-related knowledge and behavioural intervention that each participant received. Cronbach's α coefficient for internal consistency and the range of scores were computed for each scale, and the participants were categorised into three or four groups according to the range of scores based on the frequency distribution of each scale.

The HIV-related knowledge scale included six statements about whether an HIV-infected person could be identified by appearance, whether the number of HIV cases among MSM has rapidly increased in recent years, whether the prevalence of STDs remains high among MSM, whether oral sex can transmit HIV, whether anal sex more readily transmits HIV than vaginal sex and whether correct use of a condom can reduce the transmission of HIV. There were three possible responses to each of these six statements: 'Correct', 'Incorrect' and 'Unsure'. The scores for this scale ranged from 0 to 6, with 6 reflecting a high level of knowledge, 0–4 reflecting a low level of knowledge and 5 reflecting an intermediate level of knowledge. Cronbach's α coefficient for this scale was 0.666.

The intervention scale reflected the interventional services that an MSM received during the most recent

6 months, including seven statements regarding whether an MSM had ever received any condoms, lubricants, publicity material, STD diagnoses or treatments, counselling for HIV/STD, training for HIV/STD prevention or services other than those listed above. The possible responses to each statement were 'Yes' and 'No'. This scale had a Cronbach's α coefficient of 0.883, and the scores ranged from 0 to 7: scores of 7 were classified as high, 0–4 represented MSM who had received a low level of interventional services. The seven statements of this scale were first analysed separately in bivariate analyses.

Statistical analysis

Data were analysed using SPSS for Windows (V.21.0; SPSS Inc, Chicago, Illinois, USA). The frequency distributions of the independent variables and the prevalence of RHT were determined by univariate analysis. Associations between the dependent variable and each independent variable were computed using an OR with corresponding 95% CI and a p value based on a χ^2 test of proportions. Variables identified as significantly associated with RHT in the bivariate analyses were then entered into a multivariate logistic regression model to determine the independent contribution of each factor to predict RHT. A backward elimination procedure was adopted with a p value of <0.10 as the removal criterion in the model. A p value of <0.05 was considered statistically significant in these analyses.

RESULTS

Table 1 revealed that approximately 38% of the participants were aged >39 years, and 29% were aged <30 years. The distributions of unmarried and married participants were 41.0% and 42.9%, respectively. Thirty-eight per cent of participants had a high school education, and 20% had at least a college or university education. Twenty-five per cent were local residents, and 37% were not local residents but were from the same province. Thirty-two per cent earned an income of \leq ¥2500 per month, and 27% earned >¥4000 per month. There were no statistically significant differences in the uptake of RHT with respect to sociodemographic variables including age, education, residence and income. However, married MSM were less likely to have undergone RHT than were unmarried MSM (p=0.003).

Table 2 shows that among all 354 participants, 62.7% were rapid tested and 77.4% were standard tested (6.2% were only rapid tested, 20.9% were only standard tested and 56.5% were both standard and rapid tested); 16.4% had never been tested during the past 6 months. Of the 222 rapid-tested participants, 66.2% had been tested at the CDC, 46.8% had been tested in gay venues, 18.5% had been tested at community health service centres and 11.3% had been tested at hospitals.

Table 3 indicates that participants initiated in sex at the age of 20–29 years versus at the age of <20 years

Table 1 Sociodemographic characteristics of 354 men who have sex with men who visited a gay bathhouse in China

Characteristic	n	Per cent
Age in years		
≤29	102	28.8
30–39	118	33.3
>39	134	37.9
Marital status		
Unmarried	145	41.0
Married	152	42.9
Other	57	16.1
Education		
Less than high school	146	41.2
High school	136	38.4
Beyond high school	72	20.3
Residence		
Local	87	24.6
Local province	131	37.0
Other province	136	38.4
Income per month(¥*)		
≤2500	114	32.2
2501–4000	144	40.7
>4000	96	27.1

*¥1 is equivalent to approximately US\$0.163.

(OR=2.11, 95% CI 1.12 to 3.95), ever being exposed to standard testing during the past half year (OR=7.13, 95% CI 4.08 to 12.46), having a history of visiting a STD doctor (OR=3.13, 95% CI 1.39 to 7.07), having had multiple homosexual partners (OR=1.68, 95% CI 1.08 to 2.59), consistent in the use of condoms (OR=2.50, 95% CI 1.26 to 4.96), familiar with RHT (OR=8.77, 95% CI 5.33 to 14.43), with a high-risk perception of HIV infection (OR=2.47, 95% CI 1.56 to 3.92) and high level of HIV-related knowledge (OR=2.45, 95% CI 1.39 to 4.30), were more likely to have undergone RHT during the past half year. Those having been diagnosed with an STD (OR=0.47, 95% CI 0.26 to 0.85) were less likely to have undergone RHT during the past half year.

Table 2 Rapid HIV testing and testing venues

	n	Per cent
Testing		
Rapid tested	22	6.2
Rapid and standard tested	200	56.5
Standard tested	74	20.9
Not tested	58	16.4
Sites of rapid testing*		
CDC	147	66.2
Sites for MSM	104	46.8
Community health centre	41	18.5
Hospital	25	11.3
Other	9	4.1

*Among those who had undergone rapid testing, n=222. CDC, Centers for Disease Prevention and Control; MSM, men who have sex with men.

Participants who received condoms (OR=4.37, 95% CI 2.22 to 8.60), lubricants (OR=3.59, 95% CI 1.99 to 6.48), publicity materials (OR=2.23, 95% CI 1.31 to 3.79), and training for STD and HIV prevention (OR=1.91, 95% CI 1.20 to 3.04), were more likely to be associated with RHT than were those who did not receive the corresponding interventions. Participants who received 5–6 (OR=1.92, 95% CI 1.06 to 3.46) or 7 types (OR=1.73, 95% CI 1.03 to 2.93) of intervention were more likely to report RHT than were those who were exposed to 0–4 types of intervention.

Table 4 shows the results of the multivariate analysis. Considering the variables for history of visiting an STD doctor and reported STD diagnosis were collinear, we only placed the variable for history of visiting an STD doctor in the multivariate model. After adjusting for possible confounding factors, the following factors remained independent correlates of RHT during the past 6 months: sexual initiation at the age of 20–29 years (OR=2.34, 95% CI 1.01 to 5.41), ever having undergone standard testing (OR=4.62, 95% CI 2.32 to 9.17), ever having seen an STD doctor (OR=3.22, 95% CI 1.12 to 9.26), always having used a condom during the past 6 months (OR=3.18, 95% CI 1.26 to 8.02), knowledge of RHT (OR=11.30, 95% CI 6.10 to 20.93) and perception of possible infection with HIV (OR=2.37, 95% CI 1.30 to 4.32).

We tried to include the variable for reported STD diagnosis in place of the variable for history of visiting an STD doctor in the multivariate model; the analysis showed that the factors mentioned above were still the predictors of RHT during the past 6 months, and having received an STD diagnosis (OR=0.25, 95% CI 0.11 to 0.55) was independently associated with RHT.

DISCUSSION

The systematic collection of data for representative sampling in MSM who visited a gay bathhouse is challenging because client lists do not exist. Some researchers have utilised time-space sampling to recruit participants who visit bathhouses, but implementing such a design can be costly due to extensive observation, long periods of data collection and extra staffing.^{26 27} Therefore, multiple sampling methods on the weekends were used to collect the study sample.

Most of our participants were tested during the previous 6 months by RHT, standard testing or both, indicating the popularity of RHT among MSM. An American study revealed that the advent of RHT may provide a good opportunity to efficiently and effectively reach this population for HIV testing during their bathhouse visit.²⁸ We found that the main location of RHT is the CDC. In 2004, Zhejiang province began to establish VCT facilities at different levels of the CDC. These VCT facilities provide free, confidential HIV testing, and all CDCs had established VCT facilities at the time of this survey. It seems that the RHT service offered by the CDC is

Table 3 Behavioural, psychosocial and exposed interventional associations with rapid HIV testing

	Total (n, %)* n=354	Tested (n, %)* n=222	Crude OR (95% CI)	p Value
Age at first sex initiation				
≤19	53 (15.0)	28 (52.8)	1	
20–29	178 (50.3)	125 (70.2)	2.11 (1.12 to 3.95)	0.020
≥30	123 (34.7)	69 (56.1)	1.14 (0.60 to 2.18)	0.689
Standard testing during previous half year				
No	80 (22.6)	22 (27.5)	1	
Yes	274 (77.4)	200 (73.0)	7.13 (4.08 to 12.46)	0.000
History of visiting STD doctor during previous half year				
No	27 (7.6)	10 (37.0)	1	
Yes	327 (92.4)	212 (64.8)	3.13 (1.39 to 7.07)	0.006
Reported STD diagnosis during previous half year				
No	271 (76.6)	184 (67.9)	1	
Yes	56 (15.8)	28 (50.0)	0.47 (0.26 to 0.85)	0.012
Number of homosexual partners during previous half year				
1	149 (42.1)	83 (55.7)	1	
≥2	205 (57.9)	139 (67.8)	1.68 (1.08 to 2.59)	0.021
Types of homosexual partners during previous half year†				
Only regular	233 (63.0)	141 (63.2)	1	
Ever casual	109 (30.6)	64 (58.7)	0.83 (0.52 to 1.32)	0.427
Ever commercial	22 (6.2)	17 (77.3)	1.98 (0.706 to 5.56)	0.196
Gender of sexual partner during previous half year				
Only men	209 (59.0)	133 (63.6)	1	
Men and women	145 (41.0)	89 (61.4)	0.91 (0.59 to 1.41)	0.666
Condom use during previous half year				
Never/seldom	43 (12.1)	22 (51.2)	1	
Sometimes	141 (39.8)	77 (54.6)	1.15 (0.58 to 2.28)	0.692
Always	170 (48.0)	123 (72.4)	2.50 (1.26 to 4.96)	0.009
Knowledge of RHT				
No	125 (35.3)	39 (31.2)	1	
Yes	229 (64.7)	183 (79.9)	8.77 (5.33 to 14.43)	0.000
HIV risk perception				
Impossible/unsure	205 (57.9)	111 (54.1)	1	
Possible	149 (42.1)	111 (74.5)	2.47 (1.56 to 3.92)	0.000
Knowledge scale				
0–4	85 (24.0)	47 (55.3)	1	
5	116 (32.8)	60 (51.7)	0.87 (0.49 to 1.52)	0.616
6	153 (43.2)	115 (75.2)	2.45 (1.39 to 4.30)	0.002
Intervention-exposed scale (0–6)				
0–4	90 (25.4)	47 (52.2)	1	
5–6	99 (28.0)	67 (67.7)	1.92 (1.06 to 3.46)	0.031
7	165 (46.6)	108 (65.5)	1.73 (1.03 to 2.93)	0.039

*Percentage may not add up to 100 due to missing data.

†Participants were categorised into three groups of sexual partnership: those who had only regular partners, those who had ever had a casual but not a commercial partner and those who had ever had a commercial partner.

RHT, rapid HIV antibody testing; STD, sexually transmitted disease.

welcomed by this population, increasing the likelihood that they will visit these VCT centres to seek counselling and testing. The gay venue is another important place for this population to undergo rapid testing. Such RHT services in Hangzhou are usually provided by the local CDC at gay bathhouses, gay bars and parks. It seems that the provision of this service has effectively encouraged MSM to undergo RHT. Therefore, local CDCs should continue to regularly promote RHT at gay venues, especially at bathhouses, because of the striking prevalence of HIV infection among the MSM at these venues, and,

furthermore, one American study revealed that implementing bathhouse-based HIV counselling and testing did not have any demonstrable impact on patronage.²⁹ Why MSM who visit gay bathhouses seldom undergo RHT at hospitals is unclear. It may be due to the fact that hospital-provided testing services are usually not free and also owing to the concern among MSM about the doctor's attitude or the availability of RHT at hospitals, which usually provide this service only on an emergency basis. Although RHT is usually provided at community-based health service centres, use of this

Table 4 Results of multivariate analysis

Variables	Rapid HIV testing	
	Adjusted OR (95% CI)	p Value
Age at first sex initiation		
≤19	1	
20–29	2.34 (1.01 to 5.41)	0.047
≥30	1.31 (0.56 to 3.04)	0.532
Standard testing during previous half year		
No	1	
Yes	4.62 (2.32 to 9.17)	0.000
Ever visited an STD doctor during previous half year		
No	1	
Yes	3.22 (1.12 to 9.26)	0.030
Condom use during previous half year		
Never/seldom	1	
Sometimes	1.25 (0.51 to 3.06)	0.621
Always	3.18 (1.26 to 8.02)	0.014
Knowledge of RHT		
No	1	
Yes	11.30 (6.10 to 20.93)	0.000
HIV risk perception		
Impossible/unsure	1	
Possible	2.37 (1.30 to 4.32)	0.005

RHT, rapid HIV antibody testing; STD, sexually transmitted disease.

venue by MSM clients of gay bathhouses is also low. We speculate that rapid testing services are only just starting to become established at these centres and that our participants may not have been familiar with, accustomed to, or trusting of this service venue. Therefore, quality improvements and publicising of this service are important to encourage MSM to undergo RHT at these facilities.

The multivariate model revealed that RHT was strongly associated with standard testing in the past 6 months, indicating that a person tested by one method is likely to also be tested by another method. The reason for this finding is unclear. MSM who visit bathhouses may recognise the importance of testing after exposure, then undergo testing by a different method to confirm their infection status. It is important that MSM become aware of both of these testing methods and their characteristics to establish a habit of HIV testing irrespective of whether the rapid or standard method is used.

MSM who had visited STD clinics were more likely to undergo RHT. This may be explained by the fact that MSM who had visited an STD doctor had a high level of HIV risk awareness because of their STD symptoms or concerns, causing them to intentionally seek out RHT. This was confirmed in our study; MSM who thought it possible to become infected with HIV were more likely to undergo rapid testing. Lack of risk perception among Chinese MSM^{15 30} and American newly diagnosed HIV patients³¹ was the most common reason for not undergoing HIV testing. Further evidence is that MSM who

always used a condom in our survey were more likely to undergo testing. Consistent condom users are probably aware of the risks of their sexual behaviours, causing them to take protective measures during sexual intercourse and to undergo HIV testing. In the present study, only 42% of the participants thought it possible to contract HIV, and many at a high risk of HIV infection underestimated their risk.^{30 32 33} Therefore, risk perception education is urgently needed and of great value to promote RHT among this population.

MSM diagnosed with an STD during the previous 6 months had a higher risk of contracting HIV but were less likely to undergo RHT than were MSM not diagnosed with an STD. In China, STD clinics are usually affiliated with hospitals. The national CDC of China suggests that STD clinics provide HIV testing to attendees of STD clinics regardless of whether they are diagnosed with an STD.³⁴ In the present study, RHT was mainly conducted in the CDC and at gay venues rather than at hospitals. RHT is probably not available at STD clinics because such testing is usually only provided in emergency settings; that STD testing and treatment were not associated with RHT in the bivariate analysis was confirmed in our study. MSM with an STD diagnosis might be offered standard HIV testing due to their high risk of contracting HIV. One American study reported that experience with an STD diagnosis may provide patients with the expectation that test results take a week or longer to be processed by a laboratory, so RHT may not be chosen because it does not match the model of care with which the patients are familiar at the STD clinic.³⁵

In the present study, familiarity with RHT was a strong indicator of having been exposed to RHT. Domestic²⁴ and foreign³⁶ studies have both revealed that MSM who are familiar with RHT are more likely to be willing to undergo HIV testing. Some MSM were familiar with RHT and therefore willing to undergo it if it was provided by the CDC, or otherwise intentionally sought this service, while some MSM were familiar with rapid testing because they had been exposed to this type of testing in the past. Increased publicising of RHT is critical to make MSM aware of such testing and thus promote this behaviour among clients of gay bathhouses.

Initiation of homosexual acts by gay bathhouse clients aged 20–29 years was found to be associated with RHT. This group may have been more receptive to advertisements or mobilisation for rapid testing at the time they initiated the homosexual acts, then subsequently maintained this behaviour. Likewise, those who initiated sex before 20 years of age may have been unaware of the HIV risk because of their young age. Those who initiated sex beyond 29 years of age may not have perceived the risk of HIV or may have been fatigued by the widespread testing messages at the time of their sex initiation.

In the present study, RHT was not related to HIV-related knowledge, exposure to behavioural interventions, or the number, type and gender of sexual partners. RHT in this group was mainly conducted at the

CDC or gay venues. Those who underwent RHT were probably attracted by the advantages of this method, such as the simple testing procedure and the ability to obtain results quickly irrespective of whether they had been exposed to HIV education or interventions or the characteristics of their sexual partners. This implies that RHT among MSM who visit gay bathhouses may be initiated mainly by themselves or motivated by the CDC or MSM community organisation at the gay venue. Thus, HIV-related knowledge and interventions are insufficient to promote RHT in this group.

This study has several limitations. We recruited participants from one bathhouse on weekends during a 3-month period. MSM who attended at other times did not have the opportunity to participate in this study. Also, some clients who were contacted by the research team refused to participate. Therefore, selection bias is inevitable in this survey. However, we recategorised our participants' sociodemographic variables, including age, marital status, education and residence, in accordance with the categories of other reported sociodemographic data of MSM recruited from gay bathhouses in Hangzhou,^{8 37} Tianjin,⁷ Jiangsu⁹ and Guangxi.³⁸ Comparison of these recategorised variables revealed that the direction of the frequency distribution was identical or that there were no statistically significant differences among them. Thus, we believe that our findings are of value with respect to the performance of RHT in this population. The study questionnaire elicited sensitive information regarding sexual behaviour; participants may have felt uncomfortable disclosing this information to the study staff. This may have affected the magnitude of the association between RH and other risk behaviours. Finally, lack of conceptual or theoretical framework in this study may limit our data analysis and interpretation.

Despite these limitations, our study provides first insights on the MSM who visit gay bathhouses who choose to undergo RHT. We found that RHT is generally popular among MSM clients of gay bathhouses in Hangzhou. Public health programmes should consider RHT as an alternative testing method to further enlarge the coverage of HIV testing in this population. Increased publicity of RHT and education of the risk perception for HIV infection is necessary to promote RHT among this population. The characteristics of sexual behaviours among MSM who do and do not choose to undergo RHT should be taken into consideration in the establishment of future programmes to promote RHT in this group.

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Contributors SX and QM conceived of the design of this research, coordinated the study in the field, performed the statistical analysis and drafted the manuscript. XP, GC and XZ played a major role in the field survey. GC and HW helped analyse the data. ZP supervised statistical analysis and made critical comments on the manuscript. All the authors read and approved the final manuscript.

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Data sharing statement No additional data are available.

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