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Exploration of 5-year trends in HIV/STI testing, including during COVID-19

By

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Master of Public Health

Epidemiology

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University of Washington Seattle
2021

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An abstract of
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Abstract

Exploration of 5-year trends in HIV/STI testing, including during COVID-19
By Vijay Arvind Srinivasan

Given the disproportionately high burden of HIV on men who have sex with men (MSM), it is imperative that the CDC testing recommendations for HIV and other STIs for high-risk subgroups are met. The American Men's Internet Survey (AMIS) is conducted annually with around 10,000 adult men who have sex with men (MSM). Modelling was used with 52,450 from 5 cycles between July 2017 to March 2022 to identify temporal trends in testing behaviors (within 12 months preceding survey and during lifetime) stratified by participants' self-reported HIV status. HIV-negative/unknown status MSM had decreasing and stabilizing rates from 2017 to 2020 for HIV testing ever and in the past 12 months, respectively, followed by a large drop in testing in 2020 and then a steep increase in 2021. Similar trends were observed among HIV-negative/unknown status MSM for testing for gonorrhea, chlamydia, or syphilis for both ever and in the past 12 months, although STI testing in the past 12 months was overall lower. Similar trends were observed for ever having received STI testing for those living with HIV, although overall baseline STI testing was significantly higher than HIV-negative/unknown counterparts. STI testing in the past 12 months among those living with HIV increased from 2017-2019. Although higher rates of HIV/STI testing in 2021 following low rates on all testing metrics in 2020 are promising, many indicators show testing rates were either declining or stabilizing, but not increasing, from 2017-2020. Mitigation measures aimed to increase testing access during 2020 in lieu of social distancing lockdowns may prove to be efficacious in increasing testing rates well into the future.

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Contents

Introduction

The burden of HIV persists, especially amongst high-risk subgroups such as men who have sex with men (MSM). MSM account for 59% of people living with HIV (PLHIV), 69% of the new diagnoses each year, and account for 27,000 new infections per year[1]. MSM are an important population to slow HIV incidence by reducing within-subgroup transmission as well as prevalence by linking MSM living with HIV to timely care to achieve viral suppression. MSM are also disproportionally affected by other sexually transmitted infections (STIs), including being more than 10 times as likely to be diagnosed with gonorrhea and more than 70 times more likely to be diagnosed with syphilis than women or heterosexual men[1].

The disproportionate burden of HIV and other STIs in MSM is persistent and even increasing. The proportion of HIV-negative or unknown serostatus MSM who had an STI diagnosis in the past 12 months increased between 2013-2016[1]. Over 322,000 cases of gonorrhea were reported among men in 2017, an increase of 86% since 2013[2]. Among MSM rates of reported chlamydia have increased since 2000, and rates of reported gonorrhea (GC) have increased since 2009. Self-reported prevalence of these two bacterial infections increased by 37% and 40% among those tested[3].

Diagnosing HIV in the early stages of infection and linking people to healthcare for medical treatment improves the health and survival of PLHIV and can reduce the risk of the PLHIV of transmitting HIV to others[4]. Conversely, untreated chlamydia or gonorrhea infection may lead to increased chance of acquiring or transmitting HIV, particularly amongst MSM[3].

In 2006, the CDC recommended HIV screening in healthcare and clinical settings for all persons aged 13-64 years and annual rescreening for populations at high risk of HIV acquisition. This included being tested at least once, regardless of clinical signs or symptoms, and defines populations at risk for HIV as people who inject drugs and their sex partners, people who exchange sex for money or drugs, sex partners of HIV-infected people, and MSM or heterosexuals who themselves or whose sex partners have had more

than one sex partner since their most recent HIV test[5]. Annual screening of chlamydia and gonorrhea is recommended for sexually active MSM at anatomical sites of contact[3]. Despite treatment recommendations made by the CDC, treatment targets are not being met. Less than half of MSM (47%) in 2014 reported receiving a test for chlamydia and gonorrhea in the previous 12 months[3]. Less than 50% of persons at high risk for HIV were tested for HIV in the past year despite the recommendation that these persons should be screened at least annually[6]. Finally, less than half of the US adults aged 18-64 years reported ever being tested for HIV[5].

Ensuring routine testing for non-HIV STIs is important to ending the HIV epidemic. This analysis uses data from the American Men's Internet Survey (AMIS), an annual cross-sectional online HIV behavioral survey of MSM in the United States. AMIS is conducted by the PRISM Health Research Team at Emory University Rollins School of Public Health. This analysis will examine current trends in HIV and STI testing from 2017 to 2021, including changes in trends during the COVID-19 pandemic.

Methods
Study Population

AMIS is a web-based, cross-sectional behavioral survey of MSM in the United States. The survey is conducted in annual cycles and is reviewed and revised annually. Data from 52,450 MSM who participated in AMIS surveys from five cycles between 2017 and 2021 were analyzed. AMIS methodology has been previously reported[7]. Briefly, participants had to be at least 15 years old, a US resident, provide a valid US zip code, have had either history of oral or anal sex with a man in the past 12 months or self-identify as gay or bisexual, be able to complete the survey in English, and be a cisgender male. Those who were male at birth but identify as female or transgender at the time of survey were excluded from the study. Participants whose responses were eligible, unduplicated, and who provided consent were included in this analysis.

Variables

We examined four outcome measures: non-HIV STD testing in the past 12 months, non-HIV testing ever, HIV testing in the last 12 months, and HIV testing ever. Two dependent measures presented in these trend analyses are self-reported behaviors that occurred during the 12 months preceding survey participation, and two dependent measures presented are self-reported behaviors having occurred any time prior to survey participation. Self-reported HIV status was collected and this analysis only examines HIV testing behaviors among those who reported no previous positive HIV test. Self-reported HIV status was categorized as People Living with HIV (PLHIV) and HIV-negative or unknown status, consistent with similar NHBS system surveillance reports.

Participants were also categorized based on recruitment source. Participants recruited from previous AMIS cycles were categorized according to their original recruitment source for analyses of behaviors. Names of the websites and apps were not provided as to preserve operator and client privacy. Zip codes were used to determine county and state of residence, and whether a participant resided in an NHBS city. Population density was defined in the same manner as previous AMIS cycles and was based on the National Center for Health Statistic's Rural-Urban classification scheme for counties[14]. These categories were further classified into a four-level urbanicity variable; urban, suburban, medium/small, and rural.

Analysis

Chi-squared tests were used to assess whether participant characteristics differed significantly among annual recruitment cycles. Poisson modelling with Generalized Estimating Equations (GEE) were used to test for temporal linear trends between AMIS 2017, 2018, 2019, 2020 and 2021 datasets for each outcome, stratified by self-reported HIV status. Data for each outcome amongst HIV-negative and unknown respondents are presented by age group and by AMIS cycle. Data for PLHIV are presented by AMIS cycle.

Standardized prevalence estimates using adjusted estimated annual percentage change (EAPC) with corresponding 95% confidence intervals were used to estimate magnitude of average annual trend for each outcome. Statistical significance for all analyses were denoted at alpha = 0.05.

Results

There were 52,450 MSM participants in 5 annual cycles of AMIS conducted from July 2017 to March 2022 included in this analysis (Table 1). Most participants in all cycles 2018, 2019 and 2020 were aged 15-24 years (42%), however, most participants in 2017 and 2021 were aged 40+. The 2021 cycle particularly had an older age distribution with 57.9% of participants reporting age as 40+. Most participants across all cycles were non-Hispanic white and publicly insured. Participants across the 2017, 2018, 2019, and 2020 cycles were primarily recruited through general social networking, although in 2021 participants were primarily recruited through geospatial methods. Participants were recruited from all US states and the most common region of residence was the South. Approximately 35% of participants in each AMIS cycle resided in an NHBS city. Most participants resided in an urban or small-to-medium metropolitan county. Approximately 68% of each AMIS cycle were HIV-negative. Approximately 6-10% of participants reported HIV-positive status in the 2017, 2018, 2019 and 2020 cycles, however, a larger percentage of participants reported HIV-positive status in the 2021 cycle (14.4%). AMIS participants in the cycles 2017, 2018, 2019 and 2020 typically had a college degree or postgraduate education (40-55%) and this was even higher for the 2021 cycle (61.8%). All participant demographics varied significantly by AMIS cycle. Overall, the 2021 cycles appear to differ the most from other cycles with regards to education, higher income, older age, being urban-residing participants and having the most self-reporting HIV-positive participants.

The percentage of MSM not living with HIV who reported ever having an HIV test after adjusting for confounders (race/ethnicity, age, population density, and recruitment site) decreased from 80.7% in 2017 to 72.0% in 2018, stabilized until 2020 and rose to 88.4% in 2021 (Table 2; p<0.001). This same trend

was seen when examining HIV testing in the past 12 months after confounder adjustment: with decreasing rates from 2017 to 2020 (60.5 to 45.8%) that rose to 64% in 2021 (p<0.001).

The percentage MSM not living with HIV who had ever been tested for gonorrhea, chlamydia, or syphilis after adjusting for confounders was fairly stable from 2017-2019 ranging from 61-64% but dropping to a low of 42.2% in the 2020 AMIS cycle and then rising to the highest reported level of 67.1% in the 2021 AMIS cycle. STI testing in the past 12 months followed a similar trend but was overall much lower (39.7-43.8% in 2017 to 2019 dropping to 26.8% in the AMIS 2020 cycle and rising to the highest rate of 44.6% in the 2021 AMIS cycle (p<0.001)). There was significant interaction between age and AMIS cycle for both STI and HIV testing in the past 12 months and ever.

Among those living with HIV, ever having received STI testing was significantly higher and ranged from 93.4- 95% in 2017-2019 then declined to 71.9% in the 2020 cycle and increased to 81.3% in the 2021 AMIS cycle after adjusting for race/ethnicity, age, recruitment source and population density (Table 3; p<0.001). This increase in 2021 was still much lower than pre-pandemic years. STI testing in the past 12 months among PLWH increased from 66.6-76.2% from 2017 to 2019, fell to 53.2% in 2020 and increased to 62.8% in 2021 (p<0.001).

Discussion

HIV and STI testing rates fell in 2020, sometimes at rates of more than 20%. All testing rates were resumed their previous average or were higher in 2021 with the exception of STI testing among PLHIV. These rates remained 13-14% lower than they had been before the pandemic in 2019. For some of these testing trends, there were concerning results before the pandemic. Yearly HIV testing significantly decreased by almost 7% from 2017 to 2019, fell even further in 2020, and then increased by 18% in 2021 to 63.8%, the highest rate in these five years. Overall rates of ever being tested for STIs or STI testing in the past year decreased from 2017 to 2021 (12% and 4%, respectively). PLHIV had significantly higher rates of STI testing (yearly or ever) compared to the overall MSM population; 27% higher for STI testing

in the past year in 2017 and 29% higher for ever having an STI test in 2017. While still higher in 2021 compared to the overall MSM population, these rates did not rebound from the drop in testing seen during the first year of the pandemic as all other testing did.

HIV Testing

Rates of HIV in the past 12 months among those not living with HIV were already declining from 2017 to 2019, before the onset of the pandemic. This almost 7% decrease in yearly testing is concerning and was exacerbated by another 7% decreased from 2019-2020, likely due to the COVID-19 pandemic. A CDC analysis of four national data collection systems assessing HIV testing before (2019) and during (2020) the COVID-19 pandemic revealed an 8.3% decrease in screening tests resulting in a 17% decrease in the number of HIV diagnoses reported[8]. A different study found that in outpatient settings there was a 68-97% reduction in the number of HIV tests administered per week across multiple states during each state's stay-at-home order period, compared to the pre-stay-at-home order period in early 2020[9]. While rates of yearly testing for HIV increased to 64% in 2021 (up 18% from 2020), the trend prior to the pandemic is concerning.

Although HIV testing ever and in the past 12 months significantly increased during the 2021 AMIS cycle, these metrics still fall short of the CDC's current recommendations. The CDC 2006 recommendations for HIV testing are that all persons aged 13-64 years should be screened for HIV at least once, and that people at higher risk for HIV infection such as sexually active MSM should be rescreened annually[5].

STI Testing

Rates of reporting ever being tested for STIs or STI testing in the past year sharply declined by close to 20% from 2019 to 2020 for MSM who are not living with HIV. Prior to the pandemic, rates had been stable for MSM who had ever been tested for an STI (ranging from 62-64%) and had been modestly increasing for testing in the previous year, increasing from 40-44% from 2017-2019. These testing rates are well below the CDC recommendations. The CDC recommends at least annual testing for chlamydia,

gonorrhea, and syphilis at sites of contact regardless of condom use for MSM and testing every 3-6 months if at increased risk (i.e., multiple partners, MSM on PrEP)[12].

Amongst PLHIV, STI testing rates in the past year were 27% higher than among those without HIV in 2017. Additionally, these rates rose by 10% from 2017-2019 before falling by 23% in 2020. While STI testing rates in 2021 in MSM without HIV rose to rates higher than that seen before the pandemic or since 2017, among PLHIV, these rates remained lower than the pre-pandemic period suggesting that barriers to STI testing during the COVID-19 pandemic disproportionately impacted PLHIV through at least 2021. Overall, STI testing rates were much higher among PLHIV and this may be explained by the AMIS study population. PLHIV participating in research such as the AMIS survey may be more likely to be linked to the HIV care continuum and receive routine STI testing.

The COVID-19 Effect

The COVID-19 pandemic may have prevented individuals from accessing and receiving HIV and STI testing. In an online provider survey to understand how the COVID-19 pandemic affected availability of sexual health services, providers reported limiting in-person visits to only urgent circumstances[10]. Many STI program staff, such as disease intervention specialists, were redirected towards COVID-19 efforts[10]. This led to decreased resources available to keep up STI testing efforts, including HIV. Many providers reported diminished ability to offer STI and HIV testing[10]. This explanation would be consistent with previous literature. In a cohort of 56 PrEP-using MSM in the south, a quarter documented challenges while accessing HIV and STI testing due to COVID-19-related reasons. Many participants did not have an HIV or STI test in the past 3 months (32% and 43%, respectively)[11]. Unexplained by COVID-19-related barriers to testing uptake is the steep drop in being tested for HIV ever and in the past 12 months between the 2017 and 2018 AMIS cycles. For both testing outcomes, prevalence of testing dropped around 8% in the span of one year. The influx of HIV/STI testing services to alleviate COVID-19-related

barriers to testing may explain the high HIV testing rate in 2021. These services, such as mail-administered testing and telehealth, remained in place through 2021.

Limitations

AMIS data are not generalizable to all MSM in the United States or to all MSM online. The convenience sampling approach yields itself to the potential for selection or enrollment biases, despite AMIC recruitment being conducted with various types of websites and social networking applications to increase sample diversity. The online convenience sampling approach introduces more opportunities for year-to-year variations in participant enrollment demographics, elucidated by statistically significant differences in all participant demographics between AMIS cycles. Additional statistical methodology was applied to control these variations (i.e., inclusion of confounding variables in model construction). Some sampling was intended to be purposive to recruit underrepresented individuals into our study populations for analysis. Despite marginal improvements in the diversity of samples due to increased targeted recruitment, African American MSM remain underrepresented in AMIS, a common problem seen in another internet-based research[13].

AMIS surveys involve self-reported behaviors. Since HIV and STI testing may be more socially desirable responses to report, these responses may be overreported and thus overestimating testing but there is no reason to believe this bias would vary by year.

Although many HIV and STI testing measures increased in 2021 from 2020, these findings may be attenuated due to multiple limitations. Recall bias may artificially inflate the percentage of respondents reporting HIV and STI testing in the past 12 months for the 2021 cycle as participants may not be able to accurately recall whether they got tested in 2021 or 2020. This may explain the high HIV and STI testing rate in the past 12 months for 2021 though the disruption in services seen due to the pandemic likely explain these differences.

Conclusion

The main purpose of the American Men's Internet Survey is to monitor trends in behavioral indicators that revolve around sexual health efforts. The first year of the COVID-19 pandemic was accompanied by significant changes in HIV and STI testing rates among MSM included in the AMIS cohorts. STI rates before the pandemic were well below recommended rates and yearly HIV testing was already declining, a very concerning trend that was exacerbated by the pandemic. All testing rates rebounded to pre-pandemic rates other than STI testing among PLHIV. These data highlight areas of needed improvement to ensure the MSM population achieves goals for optimal sexual healthcare, including annual HIV and STI testing.

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Tables and Figures

Table 1. Characteristics of MSM participants in the American Mens Internet Survey by survey cycle, United States, 2017-2021 (n=52,450)

	AMIS-2017[a], N(%)	AMIS-2018[b], N(%)	AMIS-2019[c], N(%)	AMIS-2020[d], N(%)	AMIS-2021[e], N(%)	p-value[f]
Total	10,049	10,129	10,130	13,081	9061	
Age (years)						<0.0001
15-24	2670(27.2)	4132(41.6)	4119(41.5)	5176(42.8)	708(8.0)	
25-29	1217(12.4)	1286(13.0)	1783(18.0)	3014(24.9)	880(9.9)	
30-39	1538(15.7)	1472(14.8)	1451(14.6)	1203(9.9)	2155(24.3)	
40+	4398(44.8)	3044(30.6)	2564(25.9)	2715(22.4)	5141(57.9)	
Race						<0.0001
Non-Hispanic Black	654(6.7)	552(5.6)	1507(15.2)	1540(12.7)	1204(13.6)	
Hispanic	1529(15.6)	1625(16.4)	1546(15.6)	2460(20.3)	1113(12.5)	
Non-Hispanic White	6953(70.8)	7009(70.6)	6019(60.7)	7170(59.2)	5756(64.8)	
Other,Multiple,Unknown	687(7.0)	748(7.5)	845(8.5)	938(7.8)	811(9.1)	
Income						<0.0001
$0-19,999	1032(10.5)	1329(13.4)	1388(14.0)	1603(13.2)	814(9.2)	
$20,000-39,999	1499(15.3)	1825(18.4)	1884(19.0)	2426(20.0)	1367(15.4)	
$40,000-74,999	2197(22.4)	2470(24.9)	2549(25.7)	2846(23.5)	1969(22.2)	
$75,000	3254(33.1)	3247(32.7)	3027(30.5)	4031(33.3)	4217(47.5)	
Education						<0.0001
Less than High School Diploma	409(4.2)	769(7.7)	584(5.9)	320(2.6)	141(1.6)	
High School Diploma or Equivalent	1126(11.5)	1498(15.1)	1593(16.1)	2245(18.5)	827(9.3)	
Some college or technical degree	2880(29.3)	3355(33.8)	3411(34.4)	4414(36.5)	2396(27.0)	
College degree or postgraduate education	5275(53.7)	4209(42.4)	4283(43.2)	5071(41.9)	5494(61.8)	
Insurance Category						<0.0001
Private Only	811(8.3)	792(8.0)	829(8.4)	1214(10.0)	554(6.2)	
Public Only	6506(66.2)	6408(64.5)	6969(70.3)	7870(65.0)	6040(68.0)	
Other/Multiple	1225(12.5)	1180(11.9)	1312(13.2)	1893(15.6)	1604(18.1)	
None	881(9.0)	776(7.8)	553(5.6)	707(5.8)	540(6.1)	
Recruitment Source						<0.0001
Gay Social Networking	1400(14.3)	549(5.5)	127(1.3)	0(0.0)	0(0.0)	
General Gay Interest	112(1.1)	48(0.48)	31(0.31)	0(0.0)	2(0.02)	
General Social Networking	4279(43.6)	6717(67.6)	7411(74.7)	10951(90.4)	2510(28.3)	
Geospatial	4026(41.0)	2605(26.2)	2346(23.7)	1157(9.6)	6369(71.7)	

		a	b	c	d	e	f
NHBS City Resident							<0.0001
	Yes	3927(40.0)	3168(31.9)	3513(35.4)	4106(33.9)	3199(36.0)	
	No	5896(60.0)	6766(68.1)	6404(64.6)	8002(66.1)	5685(64.0)	
Region							<0.0001
	Northeast	1830(18.6)	1599(16.1)	1662(16.8)	2027(16.7)	1645(18.5)	
	Midwest	1890(19.2)	2158(21.7)	1978(20.0)	2460(20.3)	1719(19.4)	
	South	3770(38.4)	3806(38.3)	4281(43.2)	4898(40.5)	3468(39.0)	
	West	2333(23.8)	2371(23.9)	1996(20.1)	2723(22.5)	2052(23.1)	
	U.S. Dependent areas	0	0	0	0	0	
Population Density							<0.0001
	Urban	4129(42.0)	3619(36.4)	3676(37.1)	4527(37.4)	4115(46.3)	
	Suburban	2137(21.8)	2078(20.9)	2157(21.8)	2557(21.1)	1843(20.8)	
	Small/medium metropolitan	2769(28.2)	3255(32.8)	3099(31.3)	3794(31.3)	2243(25.3)	
	Rural	788(8.0)	982(9.9)	985(9.9)	1230(10.2)	683(7.7)	
Self-reported HIV Status							<0.0001
	Positive	944(9.6)	604(6.1)	883(8.9)	833(6.9)	1275(14.4)	
	Negative	7017(71.4)	6610(66.5)	6474(65.3)	7778(64.2)	6436(72.4)	
	Unknown	1862(19.0)	2720(27.4)	2560(25.8)	3497(28.9)	1173(13.2)	

MSM men who have sex with men, *NHBS* National HIV Behavioral Surveillance
[a] Data collected between July 2017 to November 2017
[b] Data collected between September 2018 to December 2018
[c] Data collected between August 2019 to December 2029
[d] Data collected between October 2020 to January 2021
[e] Data collected between September 2021 and March 2022
[f] Chi square test for difference in characteristics between AMIS cycles

Table 2. HIV/STI Testing Trends of HIV negative or unknown MSM participants in the American Men's Internet Survey by survey year

	AMIS-2017[a], N(%)	AMIS-2018[b], N(%)	AMIS-2019[c], N(%)	AMIS-2020[d], N(%)	AMIS-2021[e], N(%)	p-value[f]
Total	8879	9330	9034	11275	7609	
Have you ever been tested for HIV?	7162(80.7)	6720(72.0)	6618(73.3)	8136(72.2)	6728(88.4)	<0.0001[g]
Age 15-24	1449(20.2)	2075(30.9)	2227(33.7)	3014(37.1)	455(6.8)	(ref)
Age 25-29	1010(14.1)	1041(15.5)	1422(21.5)	2336(28.7)	715(10.6)	0.0062
Age 30-39	1263(17.6)	1243(18.5)	1116(16.9)	904(11.1)	1731(25.7)	0.4728
Age 40+	3440(48.0)	2361(35.1)	1853(28.0)	1882(23.1)	3827(56.9)	0.0027
Have you had an HIV test in the past 12 months?	5374(60.5)	4907(52.6)	4788(53.0)	5165(45.8)	4857(63.8)	<0.0001[g]
Age 15-24	1187(22.1)	1658(33.8)	1735(36.2)	2086(40.4)	346(7.1)	(ref)
Age 25-29	828(15.4)	741(15.1)	1034(21.6)	1535(29.7)	539(11.1)	0.0327
Age 30-39	989(18.4)	886(18.1)	829(17.3)	592(11.5)	1271(26.2)	0.0443
Age 40+	2370(44.1)	1622(33.1)	1190(24.9)	952(18.4)	2701(55.6)	0.0229
Have you ever been tested for the sexually transmitted infections gonorrhea, chlamydia, or syphilis?	5696(64.2)	5703(61.1)	5603(62.0)	4762(42.2)	5108(67.1)	<0.0001[g]
Age 15-24	1096(19.2)	1739(30.5)	1905(34.0)	1587(33.3)	299(5.9)	(ref)
Age 25-29	855(15.0)	916(16.1)	1239(22.1)	1397(29.3)	540(10.6)	<0.0001
Age 30-39	1066(18.7)	1053(18.5)	977(17.4)	554(11.6)	1323(25.9)	<0.0001
Age 40+	2679(47.0)	1995(35.0)	1482(26.5)	1224(25.7)	2946(57.7)	<0.0001
In the past 12 months, were you tested by a doctor or other health care provider for a sexually transmitted infection?	3524(39.7)	3795(40.7)	3960(43.8)	3024(26.8)	3392(44.6)	<0.0001[g]
Age 15-24	864(24.5)	1392(36.7)	1538(38.8)	1168(38.6)	227(6.7)	(ref)
Age 25-29	594(16.9)	625(16.5)	871(22.0)	923(30.5)	397(11.7)	<0.0001
Age 30-39	684(19.4)	662(17.4)	696(17.6)	365(12.1)	905(26.7)	<0.0001
Age 40+	1382(39.2)	1116(29.4)	855(21.6)	568(18.8)	1863(54.92)	0.0415

MSM men who have sex with men, *NHBS* National HIV Behavioral Surveillance, *STI* Sexually Transmitted Infection
[a] Data collected between July 2017 to November 2017
[b] Data collected between September 2018 to December 2018
[c] Data collected between August 2019 to December 2029
[d] Data collected between October 2020 to January 2021
[e] Data collected between September 2021 and March 2022
[f] Chi square *p* value for AMIS cycle variable, based on Generalized Estimating Equation model of linear test for trend
[g] AMIS cycle/age interaction term was significant at p<0.05

Table 3. STI Testing Trends of HIV Positive MSM participants in the American Men's Internet Survey by survey year

	AMIS-2017[a], N(%)	AMIS-2018[b], N(%)	AMIS-2019[c], N(%)	AMIS-2020[d], N(%)	AMIS-2021[e], N(%)	p-value[f]
Total	944	604	883	833	1275	
Have you ever been tested for the sexually transmitted infections gonorrhea, chlamydia, or syphilis?						
Yes	882(93.4)	574(95.0)	830(94.0)	599(71.9)	1037(81.3)	0.2473
No	62(6.6)	30(5.0)	53(6.0)	234(28.1)	238(18.7)	
In the past 12 months, were you tested by a doctor or other health care provider for a sexually transmitted infection?						
Yes	629(66.6)	439(72.7)	673(76.2)	443(53.2)	801(62.8)	0.0012
No	315(33.4)	165(27.3)	210(23.8)	390(46.8)	474(37.2)	

MSM men who have sex with men, *NHBS* National HIV Behavioral Surveillance, *STI* Sexually Transmitted Infection

[a] Data collected between July 2017 to November 2017

[b] Data collected between September 2018 to December 2018

[c] Data collected between August 2019 to December 2029

[d] Data collected between October 2020 to January 2021

[e] Data collected between September 2021 and March 2022

[f] Chi square *p* value for AMIS cycle variable, based on Generalized Estimating Equation model of linear test for trend

Figure 1. Proportion of AMIS participants reporting HIV and STI Testing in the Past 12 Months and Ever, by participant HIV Status and Cycle.
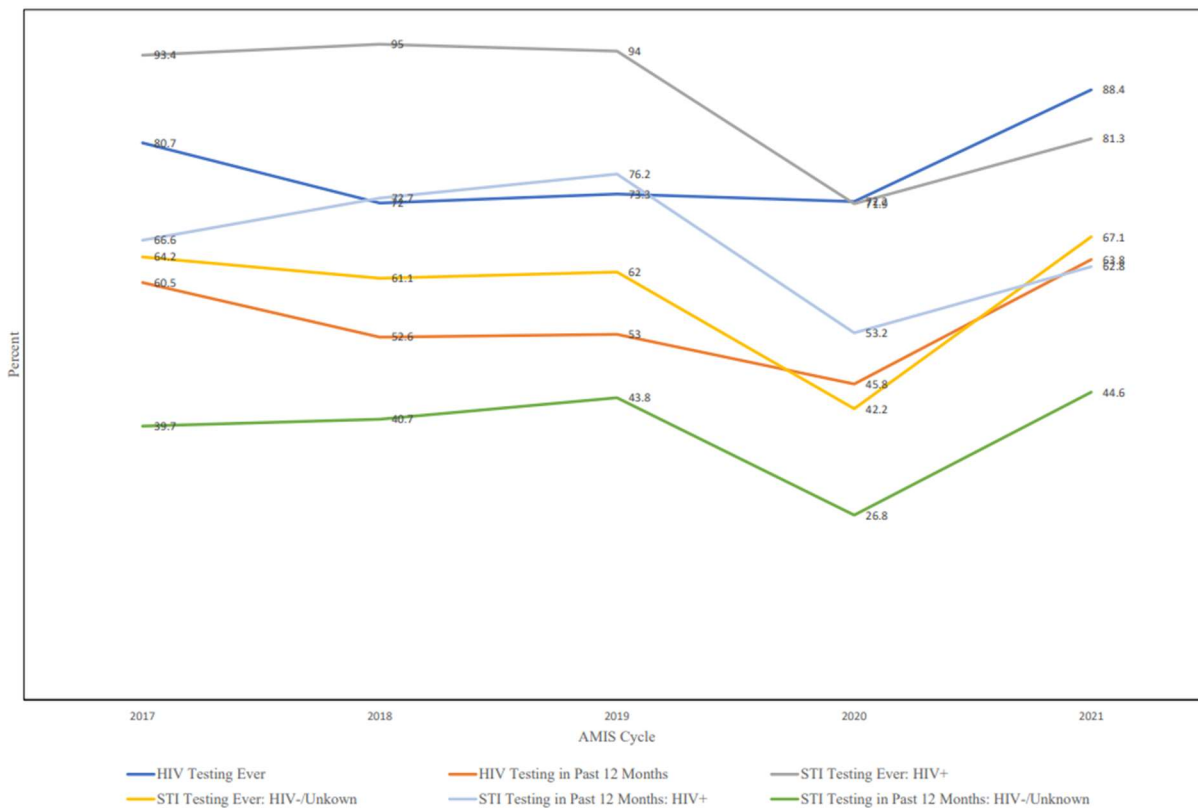
EAPC (95% Confidence Interval)	
HIV Negative/Unknown Status: HIV Testing Ever	0.1(-0.2,0.4)
HIV Negative/Unknown Status: HIV Testing in the past 12 months	-7.5(-15.9,-1.8)
HIV Negative/Unknown Status: STI Testing Ever	2.3(1.9,2.8)
HIV Negative/Unknown Status: STI Testing in the past 12 months	-3.6(-4.4,-2.8)
HIV Positive: STI Testing Ever	0(0.49,0.50)
HIV Positive: STI Testing in the past 12 months	-4.7(-6.1,-3.3)