

Preplanned Studies

Factors that Affect the Frequency of HIV Testing in College Men Who Have Sex with Men — Northeast China, 2017–2018

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Summary

What is already known about this topic?

Human immunodeficiency virus (HIV) testing is a critical tool in reducing HIV transmission among men who have sex with men (MSM); young MSM frequently use mobile phone applications and participate in social hook-ups.

What is added by this report?

The prevalence of HIV testing-frequency (≥ 2) over the whole study period (15 months) was 38.6% among college MSM in Northeast China. MSM with more social contacts, recreational drug use, and prior HIV self-test experience (reported via mobile phone geo-social apps) were more likely to have higher offline HIV testing frequency.

What are the implications for public health practice?

A gay-oriented app provides opportunities for online interventions to promote HIV testing services.

Given the burden of unrecognized infections contributing to human immunodeficiency virus (HIV) transmission, HIV cases finding among men who have sex with men (MSM) identify HIV testing as prerequisite entry points for treatment and Pre-Exposure Prophylaxis (PrEP) (1). HIV testing promotion is a critical “first step” prevention strategy to engage young MSM (YMSM) and testing should be conducted more than once each year (2). The benefits of providing more frequent testing (e.g., once every 3 or 6 months) can include risk reduction and early diagnosis to reduce local HIV transmission (3). Online social networks have made social and sexual hook-ups more efficient for YMSM (4). Geo-social network application (app) use may concurrently have manifestations of sexual risk behaviors and risk-reduction behaviors such as increased HIV testing (5). Understanding social networks among MSM attending college can inform HIV testing strategies in a

population documented to be at risk. We established a prospective longitudinal study to identify the association and magnitude of social contacts with HIV testing among 759 college MSM as users of the Yiyou App in Northeast China from April 2017 to June 2018. Higher HIV testing-frequency in the voluntary counseling and testing (VCT) site was more likely among men with recreational drug use [adjusted odds ratio (aOR)=1.7, 95% confidence interval (CI): 1.0–2.7], having ≥ 1 HIV self-test (aOR=2.7, 95% CI: 1.9–4.0), ≥ 1 social contact (aOR=4.1, 95% CI: 2.7–6.2) in cross-sectional analysis, and ≥ 1 social contact (aOR=3.8, 95% CI: 2.4–6.0) in longitudinal analysis.

The prospective longitudinal study used online survey data retrieved from the Yiyou App supported by the Heilongjiang Kangtong Community (HKC), the largest community-based organization focused on serving MSM in Northeast China. We then linked survey data to HKC’s offline services data. We approached 3,698 potentially eligible registered users of Yiyou App from 21 HKC collaborated VCT sites, among whom 759 (20.5%) college MSM were screened, enrolled, and completed our survey from April 2017 to June 2018. Inclusion criteria were: 1) biological males at least 18 years old and schooling in colleges; 2) self-reported ever had sex with men; 3) willing to provide blood samples for HIV/syphilis testing; 4) able to understand and complete the questionnaire interview; and 5) physically capable and willing to consent online. A total of 382 non-student participants (10.3% of 3,698) were enrolled from the same pool as social contacts of the 759 students. A self-administrated structured questionnaire was conducted on sociodemographic information, perceived risk of HIV infection, sexual behaviors, recreational drug use in the past 6 months, and HIV self-test experience. There was an option to choose the identity as a student or not to declare college student identity. Upon completion of the online survey, participants were

asked to undertake dual rapid HIV and syphilis tests and a parallel rapid HIV test by trained workers in offline VCT sites. Participants having positive HIV rapid results have their HIV status confirmed via Western blot at the provincial CDC and then referred for HIV care and antiretroviral therapy (ART). All participants were followed up for at least one month over the whole study period (15 months).

The outcome indicator was the HIV testing frequency of the college MSM in VCT sites during the study period. The main predictors studied using the online survey data were the number of social contacts, which was limited to the approached 3,698 registered users pool. We generated logistic regression models and generalized estimating equations (GEE) models to determine the association of HIV testing frequency with sexual behaviors and social contacts among college MSM. Microsoft Excel (Microsoft®, Albuquerque, New Mexico, USA) and Statistical Analysis System (version 9.4, SAS Institute Inc., Cary, North Carolina, USA) were used to manage the dataset and conduct the analyses.

Of 759 participating college MSM, the median age was 22 years old [interquartile range (IQR)=20–26]. Among 759 college MSM, 1,385 cumulative HIV tests were reported with 141 (18.6%) having had >2 HIV tests (repeated tests=615), 152 (20.0%) having two HIV tests (repeated tests=304) and 466 (61.4%) having one test. Hence, 293 (38.6%) had higher HIV testing-frequency (≥ 2) in the VCT site accounting for 170.50 person-years during the 15-month study period. Among 1,385 cumulative HIV tests, 34 participants with positive results were confirmed and referred to treatment. According to the cross-sectional analysis (model 1), those with more HIV testing (≥ 2) were more likely to be older (>23 years old; aOR=2.5, 95% CI: 1.8–3.6); have resided for shorter (<1 year, aOR=4.7, 95% CI: 2.6–8.4) in the survey cities; had recreational drug use in the past 6 months (aOR=1.7, 95% CI: 1.0–2.7); have ≥ 1 HIV self-test (aOR=2.7, 95% CI: 1.9–4.0); and have ≥ 1 social contacts (aOR=4.1, 95% CI: 2.7–6.2; Table 1). For the longitudinal analysis (model 2), men having ≥ 1 social contacts (aOR=3.8, 95% CI: 2.4–6.0) were more likely to have >2 HIV tests (Table 2).

DISCUSSION

We used App-derived data to explore the association of HIV testing frequency with social contacts, finding that college MSM with more social contacts (≥ 1) were

more likely to have more HIV testing (≥ 2 in cross-sectional analysis, >2 in longitudinal analysis) in Northeast China. Relative social isolation among MSM may, in contrast, result in lower HIV testing frequency. Moreover, we found that college MSM who were older (>23 years), non-local (lived <1 year), used recreational drugs, had anal sex in the past six months, and had HIV self-tested were more likely to take subsequent HIV tests. These findings raised the prospect that themed apps can be used to deliver tailored interventions, such as sending reminders for repeated testing and information about ART and promoting safer sexual behaviors in following stages of the ongoing study.

Low awareness of HIV testing has been reported in the Chinese MSM community (6), especially among the college YMSM. Those who were shorter-term residents of the surveyed city were more likely to have HIV testing; it may be more challenging for migrants to access testing information and HIV prevention intervention programs offline than online (6). Mobile apps can play an important facilitative role in improving access to testing and health information, especially among persons recently arriving on a college campus. The syndemic of high-risk sexual behavior and recreational drug use helps drive HIV transmission through higher-risk sexual behaviors (7). We found that YMSM who had anal sex or had used recreational drugs in the past 6 months were more likely to have more frequent subsequent HIV tests in univariate longitudinal analysis. The true effect may be even greater than measured here since higher-risk YMSM who become HIV-infected are then not tested once infection is confirmed. Therefore, social media apps can usher in a new era of more accessible and available educational and linkage services for hidden populations.

More social contacts may indicate that YMSM willing to share their social information are more likely to internalize their sexual orientation. We speculated that this willingness to share may indicate better coping with stigmatization and an ability to overcome initial reluctance to use HIV testing services (8). MSM having more social interactions with others were more likely to obtain HIV testing, a consistent observation in several countries (9). YMSM may be more easily influenced by social contacts, particularly one who exhibits trust by disclosing his sexual orientation (8). Social system theory suggests that social networks can affect HIV testing behavior via information sharing that facilitates actions in decision-making and

TABLE 1. Predictors of higher HIV testing-frequency (≥ 2) among 759 college men who have sex with men in Northeast China, 2017–2018 (N=759): a logistic regression model.

Factors	Higher HIV testing-frequency (≥ 2) n (%)	Crude odds ratio (95% CI)	Adjusted odds ratio (95% CI)
Age (years)			
≤ 23	131 (28.0)	1	1
> 23	147 (56.8)	3.38 (2.5–4.6)*	2.52 (1.8–3.6)*
Ethnicity			
Minority	8 (36.4)	1	
Han	285 (38.7)	1.11 (0.5–2.7)	
Marital status			
Unmarried	281 (38.5)	1	
Married	11 (44.0)	1.25 (0.6–2.8)	
Residence			
Other cities/PLADs	127 (37.8)	1	
Local	166 (39.3)	1.07 (0.8–1.4)	
Time spent locally (months)			
12–24	34 (20.7)	1	1
< 12	69 (54.8)	4.63 (2.8–7.7)*	4.67 (2.6–8.4)*
> 24	190 (40.6)	2.61 (1.7–4.0)*	2.36 (1.4–3.9)*
Perceived risk of HIV infection			
High-very high	21 (38.2)	1	
Moderate	56 (32.7)	0.79 (0.4–1.5)	
No-low	216 (40.5)	1.10 (0.6–2.0)	
Having anal sex in the past 6 months			
No	120 (36.4)	1	1
Yes	171 (45.5)	1.46 (1.1–2.0)*	0.88 (0.6–1.3)
Condom use with male partners in the past 6 months			
Never	9 (39.1)	1	
Sometimes	64 (36.8)	0.91 (0.4–2.2)	
Every time	98 (54.7)	1.88 (0.8–4.6)	
Number of regular partners in the past 6 months			
0	25 (52.1)	1	
1	100 (43.3)	0.70 (0.4–1.3)	
2	35 (47.3)	0.83 (0.4–1.7)	
≥ 3	11 (47.8)	0.84 (0.3–2.3)	
Any recreational drug use in the past 6 months			
No	217 (35.1)	1	1
Yes	76 (54.7)	2.24 (1.5–3.2)*	1.66 (1.0–2.7)*
Ever had HIV self-test			
No	141 (33.3)	1	1
Yes	150 (53.2)	2.28 (1.7–3.1)*	2.72 (1.9–4.0)*
Number of social contacts			
0	169 (28.8)	1	1
≥ 1	124 (71.7)	6.24 (4.3–9.1)*	4.07 (2.7–6.2)*

Note: All 6 variables with $P \leq 0.05$ in univariate analysis were included in multivariate analysis.

Abbreviations: HIV=human immunodeficiency virus; CI=confidence interval; PLAD=provincial-level administrative divisions.

* $P \leq 0.05$.

TABLE 2. Predictors of higher HIV testing-frequency (>2) among 759 college men who have sex with men in Northeast China, 2017–2018 (Cumulative HIV tests N=1,385): a GEE model.

Factors	Higher HIV testing-frequency (>2) n (%)	Crude odds ratio (95% CI)	Adjusted odds ratio (95% CI)
Having anal sex in the past 6 months			
No	199 (36.1)	1	1
Yes	414 (53.1)	2.01 (1.4–2.8)*	1.37 (1.0–2.0)
Any recreational drug use in the past 6 months			
No	431 (40.2)	1	1
Yes	183 (58.7)	2.11 (1.4–3.1)*	1.28 (0.8–1.9)
Ever had HIV self-test			
No	356 (42.5)	1	1
Yes	254 (51.8)	1.45 (1.1–2.0)*	1.28 (0.9–1.8)
Number of social contact			
0	270 (30.3)	1	1
≥1	345 (69.8)	5.33 (3.5–8.1)*	3.81 (2.4–6.0)*

Note: Adjusted model additionally includes categorized age, time spent locally, a total of 6 independent variables in comparison with Table 1.

Abbreviations: HIV=human immunodeficiency virus; GEE=generalized estimating equations; CI=confidence interval.

* $P \leq 0.05$.

problem-solving (10). We interpreted our findings to support a hypothesis that more social contact is associated with a higher chance of HIV testing. An alternative hypothesis is that socially engaged men are taking more risks and therefore obtaining more tests.

Limitations included our inability to generalize our findings outside of Northeast China or areas where the Yiyou App is not used. Since the app is not for “hook-up” per se, but rather designed for sero-sorting assistance, we cannot generalize our findings to all gay-themed Apps. Moreover, some users may use a different phone number for connecting with a “digital bathhouse” due to a stigmatization of homosexuality in China and/or men may delete contacts after sex encounters; therefore, social contact information could be biased towards a minimum estimate in terms of numbers, density, and/or breadth of their sexual networks.

This study highlighted the potential for online social interventions to promote HIV testing and relevant services. Governmental agencies should introduce policies to encourage themed apps to establish HIV testing information through real-time inquiry systems. MSM community organizations should provide more peer support or HIV self-test resources to available public service departments. And for college MSM, risk-reduction behaviors, such as HIV testing every 3 months, should be encouraged.

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