

RESEARCH ARTICLE**Enhancing HIV Prevention Services: Exploring Psychosocial Associations of HIV Antibody Testing Frequency among Sexually Active Men who have Sex with Men****Authors**

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Email: todd.sabato@und.edu**Abstract**

Despite recommendations of annual HIV testing for high-risk individuals, one-third of infected men who have sex with men (MSM) are unaware of their serostatus. In an effort to improve HIV prevention services and subsequently decrease prevalence, this study aimed to examine the HIV testing patterns and factors associated with testing frequency among MSM. Utilizing eight reliable and validated instruments and a sample of 374 sexually active MSM, this study examined a series of demographic, behavioral and psychosocial associations of antibody testing frequency, including substance use/abuse, depression levels, internalized homophobia, unprotected anal intercourse, sexual regulation and attribution, and HIV knowledge, . MSM who tested for HIV frequently were more likely to be older, have higher levels of educational attainment, and self-identify as gay. Respondents who reported never having been tested and irregularly tested had higher levels of internalized homophobia, depression, and alcohol use and abuse patterns. Respondents who had never been tested or infrequently tested engaged in lower levels of sexual risk, particularly unprotected receptive anal intercourse. Those with no or irregular histories of testing also exhibited greater external sexual loci of control, and were significantly more likely to attribute life events to external, unstable, and pessimistic causes.

Key Words: HIV, testing, prevention, men who have sex with men

Introduction

Undiagnosed HIV is a significant driver of the ongoing HIV epidemic in the United States, with up to 14% of infected individuals unaware of their status.^{1,2} Those with undiagnosed HIV have the highest transmission rates, and are estimated to contribute to nearly one-third of new cases, with men who have sex with men (MSM) as the primary source of transmission.³ Seventy percent of new HIV diagnoses occur among MSM.⁴

HIV infection is hyperendemic among MSM in many areas of the United States, particularly in the South. Of the 25 metropolitan statistical areas with the highest diagnosed prevalence rates among MSM, 21 are in the South.⁵ Georgia – whose statewide rate of infection among MSM is more than forty-four times higher than that of heterosexual men – is the only state that ranks in the top five for both percentage of MSM and absolute number of MSM living with a diagnosis of HIV.⁶ More than sixty percent of new diagnoses in Atlanta are among MSM.⁷ The disproportionate burden of HIV among MSM necessitates interventions to improve HIV screening, to increase diagnoses and access to preventative services including pre-exposure prophylaxis.

HIV testing plays a pivotal role in preventing viral transmission and identifying at-risk individuals.⁸ Increasing testing uptake and frequency among at-risk populations such as MSM is critical to reaching the first UNAIDS target of 90% of all persons living with HIV becoming aware of their status.^{9,10} Frequent HIV testing has been associated with a reduction in HIV risk and is an effective strategy for reducing infection rates among MSM. Current guidelines recommend annual HIV screenings for all MSM, with more frequent testing for those at greater risk of exposure.^{11,12} High prevalence of risk

behavior coupled with a low perception of risk of infection pose a significant risk of transmission. Behavioral data suggest that high levels of unprotected anal intercourse among MSM may persist after HIV voluntary testing, and many young MSM acquire HIV within one year of their most previous antibody test.⁹ These challenges suggest that regular testing to detect HIV positive status is needed to better control secondary transmission among MSM.

Defining human behavior as triadic, dynamic, and a reciprocal interaction of personal factors, behaviors, and the environment, the Social Cognitive Theory is one of the most commonly used models exploring HIV-related risk and protective behaviors.¹³⁻¹⁶ This theory suggests that individuals engage in cognitive processes which allow them to weigh both positive and negative elements of preventative behaviors, thus influencing self-efficacy and decision making.^{16,17} The application of Social Cognitive Theory has documented both individual- and structural-level barriers and facilitators of HIV-related risk behavior and testing services among MSM. Individual level factors include limited HIV knowledge, internalized homophobia, low perception of risk, binge alcohol consumption, and injection drug use. Structural elements include costs associated with testing, social norms, stigma, and discrimination.⁹ Anecdotal data indicate that MSM who are more likely to engage in repeated HIV testing are younger, have lower HIV risk perception, engage in sexual behavior with a greater number of partners, and inject drugs.¹⁸ These data have assisted policymakers and practitioners in developing strategies for increased testing.

Despite substantial evidence of the impact of frequent testing on HIV risk behavior, less is known about factors

associated with frequency of HIV testing among MSM. Though focused public health efforts have been made to slow the surge of the epidemic, nearly 30% of MSM have never received an antibody test. National HIV Behavior Surveillance data also suggest that the frequency of HIV may be inadequate, even among MSM who are tested.¹ Given the burden of HIV among MSM, particularly in the southern United States, interventions are needed to enhance HIV screening and diagnosis, and access to treatment as prevention (TasP) strategies including pre- and post-exposure prophylaxis. The purpose of this study, in an effort to improve HIV prevention services and subsequently decrease prevalence, was to examine the HIV testing patterns and factors associated with testing frequency among MSM. The results of this study may inform future interventions to expand antibody testing programs to include at-risk MSM who exhibit low testing frequency.

Methods

Sampling and Recruitment

Participants were recruited from self-identified MSM attending an annual fundraising event promoting unity and visibility across the LGBTQ community in Atlanta in 2017. Consistent with CDC surveillance and reporting methods, MSM were identified as having either a) had sex only with men, or b) having had sex with both men and women in their lifetimes, per their response to a demographic item addressing sexual behaviors.¹⁹

A trained researcher was responsible for face-to-face survey procedures. After briefly introducing the study for participants, those consenting to participate were subjected to eligibility screenings. Surveys were self-administered via electronic tablets,

and collected data pertaining to sociodemographic characteristics and psychosocial determinants. The questionnaire took approximately 30 minutes to complete.

Electronic consent was obtained from each participant via a prompt on the tablet, with the consent script appearing on the initial screen. Participants offering consent were then directed to the questionnaires. All study procedures were approved by the University of North Dakota Institutional Review Board.

Measures

Psychosocial and behavioral determinants measured in this study included sexual behavior with men and women, HIV-related knowledge, substance use and abuse, depression, attributional style, sexual regulation, and internalized homophobia. Sexual risk taking was assessed via the University of California San Francisco Center for AIDS Prevention Studies' Sexual Behavior Questionnaire.²⁰ This 20-item scale ($\alpha = .82$) asked respondents to report the number of individuals with whom they had engaged in sexual activity in the prior ninety days. Respondents were similarly asked to respond dichotomously (yes/no) to inquiries regarding condom use and insertive and receptive anal, oral, and vaginal intercourse. Summary scores could range from 0 to 22, with higher scores indicating greater HIV-related sexual risk taking.

Knowledge of HIV/AIDS was assessed via the Brief HIV Knowledge Questionnaire. The 18-item true/false questionnaire reliably ($\alpha = .82$) assesses HIV knowledge among high-risk populations, spanning common information deficits and misconceptions about sexual risk behavior, informed decisions, and behavior change, as

well as misconceptions about risk associated with close contact with individuals suspected or known to be living with HIV.²¹ In accordance with prior measures, summary scores, ranging from 0 to 18, were obtained by summing the number of items answered correctly.²²

Substance use and abuse was assessed via the Brief Michigan Alcoholism Screening Test (BMAST), as well as the Drug Abuse Screening Test (DAST-20).^{23,24} The 10-item BMAST ($\alpha=.84$) examined both behaviors and consequences associated with alcohol abuse and dependence. Aggregate scores, ranging from 0 to 29 are generated by summing weighted scores to each item, with higher scores suggesting greater behavioral risks for alcoholism. The 20-item DAST ($\alpha=.79$) examined the use and consequences of both illegal and prescription drugs. Aggregate scores range from 0 to 20, with higher scores reflecting increased drug use problems.²⁴

Research has reported associations between depression and riskier sexual behaviors, as depression may impact the ability to negotiate safer sex, initiate harm reduction strategies, or engage in risky sex as a form of self-harming behavior.²⁵ The Center for Epidemiological Studies Depression Scale was thus used in an effort to examine depressive symptomology among respondents.²⁶ The eight-item instrument asked respondents to indicate their frequency of experiencing significant characteristics of depression (e.g., depressed mood, feelings of hopelessness, etc.) within the prior seven days. Aggregate scores could range from 0 to 24, with higher scores reflecting greater depressive symptomatology.²⁶

Individuals are predisposed to explain the causes of events in a habitual manner, which has been shown to influence emotions,

cognition, motivation, and future behavior.^{27,28} These explanatory or attributional styles have been linked to health-related issues, including depression and illness.^{29,30} The Attributional Style Questionnaire ($\alpha=.83$) examined the degree to which respondents attributed life events to internal, stable, and global causes (i.e., optimistic), as opposed to external, unstable, and specific (i.e., pessimistic) causes.³¹ The instrument asked participants to generate causes for four hypothetical events, while rating themselves on a 7-point scale.³² Each of the three attributional elements (internality, stability and globality) were measured, producing a total of 12 items. Summary scores could range from 0 to 84, with higher scores indicating greater degrees of internal, stable, and global attribution.¹⁹

According to prior research, individuals with an internal locus of control report greater HIV-related preventative behaviors, including increased condom use.^{33,34} To address this possibility, the Dyadic Sexual Regulation Scale ($\alpha=.79$) was used to examine the degree to which respondents perceived their sexual activities as being regulated from internal or external loci of control.³⁵ The 11-item instrument asked subjects to respond on a 7-point scale to statements addressing personal control in dyadic sexual relations.³⁶ Summary scores could range from 11 to 77, with higher scores indicating greater external locus of control.

Internalized homophobia, which has been associated with high-risk sexual behavior, was examined via the 9-item Internalized Homophobia Questionnaire ($\alpha=.81$).^{37,38} Items with a 5-point response scale ranging from strong disagreement to strong agreement were derived from the ego-dystonic homosexuality diagnostic criteria, found in the 3rd edition of the Diagnostic and Statistical Manual of the American

Psychiatric Association, which has since been removed.^{39,40} Summary scores could range from 0 to 45.

Frequency of HIV Testing

Three items were used to measure HIV testing frequency. Participants were first asked if they had ever been tested for HIV. Those who indicated a history of testing were then asked how many antibody tests they had received in the past four years. Participants receiving more than one test were further asked about their testing frequency within the past four years. Response options included every three months, every 6 months, annually, and irregularly. HIV testing frequency was then categorized into three groups based on participants' self-reported history and frequency: never tested, irregularly tested, and frequently tested. Individuals reporting no history of antibody testing were categorized as never tested MSM. Irregularly tested MSM included those who had a history of antibody testing, yet whose tests were less frequent than twice annually or reported irregular testing in the past four years. Those MSM who engaged in antibody testing at least twice annually, or reporting receiving tests every three-to-six months, were classified as frequent testers.

Data Analyses

All data were entered into IBM SPSS v. 24, and then screened to identify missing information and/or outliers. Frequency counts were generated for each scale to examine missing data. A series of two-tailed t-tests revealed no significant univariate outliers. All missing data were excluded from analysis.

Means and standard deviations (for normal continuous data), and the frequencies and percentages were calculated for each of

the three groups of differential HIV testing frequency categories. Sociodemographic and psychosocial measurements were then compared among MSM who never tested, irregularly tested, and frequently tested. One-way ANOVA was used for continuous variables including scale scores assessing sexual risk, HIV-related knowledge, substance use and abuse, depression, attributional style, sexual regulation, and internalized homophobia.

Results

An a priori statistical power analysis was performed for sample size estimation, based on Mirandola et al.'s examination of sociodemographic predictors of HIV test seeking behavior among MSM.⁴¹ With an $\alpha = .05$ and power = 0.80, the projected sample size needed for a moderate effect was approximately 273. A total of 374 sexually active MSM participated in the study.

Table 1 presents a comparison of sociodemographic characteristics between the three HIV testing participant classes. Among the 374 participants, 139 (37.2%) were never tested, 100 (26.7%) were tested irregularly, and 135 (36.1%) were tested frequently in the past four years. Significant differences existed between the three groups of MSM in age, educational attainment, and self-reported sexual orientation. Participants who reported never having received an HIV antibody test were significantly younger than their peers (84.2% were between the ages of 18 and 29, compared to 71% and 75.6% of those who were irregularly and frequently tested, respectively, $\chi^2 = 21.24$, $p = 0.026$). Likewise, respondents who were never tested were significantly more likely to have lower levels of educational attainment (28.1% had a high school diploma or less, compared to 17% and 11.1% of irregular and frequent testers, $\chi^2 = 19.68$, $p = 0.014$). Between-group

differences were also found with regard to self-identified sexual orientation, with a greater proportion of those never tested identifying as bisexual (27.3%, compared to

21.0% and 16.3% of those irregularly and frequently tested, respectively, $\chi^2 = 3.97, p = 0.048$).

Table 1. Sociodemographic Characteristics of Sexually Active Men Who Have Sex with Men Reporting Never Testing for HIV, Irregularly Testing for HIV, and Frequently Testing for HIV (N = 374)

	Never Tested (N = 139) n (%)	Irregularly Tested (N = 100) n (%)	Frequently Tested (N = 135) n (%)	χ^2	p
Age ^a				21.24	0.026
18-29	117 (84.2)	71 (71.0)	102 (75.6)		
30-39	15 (10.8)	20 (20.0)	29 (21.5)		
40+	7 (5.0)	9 (9.0)	4 (2.9)		
Educational Attainment				19.68	0.014
High School or less	39 (28.1)	17 (17.0)	15 (11.1)		
College or more	100 (71.9)	83 (83.0)	120 (88.9)		
Self-Identified Sexual Orientation				3.97	0.048
Homosexual	101 (72.7)	79 (79.0)	113 (83.7)		
Bisexual	38 (27.3)	21 (21.0)	22 (16.3)		

^aFisher’s exact test

Table 2 presents comparisons of psychosocial and behavioral factors between MSM respondents who were never tested for HIV, tested irregularly, and those indicating frequent testing. Compared to those who were frequently tested for HIV, those reporting never having been tested and irregularly tested had higher levels of internalized homophobia (F = 7.81, p = 0.038), depression (F = 9.73, p = .048), and alcohol use and abuse patterns (F = 11.06, p = 0.000). Exhibiting lower levels of HIV transmission and prevention knowledge (F =

9.24, p = 0.041), respondents who had never been tested or infrequently tested engaged in lower levels of sexual risk (F = 5.66, p = 0.000), particularly unprotected receptive anal intercourse ($\chi^2 = 5.28, p = 0.003$). Those with no or irregular histories of testing also exhibited greater external sexual loci of control (F = 12.41, p = 0.022) and were significantly more likely to attribute life events to external, unstable, and specific (e.g., pessimistic) causes (F = 6.94, p = 0.000).

Table 2. *Psychosocial and Behavioral Factors Among Men Who Have Sex with Men Reporting Never Testing for HIV, Irregularly Testing for HIV, and Frequently Testing for HIV (N = 374)*

	Never Tested (N = 139) n (%) (M±SD)	Irregularly Tested (N = 100) n (%) (M±SD)	Frequently Tested (N = 135) n (%) (M±SD)	F/ χ^2	p
Internalized Homophobia	38.9±4.1	36.2±3.9	35.3±4.1	7.81	0.038
Dyadic Sexual Regulation	34.2±2.8	31.6±2.9	28.5±3.0	12.41	0.022
Depression	6.1±0.9	5.8±0.9	5.7±0.7	9.73	0.048
Attributional Style	49.3±3.8	53.4±3.5	56.8±4.4	6.94	0.000
Drug Abuse	1.8±0.4	1.7±0.6	1.6±0.5	8.48	0.061
Alcohol Use / Abuse	4.1±1.1	2.3±0.9	2.3±0.6	11.06	0.000
HIV Knowledge	12.4±2.6	12.9±3.3	13.1±3.2	9.24	0.041
Sexual Risk	1.1±0.4	1.4±0.6	2.3±0.3	5.66	0.000
Engaged in unprotected receptive anal intercourse in prior three months				5.28	0.003
No	101 (72.7)	68 (68.0)	80 (59.3)		
Yes	38 (27.3)	32 (32.0)	55 (40.7)		

Discussion

The present study examined the impact of sexual regulation, depression, internalized homophobia, attributional style, drug and alcohol use, knowledge of HIV transmission and prevention, and sexual risk on self-identified MSM's choices to seek voluntary HIV testing. With the exception of drug abuse, results of the study support the existence of independent associations between each of these factors and the frequency of HIV testing. Significant differences in testing frequency were further found by age, educational attainment, and self-reported sexual orientation.

The finding that MSM reporting more frequent antibody testing exhibited lower internalized homophobia is supported by research, which found an inverse correlation between internalized homophobia and HIV and other STI testing rates among MSM in Europe and Asia.⁴² In their research among Chinese MSM, Wei et al. similarly found an indirect relationship between experienced homophobia and recent testing.⁴³ Greater levels of self-acceptance have also been associated with the likelihood and frequency of testing, suggesting that stigma and subjective norms associated with sexual orientation may serve as a barrier to participation in HIV testing and other health-promoting behaviors.^{42,44}

Findings suggest that an internal locus of control, related to sexual behaviors, enhanced the likelihood and frequency of testing among MSM. Research supports the beneficial impact of an internal locus of control on self-rated health, as well as healthy behaviors.^{45,46} An internal health locus of control has further been found to facilitate a reduction in HIV and other STI risk behaviors.⁴⁷⁻⁴⁹ A pessimistic attributional style, as found among non-testers in the current study, may likewise serve as an impediment to prevention efforts, as it may interfere with logical reasoning and information-seeking behaviors. Those with pessimistic attributes may have low self-confidence, or may not effectively use existing skills to address immediate health concerns.⁵⁰

Self-reported levels of depressive symptomatology and alcohol use further impacted antibody testing status and frequency. Not only do mental health impairments such as depression and alcohol or other substance abuse or dependence play a critical role in HIV transmission – increasing the risk of transmission by four- to ten-fold – but they may also interfere with prevention efforts.⁵¹ Mangurian et al. found disparate rates of regular antibody testing among adults with severe mental illness, echoing findings of the current research.⁵² Research exploring the implementation and efficacy of PrEP to prevent HIV transmission among MSM similarly has found that individuals exhibiting higher depression scores had lower levels of emtricitabine and tenofovir, as well as higher levels of condomless receptive anal intercourse.⁵³

The finding that greater amounts of alcohol use impact antibody testing is not groundless. Inquiries about substance use during routine testing procedures may dissuade those with abuse patterns from

participating. Prior research has demonstrated that alcohol use is a mediator of HIV risk taking behaviors such as unprotected sexual activities.⁵⁴⁻⁵⁶ Often used to temporarily relieve symptoms of depression, alcohol use among MSM may similarly mediate viral transmission by providing greater opportunities for cognitive escape.⁵⁷ Despite enhancing the risk of transmission by greater than 200%, research has consistently found a negative relationship between levels of drinking and the likelihood of ever testing for HIV.⁵⁸⁻⁶¹

For people who may have been exposed to HIV, knowledge is critical to making informed decisions. An antibody test is a serious event with potentially serious outcomes. The current findings suggest that greater HIV knowledge is associated with greater likelihood and frequency of antibody testing. Research in both developing and developed countries has illuminated the value of HIV-related awareness and knowledge as consistent contributors to voluntary counseling and testing.⁶²⁻⁶⁴ Despite a link between perceived knowledge and testing status, much of the literature suggests that knowledge of one's HIV-negative status does not impact HIV risk-related sexual behaviors.⁶⁵

The CDC has aggressively invested in both proven technologies and approaches to ensure that HIV-infected MSM are aware of their status, and that all MSM have both knowledge and tools to protect themselves from infection.⁶⁶ Thus, the present study's finding that MSM engaging in greater risk-taking behaviors are more frequently tested is not unfounded, and may be mediated by enhanced knowledge levels. Research has demonstrated that men with prior testing experience are significantly more knowledgeable about HIV transmission, prevention, and treatment.²²

Despite such knowledge, research has similarly found a positive correlation between knowledge and HIV risk among MSM – suggesting that, while MSM have enhanced knowledge on the topic, their risk behaviors may not change.⁶³ Since awareness is associated with decreased concern about HIV, and subsequently less concern about consistent condom use, it has been hypothesized that a greater depth of knowledge about HIV may in fact heighten the risk of transmission, and consequently increase the likelihood of antibody testing.⁶⁷

Study Limitations

While the present study incorporated findings from a sample of sexually active MSM, several limitations exist. A convenience sample of self-identified MSM attending an LGBTQ unity event leaves the study open to a number of sampling biases, and limits the ability to generalize results to the larger population of sexual minority males. Similarly, the homogenous nature of the sample, with regard to ethnicity and sexual orientation, limits applicability.

The self-reporting nature of the instruments may similarly limit the accuracy of responses. Owing to sexual bragging, social norms, memory recall, and a refusal to respond to sexuality-based questions, self-reported sexual behaviors may be also be biased.⁶⁸ Items were presented in a manner that limited the directionality of responses, compromising the ability to assess whether risk behaviors occurred before or after testing among those who were tested. Despite such limitations, including the impact of sample size on statistical power and effect, this study appropriately highlights the associations between psychosocial attributes, behavior, and the likelihood of HIV antibody testing

among MSM, and can significantly inform prevention-based interventions.

Conclusion

Mounting evidence suggests that MSM in the United States continue to be disproportionately affected by HIV and AIDS due to their involvement in higher risk behaviors.⁶⁹ The present study highlights the need to increase HIV testing and frequency among subpopulations of MSM. Traditional prevention efforts, which target specific risk groups, may not be effective at reaching populations susceptible to infrequent or no testing histories.^{70,71} It is imperative that, in addition to concerted efforts focusing on knowledge as a prevention tool, a combination of feasible and effective strategies, such as condom use, medical male circumcision, antiretroviral therapy (ART) for treatment as prevention, pre- and post-exposure prophylaxis, and continued antibody testing, be implemented.⁷² Medical professionals, when engaging patients, should address not only behavioral predictors of HIV risk, but similarly the impact of mental health (e.g., depression, attribution, and locus of control) on both risk and protective behaviors. Outreach efforts should consider alternative methods of reaching those MSM who experience internalized homophobia and/or engage in substance use or abuse patterns, which may limit regular access to medical care and testing services. Future research and prevention efforts should explore developing, implementing and evaluating HIV testing initiatives and campaigns that will be acceptable to those to those with little or no testing history. Such MSM may be less aware of the need for frequent HIV testing or may fear stigmatization associated with mental health or prior risk behaviors.

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