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ORIGINAL ARTICLE

# Factors Associated with Sexually Transmitted Infection Testing Among Men who Utilize an Internet-Based Men Who Have Sex with Men Community

Nathan W. Stupiansky, Ph.D.,[1] Joshua G. Rosenberger, Ph.D(c)., M.P.H.,[1,2] Vanessa Schick, Ph.D.,[2] Debby Herbenick, Ph.D., M.P.H.,[2] David S. Novak, M.S.W.,[3] and Michael Reece, Ph.D., M.P.H.[2]

## Abstract

Public health messaging encourages men who have sex with men (MSM) to be tested for sexually transmitted infections (STI) and HIV at least yearly, and more frequently depending on sexual behaviors. However, despite engaging in a range of sexual behaviors, many MSM do not participate in regular STI testing. The objective of this study was to understand factors associated with STI testing among a nonclinic-based population of men accessing an Internet-based social and sexual networking site. We asked 25,736 men to complete a comprehensive behavioral and health assessment after being recruited from an Internet site popular among men seeking social or sexual interactions with other men. Analyses were performed using multivariate logistic regression with effects significant at $p < 0.05$. Two separate predictive models were assessed: STI diagnosis within the past 2 years and STI testing within the past year. Regarding previous STI diagnosis, men who used a condom some of the time or never during both insertive (odds ratio [OR] = 1.72) and receptive (OR = 1.41) anal sex were significantly more likely to have had an STI in the past 2 years. For STI testing, men who never used condoms during receptive anal sex were more likely to have had an STI test within the past year (OR = 1.31), but men who had a STI history were less likely to have been tested (OR = 0.24). Public health efforts directed toward MSM should continue to emphasize screening for STI other than HIV, particularly among those men prioritized during condom promotion campaigns. In addition to the benefits of learning one's STI status, the STI screening and treatment environment itself may provide an important venue for encouraging a range of sexual health promoting behaviors.

## Introduction

Clinicians and public health professionals have recommended that men who have sex with men (MSM) be tested for sexually transmitted infections (STIs) and HIV frequently and regularly. Centers for Disease Control and Prevention (CDC) guidelines for STI testing among MSM mandate screening for all STIs and HIV at least annually, and more frequent screening for men who have multiple or anonymous partners.[1,2] Despite the recommendations of the CDC, it has been well documented that many MSM do not receive STI screening this frequently.[3,4] Outreach efforts and HIV rapid testing initiatives have led to an increasing number of HIV tests, but these programs often only provide HIV testing and do not screen for other STIs.

Despite efforts to reduce HIV-risk behaviors among MSM, rates of other STIs continue to rise among this population.[5,6] There is sizable evidence that STIs facilitate HIV transmission when they co-occur in HIV infected men by increasing viral load in semen.[7,8] Given the increased potential of HIV transmission, as well as the public and sexual health implications resulting from STIs, early detection is critical.

The CDC also recommends clinicians to routinely inquire about their patients' HIV/STI risk behaviors, which may range from drug use to specific sexual behaviors, such as having multiple partners or sex without a condom.[1] Research focusing on the relationship between specific risk behaviors and STI risk has been well documented, and has demonstrated an association between these sexual behaviors and STI infection among MSM.[2,9–11] In order to augment clinicians' responsibilities to assess their patient's STI risk, many public health messages are designed to increase personal awareness of potential vulnerability based on behaviors such as condom use and STI testing. However, little is known about how men

[1]Section of Adolescent Medicine, Indiana University, Indianapolis, Indiana.
[2]Center for Sexual Health Promotion, Indiana University, Bloomington, Indiana.
[3]Online Buddies, Inc., Cambridge, Massachusetts.

interpret these messages, or if they are incorporated into routine sexual health behaviors such as STI testing.

There were two aims of the current study: (1) to examine the relationship between specific MSM sexual behaviors (i.e., insertive and/or receptive anal sex), condom use frequency, and sexual relationship status (i.e., sexual relationship with a single partner or multiple partners) with a previous STI diagnosis and (2) to examine the association of these factors to STI testing history among a nonclinical sample of MSM.

## Methods

### *Participant recruitment and data collection*

This study was conducted via a participatory effort with one of the United States largest internet-based networking sites for men who are seeking social or sexual interactions with other men. Use of the site requires individuals to become a member by creating an online profile, however, payment is not required to join. An electronic recruitment message was sent to the e-mail address of all individuals who had an account on the site at the time of the study (July 2009) and who indicated that their residence was within the 50 United States. The electronic message provided a brief description of the study and its incentives, and included a link to the study website. Interested individuals, upon visiting the study website, were able to read a more detailed description of the study and, if interested, proceed to the study consent form and, after reviewing this, decide whether they wanted to participate. Those who decided to participate were able to move forward in the site directly to the study questionnaire. Completion of the questionnaire took approximately 20 minutes. Participants were offered the opportunity to receive an electronic coupon valued at $10 US that could be redeemed for merchandise from an affiliate of the sexual networking site from which men were recruited.

The recruitment message remained in each individual's electronic mailbox for a period of 7 days, after which time any unopened e-mails were automatically removed. A total of 127,489 individuals opened the recruitment e-mail and 43,477 (34.1%) of these men clicked on the link to the study website. Of those viewing the study information and consent form, 26,257 (60.4%) consented to and subsequently participated in the study. All study protocols were reviewed and approved by Institutional Review Board at the academic institution of the authors.

### *Measures*

Participants completed items related to sociodemographics, STI testing, and sexual behaviors.

Sociodemographics. Measures included those related to a participant's age, gender (male, female, transgender male to female, transgender female to male), sexual orientation, race/ethnicity, level of education completed, employment status and housing situation. Participants also responded to items related to their relationship status (married, partnered, divorced, widower, single, and other); whether they were currently dating someone or in a relationship (in a relationship with the same person longer than 6 months, 3–6 months, less than 6 months, dating more than one person, or not dating anyone).

Sexual relationship. Men were asked to disclose whether they were currently in a sexual relationship (with one person; more than one person; sexually active, but do not consider myself in a sexual relationship; or currently not sexually active). Men who were currently sexually active were asked to select which sexual relationship status most accurately described their current partnership(s).

STI diagnoses and testing. Measures included history of HIV (lifetime) and other STI diagnoses (including chlamydia, gonorrhea, syphilis, human papillomavirus or herpes within the past 2 years). Men were also asked if they had received an HIV test in their lifetime and in the past year, and if they had had a test for STIs other than HIV within the past year. Non-HIV STI diagnoses prior to the previous 2 years was not assessed during this study.

Sexual behaviors. Participants were asked to indicate whether or not they had engaged in specific sexual behaviors with men within the past month, past 3 months, past year, more than a year ago, or never. Behaviors included masturbation, receptive anal intercourse, insertive anal intercourse, performing oral sex, and receiving oral sex. For behaviors that were reported within the past year, participants were asked to indicate how frequently they had engaged in each. Response options included "a few times per year," "about once per month," "a few times per month," "about once per week," "2–3 times per week," "almost every day," and "more than once per day."

Condom use. To assess unprotected behaviors, participants were asked to indicate the number of times they used a condom during the past 10 times they engaged in receptive and insertive anal intercourse. Condom use categories based on these responses included "always" for men who indicated that all ten previous events were condom-protected, "sometimes" for men who reported between one and nine out-of-ten condom-protected events, and "never" for men who reported that none of the previous ten events were condom-protected. These categories were chosen to represent varying levels of potential exposure (low, medium, high) to STIs based on self-reported condom use.

### *Data analyses*

Analyses conducted included two multivariate logistic regression models with binary outcomes: STI diagnosis within the past 2 years, and STI testing within the past year. The first model was a confirmatory model assembled to test the association of specific MSM sexual behaviors to STI history. Model 2 was created using the sexual behaviors as well as STI history to predict STI testing. Behavioral predictors entered into both models were based on factors which have been previously associated with STI risk in MSM samples. All analyses were conducted using SPSS version 17.0 (SPSS Inc., Chicago, IL).

## Results

### *Participant characteristics*

Participants in this study were 25,736 males aged 18–86 years, with a mean age of 37.4 (standard deviation [SD] = 11.9). Of the men in this sample, 81% ($n = 21{,}250$) identified as

homosexual, with an additional 16% ($n = 4152$) identifying as bisexual. Eighty-two percent of the sample identified as white ($n = 21$, 412), 8% as Hispanic ($n = 1965$), 4% as black ($n = 1063$), and the remainder as other ethnicities (6%, $n = 1583$). The majority of men were not currently dating anyone (56%, $n = 14{,}705$), 37% were in a relationship with one person ($n = 9781$), and 6% were currently dating more than one person ($n = 1502$). In terms of education, 87% had attended college ($n = 22{,}869$), of whom 53% earned a bachelor's degree ($n = 14{,}013$), and 22% reported having gone on to receive a postgraduate degree ($n = 5333$).

Of the men in this sample, 42 % ($n = 10{,}844$) had received an STI test within the past year. A total of 14% ($n = 3684$) reported having been diagnosed with at least one STI in the previous 2 years. STI diagnoses previous to the 2 years prior to this study was not assessed, so it is possible that a small number of men in the study who have noncurable STIs (such as herpes or HPV) were classified as not having an STI diagnosis in the previous 2 years.

### *STI diagnosis within the past two years*

Sexual relationship status, recent condom use during insertive anal sex, and recent condom use during receptive anal sex were all associated with an STI diagnosis within the past 2 years. Compared to men who were in a sexual relationship with only one partner, men who were sexually active but did not have a primary partner (odds ratio [OR] = 1.87; 95% confidence interval [CI] = 1.6, 2.2) and men who were maintaining sexual relationships with more than one partner (OR = 1.84; 95% CI = 1.6, 2.1) were more likely to have been recently diagnosed with an STI. Men who only had used condoms some of the time (OR = 1.72; 95% CI = 1.5, 2.0) or never (OR = 1.65; 95% CI = 1.4, 2.0) during insertive anal sex were also more likely to have had an STI diagnosis than men who always used condoms during insertive anal sex. Similarly, men who only used condoms some of the time (OR = 1.41; 95% CI = 1.2, 1.6) or never (OR = 1.41; 95% CI = 1.2, 1.7) during receptive anal sex were more likely to have been diagnosed with an STI than men who always used condoms. Table 1 shows the logistic regression results for previous STI diagnosis.

### *STI testing within the past year*

Regarding STI testing, men who were in a sexual relationship with more than one partner were less likely (OR = 0.81; 95% CI = 0.72, 0.90) to have been recently tested than those who had only one partner. Men who were sexually active but were not in a sexual relationship were no more likely to have been tested than those with one partner. Condom use during recent insertive anal sex was not significantly associated with being screened for STI among those men who reported using condoms some of the time or never, compared with men who always used condoms during insertive anal sex. Men who never used condoms during receptive anal sex were more likely (OR = 1.31; 95% CI = 1.1, 1.5) than those who always used condoms to have been tested within the last year, but men who sometimes used condoms were not significantly more likely to have been tested than men who used condoms every time. Men who had been diagnosed with one or more STIs in the previous two years were significantly less likely (OR = 0.24; 95% CI = 0.21, 0.27) to have been tested in the past year than those who had not been previously diagnosed. Table 2 shows the logistic regression results for STI testing.

Table 1. Association of Sexually Transmitted Infection Diagnosis within the Previous 2 Years with Sexual Relationship and Condom Use Variables

| | *Odds ratio (95% CI)* | *Sig.* |
|---|---|---|
| *Sexual relationship* | | |
| One sexual partner | Ref | |
| Sexually active but no steady partner | 1.87 (1.6, 2.2) | <0.0001 |
| More than one sexual partner | 1.84 (1.6, 2.1) | <0.0001 |
| *Condom use during receptive anal sex* | | |
| Always | Ref | |
| Sometimes | 1.72 (1.5, 2.0) | <0.0001 |
| never | 1.65 (1.4, 2.0) | <0.0001 |
| *Condom use during insertive anal sex* | | |
| Always | Ref | |
| Sometimes | 1.41 (1.2, 1.6) | <0.0001 |
| Never | 1.41 (1.2, 1.7) | <0.0001 |

CI, confidence interval.

## Discussion

This study contributes to our understanding of STI-risk behaviors among MSM, and also illustrates where efforts of clinicians and public health practitioners have fallen short regarding STI testing among men disproportionally affected by disease burden. The complex relationship of specific sexual behaviors, condom use, and sexual partnerships with STI risk

Table 2. Association of Sexually Transmitted Infection Testing within the Past Year with Sexual Relationship, Sexually Transmitted Infection, and Condom Use Variables

| | *Odds ratio (95% CI)* | *Sig.* |
|---|---|---|
| *Sexual relationship* | | |
| One sexual partner | Ref | |
| Sexually active but with no steady partner | 0.93 (0.84, 1.0) | 0.157 |
| More than one sexual partner | 0.81 (0.72, .90) | <0.0001 |
| *Condom use during receptive anal sex* | | |
| Always | Ref | |
| Sometimes | 1.04 (0.93, 1.2) | 0.531 |
| Never | 1.12 (0.96, 1.3) | 0.150 |
| *Condom use during insertive anal sex* | | |
| Always | Ref | |
| Sometimes | 1.09 (0.97, 1.2) | 0.138 |
| Never | 1.31 (1.1, 1.5) | <0.0001 |
| *STI diagnosis within previous 2 years (self-report)* | | |
| No | Ref | |
| Yes | 0.24 (0.21, 0.27) | <0.0001 |

CI, confidence interval; STI, sexually transmitted infection.

is better understood with model 1, which includes several factors with multiple levels of risk in order to better conceptualize how varying degrees of sexual behaviors, such as condom use during insertive and receptive anal sex, are differentially associated with STI risk. These findings are reflective of previous studies which show that decreased condom use and concurrent sexual partnerships are associated with a greater likelihood of STI diagnosis.[12–14]

The second aim of the current study was to investigate the association between specific sexual behaviors and recent STI testing, in order to gauge the effectiveness of public health efforts to increase screening among at-risk men. These data indicate that men who engage in certain types of behaviors (i.e., condomless receptive anal sex) are more vigilant about STI screening than those who always use condoms, and may reflect a greater awareness of STI risk associated with the lack of condoms during receptive anal sex. However, this finding is not duplicated among men who never used condoms during insertive anal sex, which may mark a shortcoming in efforts to educate men about STI-risk associated with specific sexual behaviors. Similarly, men who had been diagnosed with an STI in the previous 2 years were much less likely than men who had not been diagnosed during that timeframe to be tested recently, which is consistent with other research on MSM accessing STI testing services.[15] While temporal interpretations during a cross sectional study must be guarded, this finding may inform clinicians to emphasize frequent repeat screenings to their male MSM patients. The association between STI diagnosis and subsequent STI reinfection has been well documented, and the clinical environment represents an important educational opportunity for providers of sexual health care of MSM.[15–18]

There are several limitations that need to be addressed with research of this nature, and with this study in particular. The cross-sectional design of this study limits the temporal assumptions that one could make with longitudinal data. The relationships in these models, therefore, are based on correlation of predictors to a binary outcome, and must not be treated as causal. Additionally, there are several biases that must be considered with the variables in these models, including the reliability of self-report and retrospective recall; and the natural correlation between certain variables, like STI diagnosis and STI testing. Finally, this sample was not representative of all MSM who utilize online communities, and should be considered with the understanding that conducting research utilizing samples drawn from the Internet may carry additional biases. The men in this study were mostly white and fairly well educated, which may be attributed to the type of men who access and utilize these types of online communities, but not generalizable to MSM who do not interact online. However, this study may provide a valuable way to conceptualize the efficacy of STI testing and education interventions among MSM at the national and community levels.

These findings have particular importance for clinicians and public health practitioners who conduct behavioral risk assessments of MSM. The data clearly indicate different levels of STI risk based on specific sexual behaviors, and may help to inform clinicians about which behaviors to ask about in order to quickly and accurately evaluate a patients' potential STI risk. Additionally, clinicians may be able to provide reinforcement of protective behaviors, such as condom use, by emphasizing that any unprotected exposure makes the risk of an STI significantly more likely, during both insertive and receptive anal sex. For public health practitioners, the second model illustrates the need for education about STI testing among MSM who engage in certain STI-risk behaviors where there is disconcordance between likelihood of an STI and likelihood of an STI test. Future efforts to increase STI testing may focus on these men, and emphasize the importance for repeated and frequent testing.

## Author Disclosure Statement

No competing financial interests exist.

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Address correspondence to:
*Joshua G. Rosenberger, Ph.D(c)., M.P.H.*
*Center for Sexual Health Promotion*
*Indiana University*
*1025 East Seventh Street, HPER 116*
*Bloomington, IN 47405*

*E-mail:* jorosenb@iupui.edu