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Sociodemographic and behavioural factors associated with testing for HIV and STIs in a US nationwide sample of transgender men who have sex with men

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Abstract

Objectives—Transgender men who have sex with men (TMSM) represent an understudied population in relation to screening for HIV and sexually transmitted infections (STIs). We examined HIV and STI testing prevalence among TMSM along with the factors associated with testing in a diverse US nationwide sample of TMSM.

Methods—Data from a cross-sectional online convenience sample of 192 TMSM were analysed using multivariable binary logistic regression models to examine the association between sociodemographic and behavioural factors and lifetime testing for HIV, bacterial STIs and viral STIs, as well as past year testing for HIV.

Results—More than two-thirds of TMSM reported lifetime testing for HIV (71.4%), bacterial STIs (66.7%), and viral STIs (70.8%), and 60.9% had received HIV testing in the past year. Engaging in condomless anal sex with a casual partner whose HIV status is different or unknown and having fewer than two casual partners in the past 6 months were related to lower odds of

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lifetime HIV, bacterial STI, viral STI and past year HIV testing. Being younger in age was related to lower probability of testing for HIV, bacterial STIs and viral STIs. Furthermore, TMSM residing in the South were less likely to be tested for HIV and viral STIs in their lifetime, and for HIV in the past year. Finally, lower odds of lifetime testing for viral STIs was found among TMSM who reported no drug use in the past 6 months.

Conclusions—These findings indicate that a notable percentage of TMSM had never tested for HIV and bacterial and viral STIs, though at rates only somewhat lower than among cisgender MSM despite similar patterns of risk behaviour. Efforts to increase HIV/STI testing among TMSM, especially among those who engage in condomless anal sex, are needed.

INTRODUCTION

Screening for HIV and sexually transmitted infections (STIs) is critical for HIV and STI prevention and care. The US Centers for Disease Control and Prevention recommends that men who have sex with men (MSM) receive annual HIV testing.¹ Transgender men—individuals not assigned male sex at birth who identify or express their gender as men, male, trans men, or another identity on the trans masculine continuum—report relatively low HIV and STI testing prevalence compared with cisgender men.² Despite lower rates of HIV and STI testing among transgender men than cisgender men, a systematic review found that between 0.4% and 10.1% of transgender men were living with HIV in laboratory-confirmed studies, and up to 7.1% in studies that used self-report measures for HIV status.³ Additional research suggests that up to 57% of transgender men did not know their HIV status.⁴ Another review reported that as many as 25% of transgender men had not tested for HIV in the past 2 years.⁵ These findings point to opportunities to enhance HIV and STI testing uptake in transgender men.

Among the transgender male population broadly, transgender men who have sex with men (TMSM) are placed at increased risk of being affected by HIV and bacterial and viral STIs given the high prevalence of these infections within the sexual networks of MSM.^{6–8} Research shows that navigating sexuality with cisgender men can present challenges for TMSM.^{9–11} As with many stigmatized subgroups of MSM more broadly, the fear of partner rejection and the importance of feeling desired can lead to prioritizing interpersonal safety over other forms of safety, such as HIV and STI prevention.^{10,12,13} With respect to HIV and STI testing, studies have found that a sizeable proportion of TMSM have never been tested for HIV with approximately 20%–30% not having been tested for HIV in their lifetime^{14,15} and only one in five tested in the past year.¹⁶

Despite the growing evidence for HIV and STI risk among TMSM, research about the prevalence of HIV and STI testing and factors related to suboptimal HIV and STI testing in this subpopulation of MSM is limited.⁴ Furthermore, existing research on HIV and STI testing among TMSM has tended to focus on specific US cities (eg, New York City).^{8,17} To address this gap, this study examined the associations of sociodemographic and behavioural indicators with HIV and STI testing among a sample of TMSM across the US. Such an investigation would also allow to examine whether HIV and STI testing rates in TMSM differ across the four US geographical regions, as it has been documented that HIV and STI

incidence among MSM is higher in southern USA compared with its North-east, Midwest and West regions.²⁶

METHODS

Participants and procedures

Cross-sectional data were collected in 2017 from a larger sample of 12 832 MSM. For the present study, we begin by characterising the analytic sample of TMSM in comparison to the full sample of MSM (both cisgender and transgender MSM), after which analyses focus exclusively on the TMSM subsample. The TMSM subsample included a total of 192 TMSM who completed all relevant measures. Participants were recruited using targeted advertisements on two venues—one of the most used sexual networking smartphone applications ('apps') among MSM, and one of the most popular social networking websites for the general population (ie, Facebook). On the apps, advertisements were sent to all users' inboxes within USA and remained for a period of 7 days, unless deleted sooner. On Facebook, targeted banner advertisements were employed for approximately 4 weeks. Ads were targeted to people who were men, residing in the USA, ages 18 or older, and likely to be MSM based on a range of interests predetermined by the site's algorithm to be relevant to the broader lesbian, gay, bisexual, transgender and queer community, including explicit interest in the same sex.¹⁸ Participants were first presented with an online consent form, and on survey completion, were offered entry into a \$50 [Amazon.com](https://www.amazon.com) gift card drawing. Eligibility criteria for the broader sample included: (1) Ages 18 years or older. (2) US residence. (3) Sexual activity with a man within the past year. (4) Cisgender or transgender male self-identification. More details about the study design can be found at Rendina and Mustanski.¹⁹

Measures

Sociodemographics.—Participants reported their age in years, racial/ethnic identity, income level, education attainment level, gender identity, sexual orientation, current relationship status, HIV status and zip code of their current residence. The zip code was used to denote participants' geographical region (North-east, Midwest, South, West) according to the US Census. Gender identity categories included: male, female, transgender male, transgender female and other. Participants indicating a transgender male gender identity label were included in the current study.

Number of sexual partners.—Participants reported the number of casual cisgender or transgender male sexual partners during the past 6 months. Number of casual partners were analysed as a dichotomised variable with 0–1 (coded as 0) and two or more casual partners (coded as 1).

HIV and STI sexual transmission risk behaviour (TRB).—Participants reported whether they had engaged in condomless anal sex in the past 6 months with a casual male partner whose HIV status was known serodifferent or unknown (0=no, 1=yes).

Alcohol use.—Participants stated whether or not they had used alcohol in the past 6 months (0=no, 1=yes).

Drug use.—Participants reported on the use of any of the following substances in the past 6 months: cocaine, crack, crystal meth, ecstasy, gamma-hydroxybutyrate/gamma-butyrolactone (GHB/GBL), ketamine, heroin/opiates, marijuana/hash, poppers, and prescription stimulants, sedatives, or pain killers. Participants reporting use of one or more of these were coded as having engaged in drug use (0=no, 1=yes).

Lifetime HIV and STI testing.—Participants were asked whether they were ever tested for HIV (0=no, 1=yes). Past year HIV testing was also assessed (0=no, 1=yes). Further, participants separately noted whether they were ever tested for any of the listed bacterial STIs (chlamydia, gonorrhoea, syphilis) and viral STIs (herpes, genital/anal warts, human papillomavirus, hepatitis B and hepatitis C). Participants reporting ever getting tested for any of the bacterial STIs were coded as having received bacterial STI testing (0=no, 1=yes), and participants reporting ever getting tested for any of the viral STIs were coded as having received viral STI testing (0=no, 1=yes).

Data analysis

Crude ORs of lifetime and past year HIV testing, and lifetime bacterial and viral STI testing were estimated for each of the sociodemographic and behavioural variables. We then fit four separate multivariable logistic regression models to estimate adjusted ORs (aOR) and 95% CIs with all variables for four outcomes: (1) Lifetime HIV testing. (2) Past year HIV testing. (3) Lifetime bacterial STI testing. 4) Lifetime viral STI testing. All models included recruitment source (geosocial sexual-networking apps vs general social-networking websites) as a fixed-effect study design covariate.

RESULTS

Table 1 displays the demographic characteristics, behavioural factors, and HIV/STI testing prevalence in both the full and analytical samples. Compared with the full MSM sample, the subsample of TMSM reported higher rates of not knowing their HIV status and engaging in drug use in the past 6 months. In contrast, TMSM reported fewer casual partners and lower rates of sexual risk behaviour, and lifetime and past year HIV/STI testing prevalence than the broader MSM sample (in which they were included).

Focusing hereafter only on TMSM, the majority of the sample was young (ages 18–24 years), white non-Hispanic, had at least some college experience and of lowest income bracket. at least two-thirds of TMSM reported lifetime testing for STIs (71.4%), bacterial STIs (66.7%) and viral STIs (70.81%), and 60.9% reported past year STIs testing. Table 2 shows the results of the bivariate analyses as represented by crude ORs. at the bivariate level, lower STIs and STI testing prevalence was found among TMSM ages 18–24 years, recruited from a social networking website, and having had 0–1 casual partners in the past 6 months. Table 3 presents the results of the multivariable regression analyses. Engaging in STIs risk behaviour and having fewer than two casual partners were associated with lower prevalence of lifetime STIs, bacterial STIs, viral STIs and past year STIs testing. Being younger in age

was related to lower probability of testing for STIs, bacterial STIs and viral STIs. single TMSM were less likely to ever get tested for bacterial STIs compared with partnered TMSM. Furthermore, TMSM residing in the South were less likely to be tested for STIs and viral STIs in their lifetime, and for STIs in the past year. Finally, lower prevalence of lifetime testing for viral STIs was found among TMSM who reported no drug use in the past 6 months.

DISCUSSION

This study found that HIV and STI testing prevalence among TMSM, though considerable, remained suboptimal according to CDC recommended guidelines for HIV and STI testing.¹ Comparing the TMSM subsample to the broader MSM sample in this study, more TMSM reported not knowing their HIV status, which is related to the lower lifetime HIV testing prevalence found in this subsample. Similarly, lower testing prevalence for HIV in the past year and lifetime bacterial and viral STIs were found in the TMSM subsample. These findings highlight the need for greater HIV/STI testing uptake efforts among TMSM. Furthermore, since STI incidence may indicate higher risk for future HIV acquisition among MSM,²⁰²¹ efforts to increase the comparatively lower STI testing rates among TMSM are also warranted. It should also be noted that more than a third of the TMSM in this study self-identified as bisexual and fewer TMSM reported having two or more casual male partners than cisgender MSM. This may provide some insight into the lower rates of HIV and STI testing, given the possibly lower risk.

Although slightly lower than the broader MSM population, the testing prevalence estimates among TMSM were somewhat similar to lifetime and past year HIV and STI testing prevalence among cisgender MSM,²²²³ and higher than the prevalence of testing in general samples of transgender men (regardless of sexual partner genders).²¹⁷ Therefore, in the context of HIV and STI testing, TMSM in this sample appear more similar to cisgender MSM than to general samples of transgender men, supporting other TMSM research.¹⁵ Indeed, TMSM are gradually being integrated into broader MSM communities, where they socialise and form meaningful relationships.⁸⁹²⁴²⁵ As such, TMSM represent a subpopulation within the broader MSM population that warrants intervention efforts to further promote HIV/STI testing, similar to efforts promoting such uptake among cisgender MSM communities.

The most noteworthy finding is the lower prevalence of past year and lifetime HIV testing, as well as lifetime STI testing, found among those TMSM who engage in HIV risk behaviour. This finding is particularly striking since this group is behaviourally at increased risk of acquiring HIV and STIs. Moreover, TMSM who had fewer than two casual partners in the past 6 months were less likely to be tested for HIV and STIs in their lifetime and in the past year, a result that is worth noting as having one sexual partner can affect HIV STI risk. It should be noted that having no causal male partners (as reported by 28.1% of TMSM in this study) does correspond with lower risk for HIV and STI acquisition. Additional research is needed to understand the sexual partnerships of TMSM in order to further elucidate these data and guide future HIV and STI testing efforts.

These findings highlight the need for HIV and STI testing campaigns and interventions to reach TMSM residing in southern USA, which may address the lower prevalence of lifetime and past year HIV and lifetime viral STI testing found in this population. Additionally, since younger TMSM were found to be less likely to be ever tested for HIV and STIs, testing programmes may benefit from outreach to this subpopulation of TMSM. Testing programmes would similarly profit from reaching TMSM through social networking websites given their relatively low lifetime HIV testing. Generally, comprehensive, transgender-specific preventive sexual health services (eg, contraception prescription, cervical cancer screening including testing for HPV) may represent a useful strategy for implementing HIV and STI testing among TMSM.⁸¹³¹⁷ At home HIV and STI testing may also be suitable to increase testing in this hard-to-reach population.

Limitations

Several limitations should be highlighted. First, due to the cross-sectional nature of this study, causation cannot be inferred. Second, the sampling method employed in this study (social and sexual networking apps and websites) may limit the generalisability of findings to the broader TMSM population.²⁶ It is possible to argue, for example, that TMSM who completed this survey are also more likely to engage in sexual health activities and HIV/STI testing. Furthermore, our question about gender identity might not have captured all TMSM in this study's sample as some TMSM do not necessarily identify as transgender men, but rather as men or another identity on the transmasculine spectrum (eg, genderfluid, boi). In addition, HIV/STI TRB was assessed in this study in a way that possibly did not capture TMSM whose HIV status is negative but are indeed living with HIV or even in a state of acute infection. Similarly, TRB was defined as condomless anal sex with a casual partner whose HIV status is serodifferent or unknown, and thus, condomless vaginal and front-hole sex was not captured in this study. Another potential concern relates to the drug use question in this study, which included a diverse array of substances. Further, substance use was measured as any in the last 6 months, which does not quantify risk (eg, frequency of use). Future studies examining the association of specific drugs to HIV and STI testing in this population are warranted. Additionally, although pre-exposure prophylaxis (PrEP) use is associated with greater HIV and STI testing in TMSM,¹⁴ this study did not assess for PrEP use, and hence, possibly overlooked an important behavioural factor. Moreover, viral STIs are a heterogenous group of STIs with different algorithms for testing. Future research that disaggregates these and evaluates specific barriers and facilitators to each would be valuable. Another noteworthy limitation is the fact that this survey was brief, which prevented examination of other factors found to be related to lower HIV and STI testing prevalence among TMSM, such as healthcare discrimination and mistrust and gender affirmation dimensions (medical, social or legal).^{82527–30} Finally, although this study included a community advisory board of sexual minority men, we did not ask them to disclose their gender identities, and thus, it remains unknown whether any TMSM were included in the formulation of this study as these data come from a larger study that focused on MSM more broadly. We encourage future TMSM research to intentionally include TMSM and to be guided by community-defined priorities. Overall, future studies would benefit from addressing these noteworthy limitations and include larger samples of TMSM in an effort to improve HIV/STI prevention efforts in this underexamined population. Despite these

limitations, this is one of the first studies to examine both HIV and STI testing, and their sociodemographic and behavioural correlates, in a nationwide sample of TMSM recruited from apps and social networking websites in USA.

Conclusions

These findings highlight the importance of reaching TMSM and improving routine HIV and STI testing in this population placed at increased risk for HIV and STIs. Efforts to increase HIV and STI testing among TMSM who engage in condomless anal sex are especially warranted. Such prevention efforts may be implemented in existing HIV and STI testing programmes focused on reaching cisgender MSM or as part of targeted efforts using existing preventive sexual health services or via online networking sites.

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Key messages

- HIV and STI testing prevalence among transgender men who have sex with men (TMSM) is suboptimal according to CDC recommended guidelines for HIV and STI testing.
- Similar to MSM populations broadly, there is a need for greater HIV/STI testing uptake efforts among transgender MSM.
- Efforts to increase HIV and STI testing among transgender MSM who engage in condomless anal sex are especially warranted.
- Comprehensive, transgender-specific preventive sexual health services may represent a useful strategy for implementing HIV and STI testing among transgender MSM.

Table 1

Characteristics of the full sample (cisgender and transgender MSM) and of the analytic sample (TMSM only) in a nationwide sample in USA, May–June 2017

	Full sample (all MSM) (n=12 832)		Analytical sample (TMSM only) (n=192)	
	n	%	n	%
Race and ethnicity				
Black/African American	1326	10.3	6	3.1
Latinx	2873	22.4	20	10.4
White	6822	53.2	136	70.8
Multiracial/other	1811	14.1	30	15.6
Sexual orientation				
Gay/queer/homosexual	10 468	81.6	101	52.6
Bisexual	2143	16.7	73	38.0
Something else	221	1.7	18	9.4
Income				
Below \$10 000	2944	22.9	89	46.4
\$10 000 – \$19 999	2179	17.0	36	18.8
\$20 000 – \$29 999	2134	16.6	33	17.2
\$30 000 or more	5575	43.4	34	17.6
Education				
High school or less	2969	23.1	53	27.6
Some college	5714	44.6	107	55.7
Bachelor's degree	2735	21.3	28	14.6
Graduate degree	1414	11.0	4	2.1
Relationship status				
Single	8405	65.5	96	50.0
Partnered	4427	34.5	96	50.0
Geographical region [*]				
North-east	2453	19.1	36	18.8
Midwest	2392	18.6	46	24.1
South	4454	34.8	50	26.2
West	3533	27.5	59	30.9
HIV status [†]				
Negative	9662	75.3	165	85.9
Positive	2067	16.1	4	2.1
Unknown	1103	8.6	23	12.0
Recruitment source				
Sexual networking app	10 313	80.4	74	38.5
Social networking website	2519	19.6	118	61.5

	Full sample (all MSM) (n=12 832)		Analytical sample (TMSM only) (n=192)	
	n	%	n	%
Alcohol use				
Yes	10 965	85.5	164	85.4
No	1867	14.5	28	14.6
Drug use				
Yes	8291	64.6	138	71.9
No	4541	35.4	54	28.1
Number of casual male partners				
2 or more	9424	73.4	92	47.9
0–1	3408	26.6	100	52.1
Transmission risk behaviour				
Yes	4965	38.7	68	35.4
No	7867	61.3	124	64.6
HIV/STI testing				
Lifetime HIV [‡]	9568	88.9	137	71.4
Past year HIV	7956	62.0	117	60.9
Bacterial STI	9907	77.2	128	66.7
Viral STI	9761	76.1	136	70.8
	M	SD	M	SD
Age (range 18–56 years)	32.8	12.1	23.7	6.5

Transmission risk behaviour=condomless anal sex in the past 6 months with a casual male partner whose HIV status was known serodifferent or unknown.

* n = 1 missing among TMSM.

[‡] Self-reported HIV status.

[‡] n = 2064 missing for the full sample.

MSM, men who have sex with men; TMSM, transgender men who have sex with men.

Table 2

Condensed sample characteristics and crude ORs of lifetime and past year HIV testing, and lifetime STI testing in a sample of transgender men who have sex with men in USA, May–June 2017 (n=192)

Bivariate (unadjusted) models examining the following types of testing													
		HIV (lifetime)			HIV (past year)			Bacterial STI ^d (lifetime)			Viral STI ^b (lifetime)		
		n	%	OR (95% CI)	n	%	OR (95% CI)	n	%	OR (95% CI)	n	%	OR (95% CI)
Age in years													
18–24 (n=135)		84	62.2	0.12*** (0.04 to 0.36)	76	56.3	0.50* (0.26 to 0.98)	79	58.5	0.23*** (0.10 to 0.52)	86	63.7	0.25*** (0.10 to 0.58)
25 or older (n=57)		53	93.0		41	71.9		49	86.0		50	87.7	
Race/ethnicity													
Men of color (n=56)		40	71.4	1.01 (0.51 to 2.00)	35	62.5	1.10 (0.58 to 2.08)	38	67.9	1.08 (0.56 to 2.10)	42	75.0	1.34 (0.66 to 2.72)
White (n=136)		97	71.3		82	60.3		90	66.2		94	69.1	
Annual Income													
Below \$20 000 (n=125)		81	64.8	0.36** (0.17 to 0.76)	75	60.0	0.89 (0.49 to 1.65)	75	60.0	0.40** (0.20 to 0.79)	83	66.4	0.52 [†] (0.26 to 1.05)
\$20 000 or more (n=67)		56	83.6		42	62.7		53	79.1		53	79.1	
Education													
High school or less (n=53)		30	56.6	0.39** (0.20 to 0.76)	26	49.1	0.51* (0.27 to 0.97)	30	56.6	0.55* (0.28 to 1.05)	34	64.2	0.65 (0.33 to 1.28)
Some college or more (n=139)		107	77.0		91	65.5		98	70.5		102	73.4	
Sexual identity													
Gay/queer (n=101)		69	68.3	0.73 (0.39 to 1.37)	60	59.4	0.87 (0.49 to 1.56)	66	65.3	0.88 (0.48 to 1.61)	70	69.3	0.86 (0.46 to 1.60)
Something else (n=91)		68	74.7		57	62.6		62	68.1		66	72.5	

Bivariate (unadjusted) models examining the following types of testing												
	HIV (lifetime)			HIV (past year)			Bacterial STI ^d (lifetime)			Viral STI ^b (lifetime)		
	n	%	OR (95% CI)	n	%	OR (95% CI)	n	%	OR (95% CI)	n	%	OR (95% CI)
Relationship status												
Single (n=96)	71	74.0	1.29 (0.69 to 2.42)	60	62.5	1.14 (0.64 to 2.04)	62	64.6	0.83 (0.45 to 1.51)	69	71.9	1.11 (0.59 to 2.06)
Partnered (n=96)	66	68.8		57	59.4		66	68.8		67	69.8	
Geographical region												
South (n=52)	29	55.8	0.37** (0.19 to 0.73)	24	46.2	0.43* (0.23 to 0.83)	31	59.6	0.65 (0.34 to 1.27)	31	59.6	0.49* (0.25 to 0.97)
North-east/Midwest/West (n=140)	108	77.1		93	66.4		97	69.3		105	75.0	
Recruitment source												
Sexual networking app (n=74)	66	89.2	5.46*** (2.40 to 12.41)	56	75.7	2.91*** (1.53 to 5.53)	60	81.1	3.15*** (1.59 to 6.26)	63	85.1	3.53*** (1.68 to 7.40)
Social networking website (n=118)	71	60.2		61	51.7		68	57.6		73	61.9	
Alcohol use												
Yes (n=164)	123	75.0	3.00** (1.32 to 6.82)	105	64.0	2.37* (1.05 to 5.35)	114	69.5	2.28* (1.01 to 5.14)	117	71.3	1.18 (0.50 to 2.79)
No (n=28)	14	50.0		12	42.9		14	50.0		19	67.9	
Drug use												
Yes (n=138)	103	74.6	1.73 (0.88 to 3.39)	89	64.5	1.69 (0.89 to 3.19)	97	70.3	1.76 (0.92 to 3.37)	104	75.4	2.10* (1.08 to 4.10)
No (n=54)	34	63.0		28	51.9		31	57.4		32	59.3	
Number of casual male partners												
2 or more (n=92)	77	83.7	3.42** (1.73 to 6.77)	70	76.1	3.59*** (1.93 to 6.67)	73	79.3	3.14*** (1.66 to 5.96)	77	83.7	3.57*** (1.80 to 7.05)

Bivariate (unadjusted) models examining the following types of testing

	HIV (lifetime)			HIV (past year)			Bacterial STT ^d (lifetime)			Viral STT ^b (lifetime)		
	n	%	OR (95% CI)	n	%	OR (95% CI)	n	%	OR (95% CI)	n	%	OR (95% CI)
0-1 (n=100)	60	60.0		47	47.0		55	55.0		59	59.0	
Transmission risk behaviour												
Yes (n=68)	45	66.2	0.68 (0.36 to 1.30)	39	57.4	0.79 (0.43 to 1.45)	41	60.3	0.65 (0.35 to 1.20)	46	67.6	0.79 (0.42 to 1.50)
No (n=124)	92	74.2		78	62.9		87	70.2		90	72.6	

Note.

^aChlamydia, gonorrhoea, syphilis;

^bHerpes, genital/anal warts, human papillomavirus, hepatitis B, hepatitis C. OR=crude (unadjusted) OR; Transmission risk behaviour=condomless anal sex in the past 6 months with a casual male partner whose HIV status was known serodifferent or unknown.

* p<0.05;

** p<0.01;

*** p<0.001.

[†] p<0.07.

Adjusted ORs (aORs) of lifetime and past year HIV testing, and lifetime STI testing in a sample of transgender men who have sex with men in USA, May-June 2017 (n=192)

Table 3

Multivariable (adjusted) models examining the following types of testing								
	HIV (Lifetime)		HIV (Past year)		Bacterial STI ^d (Lifetime)		Viral STI ^b (Lifetime)	
	aOR	95% CI	aOR	95% CI	aOR	95% CI	aOR	95% CI
Age in years								
18–24	0.13 **	0.04 to 0.45	0.52	0.22 to 1.20	0.23 **	0.09 to 0.62	0.23 **	0.08 to 0.64
25 or older (ref)								
Race/ethnicity								
Non-white	0.64	0.26 to 1.55	0.85	0.40 to 1.78	0.78	0.36 to 1.73	1.13	0.50 to 2.58
White (ref)								
Annual income								
Below \$20 000	0.66	0.25 to 1.73	1.59	0.72 to 3.50	0.58	0.25 to 1.37	0.81	0.34 to 1.94
\$20 000 or more (ref)								
Education								
High school or less	1.06	0.43 to 2.58	0.87	0.39 to 1.95	1.18	0.51 to 2.73	1.16	0.49 to 2.75
Some college or more (ref)								
Sexual identity								
Gay/homosexual/queer	0.56	0.25 to 1.26	0.67	0.34 to 1.32	0.68	0.33 to 1.40	0.64	0.31 to 1.34
Something else (ref)								
Relationship status								
Single	0.61	0.26 to 1.42	0.62	0.30 to 1.28	0.39 *	0.18 to 0.86	0.62	0.29 to 1.34
Partnered (ref)								
Geographical region								
South	0.27 **	0.11 to 0.66	0.33 **	0.15 to 0.71	0.57	0.25 to 1.27	0.45 *	0.20 to 1.00
North-east/Midwest/West (ref)								
Recruitment source								
Sexual networking app	2.87 *	1.10 to 7.50	1.74	0.82 to 3.72	1.70	0.76 to 3.84	2.09	0.89 to 4.93

Multivariable (adjusted) models examining the following types of testing									
HIV (Lifetime)		HIV (Past year)		Bacterial STI ^d (Lifetime)		Viral STI ^b (Lifetime)			
aOR	95% CI	aOR	95% CI	aOR	95% CI	aOR	95% CI	aOR	95% CI
Social networking website (ref)									
Alcohol use									
Yes	3.06 [‡]	0.96 to 9.76	2.41	0.88 to 6.61	2.20	0.76 to 6.38	0.73	0.24 to 2.21	
No (ref)									
Drug use									
Yes	2.28	0.92 to 5.65	1.47	0.69 to 3.17	2.15 [‡]	0.95 to 4.85	2.84 [*]	1.23 to 6.53	
No (ref)									
Number of casual male sexual partners									
2 or more	7.12 ^{***}	2.39 to 21.19	6.35 ^{***}	2.69 to 15.02	6.22 ^{***}	2.44 to 15.85	5.43 ^{***}	2.13 to 13.88	
0–1 (ref)									
Transmission risk behaviour									
Yes	0.30 [*]	0.12 to 0.79	0.45 [*]	0.20 to 0.97	0.33 ^{**}	0.14 to 0.76	0.43 [*]	0.19 to 0.99	
No (ref)									
Model statistics									
% correctly classified	80.2		74.0		76.0		78.6		

^aChlamydia, gonorrhoea, syphilis;

^bHerpes, genital/anal warts, human papillomavirus, hepatitis B, hepatitis C. ref=referent group; aOR=adjusted OR; Transmission risk behaviour=condomless anal sex in the past 6 months with a casual male partner whose HIV status was known serodifferent or unknown.

* p<0.05;

** p<0.01;

*** p<0.001.

[‡] p<0.07