Online Sex-Seeking Among Chinese Heterosexual Men Who Seek Care in STIs Clinics: A Cross-Sectional Study

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Research

Keywords: Online sex-seeking, Sexual behavior, Heterosexual men, Sexually transmitted infection

DOI: https://doi.org/10.21203/rs.3.rs-774273/v1

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Abstract

**Background:** The Internet has become an important virtual venue for men who have sex with men to seek sexual partners, with a high potential threat to spread sexually transmitted infections (STIs). However, the online sex-seeking use and its risk causing STIs spread remain unclear among heterosexual men. We conducted a cross-sectional study to investigate the use of online sex-seeking venues and the related risky sex activities (e.g. condomless sex, quick sex) in STIs clinics in Guangdong, China.

**Methods:** These STIs clinics were involved in the Guangdong governmental sentinel network and we recruited heterosexual men (age >= 18) between March and August 2018. Multivariable logistic regression models were used to identify the factors associated with online sex-seeking use and risky sex activities with online sex partners.

**Results:** 191 of 2,154 participants (8.9%) ever sought sex online. Among users, 16.8% met their partners in-person within 24 hours, 31.4% engaged in condomless sex with their last online partner. Online sex-seeking was positively associated with a) previous STIs diagnosis (a OR=3.0, 95%CI:2.0-4.6), and b) having casual partners in the last three months (a OR=3.3, 95%CI:2.4-4.6). Condomless sex with the last online partner was negatively associated with the correct answer of “having only one partner can reduce the risk to infect HIV” (a OR=0.3, 95%CI:0.1-0.8).

**Conclusion:** In China, online sex-seeking and its related risky sexual activities are not rare among heterosexual men. Future prevention strategies to reduce STIs incidence should especially target heterosexual men engaging in online sex-seeking.

Background

The use of the internet has dramatically changed people's social behaviors in the 21st century. Specifically, the advantage of efficient communications through the internet has reinforced the behaviors of seeking casual partners through dating websites and apps as well as other social media. While the Internet extended people's social contact, previous studies indicated that the uses of such platforms may facilitate the spread of sexually transmitted infections (STIs). This risk of STIs transmission in online sex-seeking may be explained by the greater number of sexual partners and a higher likelihood of practicing unprotected intercourse among online sex partners. Therefore, understanding the profiles of online sex-seeking use and its related sexual activities is important for the development of prevention measures for STIs (e.g. HIV).

Although a large number of existing research have reported the use of online sex-seeking and characteristics of its sexual activities among men who have sex with men, few studies focused on heterosexual men. More attention should be given to the risk associated with sexual activities of heterosexual men because these males can eventually transmit the STIs from casual partners to their permanent partners. More importantly, the STIs including Chlamydia trachomatis (CT), Neisseria gonorrhoea (NG), Syphilis, and Trichomoniasis have continuously and severely affected human's morbidity...
as well as heterosexual men's quality of life worldwide. In extreme cases, the STIs would result in female infertility, adverse birth outcomes (e.g. spontaneous abortion and stillbirth), and congenital infection. Given the neglected risk of heterosexual men's online sex-seeking behavior, we urgently need to comprehensively investigate the online sex-seeking behavior pattern and its related sexual behaviors that influence the acquisition and transmission of STIs infection for re-designing prevention strategies.

We hereby conducted a cross-sectional study to explore the risk of STIs acquisition and transmission associated with online sex-seeking among heterosexual men in Guangdong, China. The specific objectives of this study include: 1) investigating online sex-seeking use among heterosexual men; 2) describing characteristics of specific sexual behavior among online sex-seeking users; and 3) identifying factors associated with online sex-seeking, condomless sex, and quick sex.

Concerning China has the largest number of Internet users (approximately 0.83 billion users) among the world population in 2018, the site selection in this study is critical. Guangdong ranked 1st in the Internet development index among 31 Chinese cities. Meanwhile, Guangdong has the greatest amount of new infections in syphilis and NG in China in 2018, with 56180 and 31262 new reported cases. A large number of Internet users and STIs cases in Guangdong can provides a unique opportunity to clarify the profiles of online- sex seeking use and its threat to the STIs epidemic.

**Methods**

**Study design and setting**

We conducted this cross-sectional survey in Guangdong, China from March to August in 2018, which was a sub-study of the Guangdong governmental sentinel surveillance programmes on STIs. The Guangdong governmental sentinel surveillance network was established in 2015 and comprised 10 cities (Zhuhai, Dongguan, Foshan, Jiangmen, Qingyuan, Shaoguan, Jieyang, Shantou, Maoming, Zhanjiang) with a high burden of STIs (see supplementary table S1). The 10 cities were located in the Pearl River Delta, East, West, and North of Guangdong, which can reflect economic and geographic diversity in Guangdong. Their locations are shown in supplementary figure S1. In the surveillance programme, 1-3 clinics at the prefecture-level city were selected according to the number of their outpatients. A minimum sample size of 200 to 250 was required for each site.

**Participants Eligibility**

According to the sentinel surveillance protocol, participants were sampled by the sequential sampling method. In detail, all male visitors in clinics were recruited into surveillance excluding men who visited a clinic for reproductive health, dermatology disease, and other research programmes (e.g. voluntary counseling and testing). The eligible subjects need to be men at least 18 years old who had sex lives and were willing to test for HIV, syphilis, CT, and NG. In our study, we further excluded men who had sex with men in previous years, and subjects without STIs test results, using a smartphone, and using online sex-seeking. The flowchart of the study population was shown in supplementary files (Figure S2).
Survey

The sentinel surveillance programme annually observes the prevalence of STIs including HIV, syphilis, CT, and NG among STIs clinic visitors. Information from surveillance includessocial-demographic, sexual behaviors, previous STIs diagnosis, and the questions about HIV-related knowledge (see supplementary Table S3). Urine was self-collected by each eligible participant for CT and NG testing, and blood was collected by professional physiciansat the clinics to test HIV and syphilis. More information on testing kits and lab testing methods can be found in Supplementary methods (Table S4).

Local STIs clinic staff who assisted the survey were given intensive training. Interview settings had at least 1 private interview/counseling room and a waiting room. After providing verbal informed consent, those who met the eligibility criteria and agreed to participate in the study were referred to a separate, quiet room to complete a questionnaire.

The questions that referred to online sex-seeking use and its related sex activities were as follows: duration of using online sex-seeking venues, the number of partners, condom use, and the period from initial online connection to an in-person meeting. They were also asked whether they inquired about condom use and HIV status with their sex partner before meeting, via the internet.

Data analysis

Outcomes

Participants were specifically asked whether they ever found sexual partners online. If participants reported any use of online venues to find sexual partners, they were classified as online sex-seeking users, while others were categorized as non-users. The online venues contained Weibo, Website, Blog, and Apps. Online partners only referred to female partners that our participants met online.

Statistical analysis

Data analyses were conducted in RX64 3.4.2 (R Foundation for Statistical Computing, Vienna, Austria). We used the chi-square test to compare the difference between categorical factors. Fisher's exact test was used as an alternative to the Chi-square test when one or more of the cell counts in a cross-table is less than 5.

Univariate and multivariable logistic regression models were used to explore the factors associated with online sex-seeking use adjusting for age, residence, marital status, visiting clinic type, and the number of children. The potential factors associated with online sex-seeking and risky sex were included models as categorical variables. For the score of HIV-related knowledge (8 was the total score), we classified it into two categories (< 6, 6-8) and then included them in models. We also separately observed the effect of questions on right condom use and the number of sexual partners (see supplementary files Table S3).
Subsequently, we performed a sub-analysis to identify the characteristic of users with condomless sex and quick sex. Condomless sex was defined as the sexual behavior that online sex-seekers did not use a condom during the last sexual intercourse with their online partners. Quick sex meant that users met their online partners in person and engaged in sex within 1 week from the first online meeting.

## Results

### Social demographic, Behavior, and STIs

We recruited a total of 2154 heterosexual men in this study, including 48.0% of which aged over 40 years. Approximately 36.6% and 22.1% of participants self-reported commercial sex and casual sex in the last 3 months, respectively. More than 74% of heterosexual men agreed that condom use can reduce the risk of HIV infection in sex. Additionally, nearly 9.2% of participants self-reported that they ever suffered STIs. Our lab test showed that the prevalence of HIV, syphilis, CT, and NG were 0.8%, 4.2%, 5.6%, and 4.4%, respectively.

### Use of online sex-seeking

The prevalence of online sex-seeking was 8.8% (191/2154) self-reported by participants (Table 1). Compared with non-online sex-seeking users, the users were generally 1) younger, 2) with a higher prevalence of casual sex, and 3) with a larger proportion of self-reported medical history related to STIs and HIV infection. Besides, our lab test showed that users had a higher prevalence of HIV, syphilis, and CT (1.1%, 6.8%, and 7.3%, respectively).

### Sexual activities related to online sex-seeking

Among the men who ever sought sex partners online, 63.0% of them had more than one-year’ experience in online sex-seeking (Table 2). During the study, 5.5% of users found partners online in the last 4 weeks and more than 66% of them had one more sexual partners in the last 4 weeks. Moreover, 40.7% of users met their last sexual partner in person within one week, and 31.4% had condomless sex. Besides, before the in-person meeting, 19.9% of them negotiated about condom use, while 89.5% did not inquire about their partner’s HIV status.

### Factors associated with online sex-seeking use

Our multivariable regression results (Table 3) showed that online sex-seeking use was positively associated with a) previous STIs diagnosis (adjusted Odds Ratio (aOR) =3.0, 95%CI:2.0-4.6), and b) having casual partners in the last three months (aOR=3.3, 95%CI 2.4-4.6).

### Factors associated with the condomless and quick sex with online partners

As presented in Table 4, having condomless sex with the most recent online partner in the last sex was negatively associated with the correct answers on the HIV-related knowledge: having only one partner can
reduce the risk of getting HIV infection” (a OR=0.3, 95%CI: 0.1-0.8). The relationships between condomless sex and characteristics of online sex-seeking users were not significant, such as negotiating condom use with the last online partner before meeting in person (a OR=1.14, 95% CI: 0.50-2.59).

In addition, Table 5 showed that quick sex was more likely occurred among users who a) had more than 6 months’ experience in using online sex-seeking tools, b) had no online partners in the last 4 weeks, c) used condoms during the last sex, and d) negotiated condom use and inquired HIV status of the last online partner before meeting in person. Compared with users who had sex after a one-week online connection with their partners, the quick sex subgroup has a larger proportion of new online sex-seekers (P-value <0.001).

**Discussion**

Seeking sex through the internet platform has remarkably increased among men who have sex with men (MSMs) in China in recent years, while researches on the use of online sex-seeking venues among heterosexual men remain few. Our study provided compelling evidence that the internet platform has become an important tool to seek sex among heterosexual men, especially for those high-risk populations (e.g. men who had a previous STIs diagnosis and engaged in casual sex in the last three months). The use of online sex-seeking maybe facilitates STIs transmission due to the higher rate of having condomless sex (33.8%) and quick sex (39.6%) with online sex partners.

To our knowledge, this survey is the first study focusing on online sex-seeking behaviors among heterosexual men in China. Compared with 45% of MSMs seeking sex-partners online and the 59% of them using gay-apps in previous national-wide surveys in China\textsuperscript{1,10}, our data shows a lower prevalence (10%) of online sex-seeking among heterosexual men. This rate was also lower than the 14% of patients attending genitourinary medicine clinic in 2002 in United Kingdom\textsuperscript{17}. Although online sex-seeking was not so popular in heterosexual men as in MSM, our findings suggested that the risk of spreading STIs in Chinese heterosexual men should be highlighted due to the higher rates (33.8%) of condomless sex (Chinese MSM: 25.4%) and the far lower rate of inquiring condom use (Chinese MSM: 32.3%) and HIV status (Chinese MSM: 33.3\%)\textsuperscript{1}. Our lab results also showed a higher positivity rate of STIs among users, which highlighted the necessity of paying attention to heterosexual men in future interventions on seeking sex online.

Additionally, our findings on the difference in characteristics between online sex-seeking users and non-users implied that this sex-seeking tool was maybe more attractive for those risky populations. Compared to non-users of the online sex-seeking tool, the users were more likely to be young, never get married, and ever have STIs diagnosis. These features were consistent with findings among MSMs\textsuperscript{1} and patients attending genitourinary medicine clinic\textsuperscript{17}. The larger proportion of the high-risk population seeking sex online might be explained that young men generally learn how to use new social tools faster and this online sex-seeking tool provides these men an easier way to hide their STIs positive status. We also found that our surveyed users had used online sex-seeking tools for more than 1 year (63.5%) and still had
contacted their online partners in the last 4 weeks, which suggested that these users persistently used this sex-seeking tool.

The emerging evidence from behavioral health and chronic disease management show that the Internet is an effective platform to deliver health promotion activities\textsuperscript{18}. In this survey, our results found men with a higher score of HIV-related knowledge were more likely to seek sex online (a \textit{OR}=2.2, 95\% \textit{CI}:1.2-4.4), but men knowing the risk of getting STIs through multiple partnerships would avoid having condomless sex (a \textit{OR}=0.3, 95\% \textit{CI}:0.1-0.6). It suggests that knowledge is a key driver for having protected sex among online sex-seeking users, therefore, strengthening health education should be addressed in the intervention strategies. On the other hand, we did not observe an association between condomless sex and participants knowing the benefit of using condoms to prevent STIs infection. It implies that the awareness of risks may play a more important role in avoiding risky sex behaviors and this awareness should be enhanced in designing future health education materials for online sex-seeking users.

\textbf{Strengths and Limitations}

To our knowledge, our study is one of the very few researches focused on online sex-seeking and its threat to STIs transmission among heterosexual men in China. However, there were several limitations as follows. First, the data was obtained from an organization whose primary mission is to monitor sexually transmitted infections, and there may be a substantial selection bias towards heterosexual men with risky sexual experiences. Because those experiences may have prompted the need and action for STIs’ screening services. Second, the use of online sex-seeking was self-reported, which could be influenced by recall bias, and underreport due to stigma, this might have led to an underestimation of the number of online sex-seeking users. Third, despite we observed a higher positivity rate of STIs among the online sex-seeking users, we still can’t identify the impact of online sex-seeking on the spread of STIs through this cross-sectional survey. A follow up of online sex-seeking users and case management are needed to clarify the threat of online sex-seeking for STIs transmitted in future surveillance.

\textbf{Implications for policy and Practice}

Despite the limitations and the low prevalence of online sex-seeking among heterosexual men, we found risky patterns for STIs spread among online sex-seeking users and the relation between users’ HIV-related knowledge and their motivation to avoid risky sexual. With the popularity of smart phones and online sex-seeking, its sequential high-risk sexual behaviors in men’s heterosexual sex present interesting challenges and opportunities for developing STIs prevention. We suggest that governmental programmes on STIs and HIV prevention should bring online sex-seeking use among heterosexual men and their related sexual behaviors into surveillance. In addition, prevention strategies should utilize these online platforms to effectively disseminate information on how to best prevent the contraction and spread of HIV and other STIs.

\textbf{Conclusion}
In China, online sex-seeking and its related risky sexual activities are not rare among heterosexual men. The high proportion of risky sexual behaviors among heterosexual men may facilitate STIs transmission among them. Future prevention strategies to reduce STI incidence should especially target heterosexual men engaging in online sex-seeking.

**Abbreviations**

STIs, sexually transmitted infections  
CT, Chlamydia trachomatis  
NG, Neisseria gonorrhea  
aOR, adjusted Odds Ratio  
MSMs, men who have sex with men

**Declarations**

**Ethics approval and consent to participate**

This study received ethical approval from the Dermatology hospital of Southern Medical University (GDDHLS-20181207).

**Consent for publication**

Not applicable.

**Availability of data and material**

The datasets generated during the current study are not publicly available due to the clinical and confidential nature of the material but are available from the corresponding author on request.

**Competing interest**

The authors have declared that no competing interests exist.

**Funding**

Not applicable.

**Authors’ Contribution**

We gratefully acknowledged the contribution of all authors. C.L. and C.W conceived of the study and supervised all aspects of its implementation. W.T. and D.H contributed to conceptualizing ideas and
designing the study, P.Z provided input regarding the analysis of the data, Y.W, M.X, B.Y, and H.Z interpreted findings and reviewed drafts of the manuscript. All authors read and approved the final manuscript.

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### Tables

**Table 1** Demographics, behaviors, and physical condition of participants from STIs surveillance sites in Guangzhou, China, 2018 (N=2154)"
| Characteristics                  | Total  | Online sex-seeking users | Non-users |
|---------------------------------|--------|--------------------------|-----------|
|                                 | (N=2154) | (N=191)                  | (N=1963)  |
|                                 | n      | %                        | n         | %          |
|                                 | n      | %                        | n         | %          |
| Demographic characteristics     |        |                          |           |            |
| Age                             |        |                          |           |            |
| <20                             | 56     | 2.6                      | 6         | 3.14       | 50       | 2.55     |
| 20-29                           | 569    | 26.42                    | 69        | 36.13      | 500      | 25.47    |
| 30-39                           | 496    | 23.03                    | 75        | 39.27      | 421      | 21.45    |
| 40 and above                    | 1033   | 47.96                    | 41        | 21.47      | 992      | 50.53    |
| Residence                       |        |                          |           |            |
| Guangdong                       | 1892   | 87.84                    | 173       | 90.58      | 1719     | 87.57    |
| Other provinces                 | 262    | 12.16                    | 18        | 9.42       | 244      | 12.43    |
| Marital Status                  |        |                          |           |            |
| Never married                   | 501    | 23.26                    | 63        | 32.98      | 438      | 22.31    |
| Married or Cohabitation         | 1600   | 74.28                    | 124       | 64.92      | 1476     | 75.19    |
| Divorced or Widowed             | 53     | 2.46                     | 4         | 2.09       | 49       | 2.5      |
| Ethnicity                       |        |                          |           |            |
| Han                             | 2134   | 99.07                    | 189       | 98.95      | 1945     | 99.08    |
| Minority                        | 16     | 0.74                     | 1         | 0.52       | 15       | 0.76     |
| High-risk behaviors             |        |                          |           |            |
| Engaged in commercial sex in the last 3 months |        |                          |           |            |
| Yes                             | 789    | 36.63                    | 69        | 36.13      | 720      | 36.68    |
| No                              | 1365   | 63.37                    | 122       | 63.87      | 1243     | 63.32    |
| The number of commercial partners in the last 3 months |        |                          |           |            |
| 1                               | 442    | 56.02                    | 29        | 42.03      | 406      | 56.39    |
| >1                              | 285    | 36.12                    | 33        | 47.83      | 248      | 34.44    |
| Missing data                    | 73     | 9.25                     | 7         | 10.14      | 66       | 9.17     |
| Engaged in casual sex in the last 3 months |        |                          |           |            |
| Yes                             | 478    | 22.19                    | 89        | 46.6       | 389      | 19.82    |
| No                              | 1676   | 77.81                    | 102       | 53.4       | 1574     | 80.18    |
### Score of HIV-related Knowledge

| Score (Mean ± SD) | 6.24 ±2.30 | 7.35 ±1.50 | 6.13 ±2.33 |
|-------------------|-------------|-------------|-------------|
| <6                | 660 30.64   | 19 9.95     | 641 32.65   |
| 6-8               | 1494 69.36  | 172 90.05   | 1322 67.35  |

### Using condoms correctly can reduce the risk of HIV infection

|                | Yes         | No          | Unknown    |
|----------------|-------------|-------------|------------|
| No             | 1709 79.34  | 183 95.81   | 1526 77.74 |
| No             | 81 3.76     | 2 1.05      | 79 4.02    |
| Unknown        | 364 16.9    | 6 3.14      | 358 18.24  |

### Have sex with one partner can reduce the risk of HIV infection

|                | Yes         | No          | Unknown    |
|----------------|-------------|-------------|------------|
| Yes            | 1595 74.05  | 168 87.96   | 1427 72.69 |
| No             | 121 5.62    | 3 1.57      | 118 6.01   |
| Unknown        | 438 20.33   | 20 10.47    | 418 21.29  |

### Physical condition

#### Self-reported history of STIs

|                | Yes         | No          | Unknown    |
|----------------|-------------|-------------|------------|
| Yes            | 199 9.24    | 39 20.42    | 160 8.15   |
| No             | 1955 90.76  | 152 79.58   | 1803 91.85 |

#### Testing result in this survey

|                | HIV         | Syphilis    | CT          |
|----------------|-------------|-------------|-------------|
| Yes            | 11 0.51     | 2 1.05      | 9 0.46      |
| No             | 2137 99.21  | 189 98.95   | 1948 99.24  |
| Missing data   | 6 0.28      | 0 0         | 6 0.31      |

### CT

|                | Yes         | No          |
|----------------|-------------|-------------|
| Yes            | 119 5.52    | 14 7.33     |
| No             | 2008 93.22  | 175 91.62   |
| Missing data | NG | Yes | 90 | 4.18 | 6 | 3.14 | 84 | 4.28 |
|--------------|----|-----|----|------|---|------|----|------|
| No           | 2037 | 94.57 | 183 | 95.81 | 1854 | 94.45 |
| Missing data | 27 | 1.25 | 2 | 1.05 | 25 | 1.27 |

^aSTIs, sexually transmitted infections. HIV, human immunodeficiency virus. OR, odds ratios. CI, confidence interval. CT, Chlamydia trachomatis, NG, Neisseria gonorrhoea

Table 2. Information and behaviors of online sex-seeking heterosexual men in Guangdong, China (N=191)
| Variables                                                                 | n  | %       |
|--------------------------------------------------------------------------|----|---------|
| **Time since started to seek sex online**                                 |    |         |
| < 6 months                                                               | 21 | 10.99   |
| 6 months-1 year                                                          | 41 | 21.47   |
| 1-3 years                                                                | 70 | 36.65   |
| > 3 years                                                                | 49 | 25.65   |
| Missing data                                                             | 10 | 5.24    |
| **Engaged in finding sexual partners online in the last 4 weeks**         |    |         |
| Yes                                                                      | 106| 55.5    |
| No                                                                       | 81 | 42.41   |
| Missing data                                                             | 4  | 2.09    |
| **The number of sexual partners found online in the last 4 weeks**        |    |         |
| 1                                                                        | 35 | 33.02   |
| 2 to 3                                                                   | 68 | 64.15   |
| Above 4                                                                  | 3  | 2.83    |
| **Timing of finding the last partner online**                            |    |         |
| ≤1 week                                                                  | 84 | 43.98   |
| 2-4 weeks                                                                | 51 | 26.7    |
| > 4 weeks                                                                | 52 | 27.23   |
| Missing data                                                             | 4  | 2.09    |
| **Time gap between meeting the most recent sex partner in person and**   |    |         |
| meeting her online                                                       |    |         |
| ≤1 day                                                                   | 32 | 16.75   |
| 2-7 days                                                                 | 46 | 24.08   |
| 1-2 weeks                                                                | 58 | 30.37   |
| > 2 weeks                                                                | 52 | 27.23   |
| Missing data                                                             | 3  | 1.57    |
| **Used condoms during last sex with the last online partner**            |    |         |
| Yes                                                                      | 128| 67.02   |
| No                                                                       | 60 | 31.41   |
| Missing data                                                             | 3  | 1.57    |
| **Negotiated about condom use in-person with the last online partner**   |    |         |
| Yes                                                                      | 38 | 19.9    |
| No                                                                       | 150| 71.49   |
| Asked the last online partner’s HIV status before meeting in person? | Yes | 17 | 8.9 |
|-------------------------------------------------------------------|-----|----|-----|
| Missing data                                                      |     |    |     |
| No                                                                | 171 |    | 89.53 |
| Missing data                                                      | 3   |    | 1.57 |

a HIV, human immunodeficiency virus.

Table 3. Factors correlated with online sex-seeking use for partner-seeking among heterosexual men in Guangdong, China, 2018 (N=191) a
### Variables

| Variables                                                                 | Univariate analysis | Multiple analysisb |
|--------------------------------------------------------------------------|---------------------|---------------------|
|                                                                          | Crude OR           | 95%CI               | Adjusted OR  | 95%CI               |
| Engaged in commercial sex in the last 3 months                           | No                  | Ref.                | Ref.         |                    |
|                                                                          | Yes                 | 0.98 (0.72, 1.33)   | 1.02         | (0.74, 1.41)       |
| Engaged in casual sex in the last 3 months                               | No                  | Ref.                | Ref.         |                    |
|                                                                          | Yes                 | 3.53*** (2.60, 4.79)| 3.32***      | (2.40, 4.60)       |
| Previous STIs diagnosis                                                  | No                  | Ref.                | Ref.         |                    |
|                                                                          | Yes                 | 2.89*** (1.96, 4.25)| 3.00***      | (1.97, 4.56)       |
| Score of HIV-related knowledge                                           | 6-8                 | Ref.                | Ref.         |                    |
|                                                                          | <6                  | 1.40 (0.49,378)     | 1.57         | (0.52,4.56)        |
| Right condom use can reduce the risk to infect HIV                       | No or Unknown       | Ref.                | Ref.         |                    |
|                                                                          | Yes                 | 6.55*** (3.21, 13.41)| 5.21***      | (2.52,10.75)       |
| Having sex with one partner can reduce the risk to infect HIV            | No or Unknown       | Ref.                | Ref.         |                    |
|                                                                          | Yes                 | 2.74*** (1.75, 4.23) | 2.28*        | (1.43,3.65)        |

*STIs, sexually transmitted infections. HIV, human immunodeficiency virus. OR, odds ratios. CI, confidence interval.

**Adjusted age, clinic type, marital status, having children.

*P value < 0.05, **P value < 0.01, ***P value < 0.001

Table 4. Factors correlated with condomless sex with the last partner among online sex-seeking users in Guangdong, China, 2018 (N=77) a
| Variable                                                                 | Univariate analysis | Multiple analysis |
|------------------------------------------------------------------------|----------------------|-------------------|
|                                                                        | Crude OR | 95%CI     | Adjust OR | 95%CI     |
| **Characteristics of online sex-seeking users**                        |          |           |           |           |
| Time since the start of seeking sex online                             |          |           |           |           |
| < 6 months                                                             | Ref.     |           | Ref.      |           |
| 6 months-1 year                                                        | 2.61     | (0.92, 7.38) | 2.39     | (0.81, 7.01) |
| 1-3 years                                                              | 0.70     | (0.26, 1.91) | 0.61     | (0.22, 1.73) |
| > 3 years                                                              | 1.05     | (0.38, 2.90) | 1.04     | (0.35, 3.05) |
| Time-gap of finding the last partners online                           |          |           |           |           |
| ≤ 1 week                                                               | Ref.     |           | Ref.      |           |
| 2-4 weeks                                                              | 1.40     | (0.68, 2.87) | 1.33     | (0.63, 2.81) |
| > 4 weeks                                                              | 0.54     | (0.24, 1.20) | 0.51     | (0.22, 1.18) |
| Duration between meeting the last sexual partner online and meeting in person |          |           |           |           |
| ≤ 1 day                                                                | Ref.     |           | Ref.      |           |
| 2-7 days                                                               | 1.02     | (0.39, 2.67) | 1.05     | (0.39, 2.86) |
| 1-2 weeks                                                              | 1.86     | (0.76, 4.57) | 1.72     | (0.68, 4.31) |
| > 2 weeks                                                              | 1.25     | (0.49, 3.19) | 1.28     | (0.47, 3.49) |
| Negotiated about condom use with the last online partner before meeting in person |          |           |           |           |
| No                                                                     | Ref.     |           | Ref.      |           |
| Yes                                                                    | 1.14     | (0.54, 2.42) | 1.14     | (0.50, 2.59) |
| Asked the last online partner’s HIV status before meeting in person    |          |           |           |           |
| Yes                                                                    | Ref.     |           | Ref.      |           |
| No                                                                     | 1.12     | (0.48, 2.59) | 1.04     | (0.42, 2.56) |
| **HIV related knowledge**                                              |          |           |           |           |
| Score of HIV related knowledge                                         |          |           |           |           |
| 6-8                                                                    | Ref.     |           | Ref.      |           |
| <6                                                                     | 1.41     | (0.49, 3.77) | 1.58     | (0.53, 4.53) |
| Using condoms correctly can reduce the risk                            | No or    | Ref.      | Ref.      |           |
| Having sex with one partner can reduce the risk of HIV infection | Unknown |
|---------------------------------------------------------------|---------|
| Yes                                                          | 0.57    | (0.13, 2.83) |
| No or Unknown                                                 | Ref.    | Ref. |
| Yes                                                          | 0.34*   | (0.14, 0.84) |
|                                                            | 0.30*   | (0.11, 0.81) |

a STIs, sexually transmitted infections. HIV, human immunodeficiency virus. OR, odds ratios. CI, confidence interval.

b Adjusted age, clinic type, marital status, have babies

*P value <0.05, **P value <0.01, ***P value <0.001

Table 5. Sex patterns with the last online partners among heterosexual men who met last online partner within and over one week after meeting through the internet, 2018
| Duration between first meeting online and in-person | One week or less (N=78) | More than one week (N=110) | P value |
|--------------------------------------------------|------------------------|-----------------------------|---------|
|                                                   | n   | %     | n   | %     |         |
| Time since to the start of seeking sex online     |     |       |     |       |         |
| < 6 months                                       | 18  | 23.08 | 9   | 8.18  | <0.001  |
| 6 months-1 year                                  | 23  | 29.49 | 17  | 15.45 |         |
| 1-3 years                                        | 26  | 33.33 | 44  | 40.00 |         |
| > 3 years                                        | 11  | 14.10 | 38  | 34.55 |         |
| Number of sex partners found online in the last 4 weeks | 18  | 23.08 | 17  | 15.45 | 0.99    |
| 2 to 3                                           | 36  | 46.15 | 32  | 29.09 |         |
| Above 4                                          | 2   | 2.56  | 2   | 1.82  |         |
| Used condom with the last partner met online in the last sex | 57  | 73.08 | 71  | 64.55 | 0.28    |
| Yes                                              | 21  | 26.92 | 39  | 35.45 |         |
| No                                               | 15  | 19.23 | 23  | 20.91 | 0.92    |
| 80.77                                            | 63  |       | 87  | 79.09 |         |
| Negotiated about condom use with the last online partner before meeting in person | 7   | 8.97  | 10  | 9.09  | 0.98    |
| Yes                                              | 71  | 91.03 | 100 | 90.91 |         |
| No                                               | 15  | 19.23 | 23  | 20.91 | 0.92    |
| 80.77                                            | 63  |       | 87  | 79.09 |         |
| Asked the last online partner’s HIV status before meeting in person? | 7   | 8.97  | 10  | 9.09  | 0.98    |
| Yes                                              | 71  | 91.03 | 100 | 90.91 |         |
| No                                               | 15  | 19.23 | 23  | 20.91 | 0.92    |
| 80.77                                            | 63  |       | 87  | 79.09 |         |

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