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Trends in Internet Use Among Men Who Have Sex With Men in the United States

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Abstract

Background—Internet-based platforms are increasingly prominent interfaces for social and sexual networking among men who have sex with men (MSM).

Methods—MSM were recruited through venue-based sampling in 2008, 2011, and 2014 in 20 US cities. We examined changes in internet use (IU) to meet men and in meeting the last partner online among MSM from 2008 to 2014 using Poisson regression with generalized estimating equations to calculate adjusted prevalence ratios (APRs). We also examined factors associated with increased frequency of IU using data from 2014. IU was categorized as never, infrequent use (<once a week), and frequent use (≥once a week).

Results—Frequent IU increased from 21% in 2008 to 44% in 2014 (APR = 1.39, 95% confidence interval: 1.36 to 1.42), and having met the last partner online increased from 19% in 2008 to 32% in 2014 (APR = 1.30, 95% confidence interval: 1.26 to 1.34). Those who never used the internet had fewer partners (median of 2 in the past 12 months, interquartile range: 1–4) compared with infrequent (4, 2–7) and frequent users (5, 3–12). HIV testing in the past 12 months also increased with increasing IU (58%, 68%, and 71%, respectively, $P < 0.0001$). Among HIV-positive participants, the percent HIV-positive awareness increased as IU increased (71%, 75%, and 79%, $P < 0.005$).

Conclusions—Both IU to meet men and meeting the last partner online increased since 2008. Although men who used the internet more frequently reported more partners in the past 12 months, they were also more likely to report testing in the past 12 months and were more likely to be HIV-positive aware.

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Keywords

MSM; HIV; internet; partners; HIV testing; sexual behavior; trends; changes

BACKGROUND

Internet-based dating websites or applications (apps) are increasingly being used for social and sexual networking among gay, bisexual, and other men who have sex with men (referred to collectively as MSM). Before the widespread use of the internet, meeting friends and sex partners often occurred in person at venues such as bars, parties, and public cruising areas. As personal computers became available and social network software was developed in the 1990s, methods for MSM to meet other men broadened to include the internet. Websites rapidly developed in the early 2000s to provide services to those who wanted to meet people, including sexual partners, over the internet.[1] Norms quickly shifted too, as one study of MSM in the United Kingdom found that the proportion of men under 30 who reported meeting their first sexual partner over the internet increased 20-fold from less than 3% in 1992 to 61% in 2002.[2] Because internet speed and coverage has rapidly increased, what began as chat rooms tied to a computer with limited visual capabilities have developed into websites and apps that are on mobile phones and allow instant sharing of photographs and location.[3] Today, the use of geospatial social networking and dating apps and websites is common among all segments of the population and around the world.[3] Although dating apps and websites are used by many different subpopulations, Grov et al[3] reported in 2013 that MSM accessed dating apps on average 22 times a week compared to heterosexuals who accessed dating apps on average 8 times a week. Apps link MSM around the globe—one of the most popular apps for MSM is available in 196 countries and reports over 1,000,000 users per hour.[4]

The first reported cases of HIV in the United States in the early 1980s were among MSM,[5] a group that continues to be disproportionately affected by HIV. Despite representing approximately 2% of the US population,[6,7] MSM accounted for 70% of all new HIV diagnoses (including MSM who inject drugs) in 2014.[8] An estimated 15% of MSM Nationwide have HIV, with 11% estimated to be already diagnosed.[9] Prevalence is even higher in the 20 cities that are part of the Centers for Disease Control and Prevention's (CDC) National HIV Behavioral Surveillance (NHBS). In 2014, 22% of participating MSM were found to be HIV positive.[10] Other sexually transmitted infections (STI), such as syphilis, have also increased among MSM in the United States.[8,11]

There is substantial evidence linking use of the internet to meet men to risky sexual behavior, including condomless anal sex and higher number of sexual partners.[12,13] In addition, men recruited online report more risk behavior and more partners than those recruited offline.[14] Although some studies have failed to show an association between use of networking apps to meet sex partners and risk of chlamydia and gonorrhea infection,[15,16] others have found a higher prevalence of these infections among MSM who use networking apps compared with those who met partners exclusively through in-person methods.[1] Furthermore, the internet has played a key role in several outbreaks of STIs among MSM.[13]

The high usage of dating apps and websites among MSM, coupled with high HIV and STI rates among users, make these apps potentially effective and efficient ways to reach a high-risk population with prevention and care messages, and serving as effective channels to recruit participants for public health programs and research. We sought to examine trends in the internet use (IU) to meet men among a large sample of MSM recruited offline in 20 large cities in the United States. We used data among MSM participating in NHBS to evaluate changes from 2008 to 2014 in using the internet to meet or socialize with men and in having met the last sex partner online. We also investigated the association between using the internet to meet men, and HIV-testing behavior and risk behavior in 2014.

METHODS

NHBS collects data among MSM every 3 years. All NHBS participants must be aged ≥18 years, live in a participating MSA or city, and be able to complete a behavioral survey in English or Spanish. The cross-sectional data reported in this analysis are from MSM recruited for interviews and HIV testing through venue-based, time-space sampling in surveys in the 20 cities that participated in NHBS (cities included in this analysis are: Atlanta, GA; Baltimore, MD; Boston, MA; Chicago, IL; Dallas, TX; Denver, CO; Detroit, MI; Houston, TX; Nassau-Suffolk, NY; New Orleans, LA; Los Angeles, CA; Miami, FL; Newark, NJ; New York, NY; Philadelphia, PA; San Diego, CA; San Francisco, CA; and San Juan, PR; Seattle, WA; and Washington, DC) in 2008, 2011, and 2014. NHBS-venue-based, time-space sampling procedures have been previously published.[17,18] In each city, a team of staff members familiar with the local community conducted formative research to establish a list of venues frequented by MSM. Venues on the list were categorized as bar, dance club, fitness club or gymnasium, Gay Pride event, park or beach, large dance party (eg, rave or circuit party), cafe or restaurant, retail business, sex establishment or sex environment, social organization, street location, or another venue type, such as an event hosted by the local house ball community.

Interviews were conducted by trained interviewers using a standardized questionnaire covering demographics, HIV-associated behavior, and the use of HIV prevention and testing services. HIV testing was performed by collecting blood or oral specimens for either rapid testing in the field or laboratory-based testing followed by laboratory confirmation. Participants received incentives for participating in the interview and the HIV test. The incentive format (cash or gift card) and amount varied by city based on formative assessment and local policy. A typical incentive included $25 for completing the interview and $25 for providing a specimen for HIV testing. NHBS activities were approved by local institutional review boards in each participating city and as nonengaged research by the CDC.

Measures

IU to meet men was assessed with the question: “In the past 12 months, how often have you used the internet to meet or socialize with gay men either for friendship or sex? This could include social networking websites (such as Facebook or MySpace), websites directed toward gay men (such as Manhunt or Gay.com), or dating websites, or the use of mobile social apps (such as Foursquare or Grindr).” The 2008 measure of IU was slightly different

and specified using the internet to look for sex partners. Response options were grouped as follows: frequent (once a week/more than once a week/daily), infrequent (less than once a month/once a month/more than once a month), and never. Place where participants met their last sex partner was assessed with the following question: "Where did you first meet this partner?" We grouped responses as having met the last sex partner on the internet versus all other responses. Discordant condomless anal sex was defined as condomless anal sex at last sex with a partner of different or unknown HIV status. During the interview, participants were asked questions to determine if they had previously tested positive for HIV. After the interview, each participant was offered HIV testing. A nonreactive rapid test was considered a definitive negative result; a reactive (preliminary positive) rapid test result was considered a definitive positive only when confirmed by supplemental laboratory testing (eg, western blot, immunofluorescence assay or nucleic acid amplification test). Participants with a confirmed positive HIV-test result who reported having previously tested positive for HIV were considered to be aware of their infection.

Analysis

Men who consented to and completed the survey and had a male sex partner in the past 12 months were included in analyses. The main outcomes for the analyses were having met the last sex partner online and frequent IU to meet or socialize with gay men. To determine if these outcomes changed over time, we used Poisson models with generalized estimating equations clustered on recruitment event to calculate adjusted prevalence ratios (APRs) and 95% confidence intervals (CIs). Year was included in the model as an ordinal variable. Individual interaction terms for each covariate by year were included in models to examine changes over time by subgroup. Each PR measures change in the outcome for a 3 year increase in interview year (ie, 2008–2011 or 2011–2014). Age, race, and income were included as covariates. Using data from 2014, we also investigated the association between HIV testing, awareness of HIV status and risk behaviors, using the Wilcoxon rank sum and chi-square tests.

RESULTS

The analysis sample was n = 8881 in 2008, n = 9253 in 2011, and n = 9636 in 2014. The race, age, education, and income composition were similar across years. A larger proportion of participants were HIV positive based on the NHBS test results in 2014 (20%) compared with 2011 (17%) and 2008 (17%) (Table 1).

Having Met the Last Sex Partner Online

Across years, white MSM and those with an annual income of $75,000 or more had higher reports of meeting the last sex partner online. Overall, having met the last sex partner online increased from 19% in 2008 to 24% in 2011 and 32% in 2014 (APR = 1.30, 95% CI: 1.26 to 1.34). IU increased over time in all age, race, income, and HIV-status categories (Table 2).

Frequency of Internet Use to Meet Men

The percentage of men who reported never using the internet to meet men decreased over time from 62% in 2008 to 36% in 2011, and 31% in 2014. Across all years, white MSM

were more likely to report frequent IU compared with other races. The percent of men who reported frequent IU increased from 21% in 2008 to 42% in 2011 and 44% in 2014 (APR = 1.39, 95% CI: 1.36 to 1.42) and increased in all age, race, income, and HIV-status categories. Significant increases were seen in all cities but one (Table 3).

Characteristics of MSM by Frequency of Internet Use

Median number of male sex partners in the past 12 months increased with increasing IU. In 2014, those who never used the internet had a median of 2 partners [interquartile range (IQR): 1–4] compared with a median of 4 among infrequent internet users (IQR: 2–7) and 5 among frequent users (IQR: 3–12) ($P < 0.0001$). The percentage reporting any condomless sex in the past 12 months increased with increasing IU (55%, 67%, and 70%, $P < 0.001$). HIV testing in the past 12 months also increased with increasing IU (58%, 68%, and 71%, respectively, $P < 0.0001$). HIV prevalence decreased with increasing IU (25%, 20%, and 20%, $P < 0.0001$). Similarly, the percent of HIV-positive MSM who were aware of their status was higher among nonfrequent and frequent internet users (71%, 75%, and 79%, $P < 0.005$) (Table 4).

DISCUSSION

In a sample of men recruited offline in gay venues in large cities in the United States, IU to meet men was very common; in 2014, two-third of men had used the internet to meet other men and one-third had met their last sex partner online. Both the percentage of MSM using the internet frequently to meet men and the percentage of men who met the last sex partner online have increased since 2008, illustrating how common IU for social and sexual connection has become among MSM. Data from 2014 showed that men who used the internet more frequently had higher number of partners and higher reports of condomless sex. However, frequent internet users also had higher testing rates and were less likely to be HIV positive but unaware of their status.

As others have done before, we documented sexual risk among MSM using the internet to meet men. A recent meta-analysis found that meeting sex partners online was associated with increased risk of condomless anal sex, group sex, serosorting, and strategic positioning.[13] We have reported previously on an association between frequent IU and a higher occurrence of recent and acute HIV infection among MSM.[19] Case control studies in the United Kingdom found that men who use the internet to meet sex partners had twice the odds of seroconverting to being HIV positive compared with those who did not use the internet.[20] Furthermore, several studies have shown increased prevalence of chlamydia and gonorrhea among men who use the internet to meet sex partners.[1] However, it is important to note that it is not clear if the association between IU and high-risk sex is because of the internet facilitating riskier sex or to riskier men using the internet to meet sex partners. The internet environment may accentuate risk taking and make it easier to meet partners for condomless sex by providing an anonymous interface to disclose sexual preferences.[12] However, the association could also be because of high-risk men being more likely to use the internet to meet sex partners, as suggested by research showing higher number of

partners[21] and STIs[1] among those who meet partners online versus those meeting partners offline only.

Our data and data from others also suggest that MSM who use the internet more frequently are taking steps to protect their health. We found a lower HIV prevalence among those using the internet, and HIV-positive MSM who used the internet to meet men were more likely to be aware of their status. Furthermore, we found higher HIV testing among those using the internet more frequently. The formation of online partnerships may include intensive communications including risk negotiations before an offline, in-person contact is made.[12] In contrast, typical offline venues such as bars and clubs may not be conducive to such negotiations. However, risk negotiations do not invariably result in higher levels of protected sex; the accuracy of self-reported status among prospective sex partners cannot be taken for granted, as it depends on when the last HIV test occurred and on the veracity of the reported status.[22] A recent survey of website/app owners, users, and public health professionals found agreement about several ways that dating apps and websites could be used to promote public health, including: automated HIV and STI testing reminders, local STI testing directories, access to sexual-health experts, profile options to include safer sex preference, and other strategies.[23] There is also evidence that many MSM across age and racial/ethnic groups are using the internet generally, and dating apps and websites specifically, to receive and obtain sexual-health information.[24,25] Encouraging frequent HIV testing among HIV-negative MSM using the internet to meet men and disclosure of HIV status among HIV-positive MSM may reduce the likelihood of discordant condomless sex and the potential for HIV transmission. A recent meta-analyses of HIV testing among MSM recruited online suggests that HIV-testing frequency is suboptimal and there is room for improvement.[26] The ability to target messages to specific populations, on specific apps or websites, or in specific geographic areas gives great power to public health practitioners to tailor messages for maximum impact.

The findings in this report are subject to limitations. NHBS data are from MSM who were recruited at venues in cities with high HIV burden. Thus, results may not be generalizable to all MSM. Recruiting men at venues may lead to an underestimate of IU, however, if venues such as bars are popular locations to meet partners found online, it could lead to an overestimate of IU. Furthermore, analyses were based on self-reported data and may be subject to social desirability bias. In addition, all data are cross-sectional, thus we are not able to causally link use of the internet to meet men with risk or protective behaviors. The question to assess frequency of IU changed from 2008 to 2011, when most of the change was seen for increases in frequent use. However, these changes were accompanied by increases in having met the last sex partner online, a measure that remains unchanged. This provides evidence that the observed trends are real and not a measurement artifact. NHBS does not collect data on specific websites or apps used. There are likely important differences between using the internet for socializing and specifically to find sex partners that our study cannot investigate. Finally, data are not weighted to account for the complex sampling methodology used to recruit MSM. Point estimates may therefore be biased by over- or under-represented subgroups of the population. However, multivariate analysis of differences across years should not be affected by a lack of weighting, especially given the consistency of data distribution across years.

Gay, bisexual, and other MSM represent two-thirds of new HIV diagnoses in the United States and are increasingly using the internet to meet men. It is encouraging to see more testing and high awareness of status among those using the internet frequently, but our data underscore the need for innovative and effective strategies to best HIV-prevention needs of MSM who use dating apps and websites. The implications of these trends for HIV or STI transmission risk are complex and suggest the need to develop online prevention strategies to reach MSM who use apps, who engaged in more condomless sex, and prevention strategies for men not using apps, who were less likely to be aware of their HIV status.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

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For the full list of NHBS Study Group participants, please see Supplemental Digital Content, http://links.lww.com/QAI/B38.

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TABLE 1

Characteristics of Sexually Active Men Who Have Sex With Men, NHBS, 20 Cities, United States, 2008, 2011, and 2014*

	2008		2011		2014	
Characteristic	**n**	**%**	**n**	**%**	**n**	**%**
Race/ethnicity						
American Indian/Alaska Native	48	0.5	75	0.8	63	0.7
Asian/Native Hawaiian/Other Pacific Islander	262	3.0	272	2.9	224	2.3
Black	2125	23.9	2485	26.9	2652	27.7
Hispanic†	2219	25.0	2407	26.1	2523	26.3
White	3762	42.4	3665	39.7	3668	38.3
Other‡	459	5.2	325	3.5	455	4.7
Age group, yrs						
18–24	2005	22.6	2352	25.4	1960	20.3
25–29	1641	18.5	1750	18.9	2109	21.9
30–39	2475	27.9	2190	23.7	2487	25.8
40–49	1899	21.4	1873	20.2	1686	17.5
≥50	861	9.7	1088	11.8	1394	14.5
Education						
<High school	578	6.5	427	4.7	348	3.6
High school diploma or equivalent§	3367	37.9	2215	24.1	2081	21.8
Some college or technical degree	2064	23.2	3143	34.2	3089	32.3
College degree or postgraduate education	2871	32.3	3392	37.0	4048	42.3
Annual household income						
0–$19,999	2624	30.0	2906	31.9	2917	30.7
$20,000–$39,999	2228	25.5	2275	25.0	2285	24.0
$40,000–$74,999	2162	24.7	2193	24.1	2343	24.6
$75,000 or more	1735	19.8	1732	19.0	1961	20.6
Sexual identity						
Homosexual	7197	81.2	7573	82.1	7831	81.5
Bisexual	1570	17.7	1550	16.8	1649	17.2

	2008		2011		2014	
Characteristic	**n**	**%**	**n**	**%**	**n**	**%**
Heterosexual	101	1.1	102	1.1	125	1.3
Frequency of IU to meet men[//]						
Never	5471	61.9	3285	35.5	2989	31.0
Infrequent	1543	17.5	2102	22.7	2419	25.1
Frequent	1821	20.6	3858	41.7	4225	43.9
Self-reported HIV status						
HIV positive	1060	11.9	1244	13.4	1586	16.5
HIV negative	6767	76.2	7131	77.1	7424	77.0
HIV unknown	1054	11.9	878	9.5	626	6.5
HIV-test result						
Positive	1516	17.1	1553	16.8	1888	19.6
Negative	6315	71.1	6867	74.2	6846	71.0
Not tested or invalid	1050	11.8	833	9.0	902	9.4
City						
Atlanta, GA	347	3.9	558	6.0	507	5.3
Baltimore, MD	502	5.7	452	4.9	497	5.2
Boston, MA	283	3.2	417	4.5	302	3.1
Chicago, IL	566	6.4	501	5.4	519	5.4
Dallas, TX	509	5.7	471	5.1	500	5.2
Denver, CO	544	6.1	547	5.9	515	5.3
Detroit, MI	388	4.4	460	5.0	512	5.3
Houston, TX	448	5.0	509	5.5	508	5.3
Los Angeles, CA	537	6.0	520	5.6	524	5.4
Miami, FL	529	6.0	504	5.4	534	5.5
Nassau-Suffolk, NY	281	3.2	339	3.7	338	3.5
New Orleans, LA	478	5.4	488	5.3	517	5.4
New York, NY	554	6.2	521	5.6	508	5.3
Newark, NJ	98	1.1	250	2.7	246	2.6
Philadelphia, PA	563	6.3	545	5.9	655	6.8
San Diego, CA	549	6.2	471	5.1	538	5.6

	2008		2011		2014	
Characteristic	**n**	**%**	**n**	**%**	**n**	**%**
San Francisco, CA	487	5.5	465	5.0	388	4.0
San Juan, PR	355	4.0	363	3.9	515	5.3
Seattle, WA	362	4.1	371	4.0	503	5.2
Washington, DC	501	5.6	501	5.4	510	5.3
Total	8881		9253		9636	

Numbers might not add to total because of missing or unknown data. Percentages might not sum to 100 because of rounding.

[*] Includes men who consented to and completed the survey, had a male sex partner in the past 12 months and reported their HIV status.

[†] Hispanic can be of any race.

[‡] Other race includes multiple races.

[§] General educational development (GED) diploma.

[‖] Infrequent use of the internet is defined as <once a week, frequent use is defined as ≥once a week.

TABLE 2

Met the Last Sex Partner on the Internet, Men Who Have Sex With Men, NHBS, 20 Cities, United States, 2008–2014*

	2008		2011		2014			
	n	%	n	%	n	%	Unadjusted PR (95% CI)†	Adjusted PR (95% CI)‡
Overall	1424	19.1	1908	24.3	2617	32.1	1.30 (1.26 to 1.34)	1.30 (1.26 to 1.34)
Age, yrs								
18–24	338	18.0	513	22.9	583	31.5	1.33 (1.25 to 1.41)	1.30 (1.22 to 1.38)
25–29	311	21.6	399	25.3	678	35.9	1.30 (1.23 to 1.38)	1.32 (1.24 to 1.39)
30–39	414	20.2	514	28.0	733	35.3	1.32 (1.25 to 1.39)	1.32 (1.25 to 1.38)
40–49	261	17.8	331	23.1	383	29.3	1.28 (1.20 to 1.37)	1.29 (1.21 to 1.38)
≥50	100	16.6	151	19.4	240	23.5	1.19 (1.08 to 1.33)	1.22 (1.10 to 1.35)
Race								
Black	240	13.3	410	19.2	554	24.3	1.34 (1.25 to 1.44)	1.31 (1.23 to 1.41)
Hispanic§	336	17.6	508	24.3	702	32.2	1.35 (1.27 to 1.43)	1.32 (1.25 to 1.40)
White	700	22.8	833	27.4	1133	37.4	1.29 (1.24 to 1.35)	1.30 (1.25 to 1.36)
Other‖	146	22.3	153	26.4	212	34.3	1.20 (1.09 to 1.32)	1.22 (1.11 to 1.34)
Annual household income								
0–$19,999	310	13.4	512	19.8	633	24.4	1.33 (1.25 to 1.42)	1.33 (1.25 to 1.42)
$20,000–$39,999	373	19.4	484	24.5	678	33.9	1.33 (1.26 to 1.41)	1.32 (1.25 to 1.40)
$40,000–$74,999	415	23.2	495	26.7	679	34.6	1.23 (1.16 to 1.30)	1.24 (1.17 to 1.31)
$75,000 or more	309	23.7	389	29.3	589	40.0	1.30 (1.23 to 1.38)	1.32 (1.24 to 1.40)
Self-reported HIV status								
HIV positive	181	21.1	245	25.2	421	32.8	1.30 (1.25 to 1.34)	1.31 (1.27 to 1.35)
HIV negative	1104	19.4	1516	24.8	2060	32.7	1.25 (1.16 to 1.35)	1.28 (1.19 to 1.38)
HIV unknown	139	15.3	147	19.0	136	24.1	1.26 (1.12 to 1.41)	1.25 (1.12 to 1.40)
City								
Atlanta, GA	74	22.9	129	27.9	138	31.5	1.17 (1.02 to 1.34)	1.20 (1.04 to 1.38)
Baltimore, MD	64	15.7	49	13.2	109	27.0	1.35 (1.14 to 1.61)	1.34 (1.14 to 1.56)
Boston, MA	57	24.2	111	31.7	107	41.2	1.30 (1.12 to 1.52)	1.32 (1.13 to 1.53)
Chicago, IL	101	21.2	106	24.8	167	38.8	1.37 (1.22 to 1.54)	1.33 (1.19 to 1.49)

	2008		2011		2014			
	n	%	n	%	n	%	Unadjusted PR (95% CI)†	Adjusted PR (95% CI)‡
Dallas, TX	59	13.6	65	16.2	98	22.6	1.31 (1.10 to 1.55)	1.30 (1.10 to 1.54)
Denver, CO	76	17.1	116	24.2	143	34.3	1.42 (1.27 to 1.58)	1.40 (1.26 to 1.56)
Detroit, MI	40	11.8	76	18.8	110	24.8	1.42 (1.23 to 1.66)	1.41 (1.22 to 1.62)
Houston, TX	49	13.3	91	20.9	113	27.0	1.40 (1.18 to 1.67)	1.42 (1.21 to 1.68)
Los Angeles, CA	99	21.7	131	28.7	176	39.1	1.35 (1.20 to 1.51)	1.36 (1.22 to 1.52)
Miami, FL	63	13.7	117	25.8	132	28.0	1.38 (1.19 to 1.59)	1.35 (1.17 to 1.56)
Nassau-Suffolk, NY	62	29.5	75	26.3	129	45.9	1.30 (1.10 to 1.54)	1.30 (1.12 to 152)
New Orleans, LA	46	12.3	61	15.3	97	22.7	1.37 (1.19 to 1.58)	1.39 (1.21 to 1.60)
New York, NY	85	18.0	87	18.9	170	39.3	1.53 (1.35 to 1.74)	1.41 (1.25 to 1.58)
Newark, NJ	12	15.2	58	26.5	51	25.6	1.18 (0.94 to 1.48)	1.18 (0.93 to 1.49)
Philadelphia, PA	99	22.5	115	27.2	158	27.3	1.10 (0.98 to 1.22)	1.12 (1.01 to 1.25)
San Diego, CA	115	25.5	112	28.5	172	40.1	1.26 (1.15 to 1.39)	1.28 (1.15 to 1.40)
San Francisco, CA	104	25.0	114	28.7	134	42.1	1.30 (1.15 to 1.47)	1.28 (1.14 to 1.45)
San Juan, PR	55	18.0	94	30.0	140	30.6	1.26 (1.08 to 1.46)	1.26 (1.09 to 1.46)
Seattle, WA	73	23.6	72	23.3	137	32.2	1.19 (1.02 to 1.38)	1.23 (1.06 to 1.42)
Washington, DC	91	20.7	129	30.1	136	31.4	1.21 (1.09 to 1.36)	1.21 (1.09 to 1.35)

Numbers might not add to total because of missing or unknown data. Percentages might not sum to 100 because of rounding.

*Includes men who consented to and completed the survey, had a male sex partner in the past 12 months and reported their HIV status.

†Reference is 2008; PR corresponds with the interaction term with year.

‡Reference is 2008; PR corresponds to the interaction term with year; model includes year, race/ethnicity, and annual household income, and their interactions with year as fixed effects.

§Hispanic can be of any race.

//Includes MSM reporting American Indian or Alaska Native, Asian, Native Hawaiian or Pacific Islander, other race, or multiple races.

TABLE 3

Frequent Use of the Internet to Meet Men, Men Who Have Sex With Men, NHBS, 20 Cities, United States, 2008–2014 *

	2008		2011		2014			
	n	%	n	%	n	%	Unadjusted PR (95% CI)†	Adjusted PR (95% CI)‡
Overall	1821	20.6	3858	41.7	4225	43.9	1.39 (1.36 to 1.42)	1.39 (1.36 to 1.42)
Age, yrs								
18–24	333	16.7	1058	45.1	917	46.8	1.52 (1.46 to 1.59)	1.51 (1.45 to 1.58)
25–29	356	21.8	814	46.5	1064	50.5	1.43 (1.37 to 1.49)	1.44 (1.38 to 1.50)
30–39	588	23.9	1016	46.4	1177	47.4	1.36 (1.31 to 1.41)	1.36 (1.31 to 1.41)
40–49	380	20.1	657	35.1	671	39.8	1.38 (1.31 to 1.45)	1.37 (1.30 to 1.44)
≥50	164	19.2	313	28.8	396	28.4	1.18 (1.10 to 1.27)	1.18 (1.10 to 1.27)
Race								
Black	363	17.2	975	39.3	1051	39.7	1.41 (1.34 to 1.48)	1.40 (1.33 to 1.47)
Hispanic§	432	19.5	1038	43.1	1112	44.1	1.41 (1.35 to 1.47)	1.41 (1.35 to 1.47)
White	863	23.1	1553	42.4	1695	46.2	1.38 (1.34 to 1.42)	1.38 (1.34 to 1.43)
Other‖	161	21.1	286	42.6	342	46.1	1.38 (1.28 to 1.48)	1.39 (1.29 to 1.49)
Annual household income								
0–$19,999	471	18.1	1130	38.9	1172	40.2	1.40 (1.35 to 1.46)	1.40 (1.35 to 1.46)
$20,000–$39,999	475	21.4	987	43.4	1076	47.1	1.42 (1.36 to 1.48)	1.41 (1.36 to 1.47)
$40,000–$74,999	478	22.2	945	43.1	1055	45.1	1.37 (1.31 to 1.42)	1.36 (1.31 to 1.42)
$75,000 or more	370	21.4	736	42.5	872	44.5	1.38 (1.32 to 1.44)	1.39 (1.33 to 1.46)
Self-reported HIV status								
HIV positive	270	25.5	525	42.2	694	43.8	1.41 (1.37 to 1.44)	1.41 (1.38 to 1.45)
HIV negative	1359	20.2	3018	42.4	3294	44.4	1.26 (1.20 to 1.33)	1.27 (1.21 to 1.34)
HIV unknown	192	18.3	315	35.9	237	37.9	1.42 (1.31 to 1.53)	1.42 (1.32 to 1.53)
City								
Atlanta, GA	121	35.1	219	39.3	246	48.5	1.18 (1.08 to 1.30)	1.20 (1.09 to 1.32)
Baltimore, MD	75	15	127	28.4	158	31.8	1.42 (1.26 to 1.60)	1.43 (1.28 to 1.61)
Boston, MA	72	25.5	173	41.5	157	52.2	1.40 (1.27 to 1.55)	1.38 (1.25 to 1.53)
Chicago, IL	112	20	230	45.9	248	47.9	1.47 (1.36 to 1.58)	1.47 (1.37 to 1.58)

	2008		2011		2014			
	n	%	n	%	n	%	Unadjusted PR (95% CI)†	Adjusted PR (95% CI)‡
Dallas, TX	80	15.8	179	38	187	37.4	1.44 (1.31 to 1.59)	1.46 (1.33 to 1.61)
Denver, CO	108	20	245	44.9	236	45.8	1.44 (1.33 to 1.56)	1.44 (1.33 to 1.56)
Detroit, MI	60	15.5	197	42.9	222	43.4	1.48 (1.34 to 1.65)	1.50 (1.34 to 1.67)
Houston, TX	69	15.4	171	33.6	181	35.6	1.43 (1.27 to 1.61)	1.42 (1.26 to 1.60)
Los Angeles, CA	109	20.8	212	40.8	255	48.7	1.48 (1.37 to 1.59)	1.49 (1.38 to 1.61)
Miami, FL	123	23.3	241	47.8	243	45.5	1.33 (1.20 to 1.48)	1.32 (1.20 to 1.46)
Nassau-Suffolk, NY	86	30.8	140	41.3	152	45	1.20 (1.06 to 1.35)	1.17 (1.04 to 1.32)
New Orleans, LA	57	11.9	156	32	197	38.1	1.64 (1.47 to 1.83)	1.64 (1.47 to 1.84)
New York, NY	115	21	170	32.6	243	47.8	1.51 (1.39 to 1.63)	1.46 (1.34 to 1.58)
Newark, NJ	6	6.4	171	68.4	144	58.5	1.43 (1.24 to 1.66)	1.46 (1.26 to 1.69)
Philadelphia, PA	162	28.9	215	39.4	228	34.9	1.08 (1.00 to 1.18)	1.10 (1.01 to 1.19)
San Diego, CA	130	23.7	219	46.5	244	45.4	1.33 (1.22 to 1.46)	1.36 (1.24 to 1.49)
San Francisco, CA	119	24.4	224	48.2	192	49.5	1.38 (1.28 to 1.49)	1.39 (1.28 to 1.50)
San Juan, PR	61	17.3	158	43.5	216	41.9	1.41 (1.27 to 1.57)	1.43 (1.28 to 1.59)
Seattle, WA	73	20.2	199	53.6	241	47.9	1.39 (1.27 to 1.53)	1.43 (1.30 to 1.57)
Washington, DC	83	16.6	212	42.3	235	46.1	1.55 (1.42 to 1.68)	1.54 (1.41 to 1.67)

Numbers might not add to total because of missing or unknown data. Percentages might not sum to 100 because of rounding. Frequent use of the internet is defined as ≥once a week.

* Includes men who consented to and completed the survey, had a male sex partner in the past 12 months and reported their HIV status.

† Reference is 2008; PR corresponds with the interaction term with year.

‡ Reference is 2008; PR corresponds to the interaction term with year; model includes year, race/ethnicity, and annual household income, and their interactions with year as fixed effects.

§ Hispanic can be of any race.

// Includes MSM reporting American Indian or Alaska Native, Asian, Native Hawaiian or Pacific Islander, other race, or multiple races.

TABLE 4

Characteristics of Men by Frequency of Internet Use, Men Who Have Sex With Men, NHBS, 20 Cities, United States, 2014*

	Internet Usage						
	Never		Infrequent		Frequent		
	n	%	n	%	n	%	*P*
Used noninjection drugs, past 12 mo							
Yes	1510	50.5	1438	59.5	2503	59.3	<0.0001
No	1479	49.5	981	40.6	1721	40.7	
STD, past 12 mo							
Yes	234	7.8	363	15.0	750	17.8	<0.0001
No	2749	92.2	2053	85.0	3470	82.2	
Anal sex with a male without a condom, past 12 mo							
Yes	1636	54.8	1609	66.7	2955	70	<0.0001
No	1349	45.2	803	33.3	1267	30	
HIV status of last male sex partner							
Discordant	260	8.7	187	7.7	353	8.4	0.08
Concordant	1525	51.1	1333	55.2	2255	53.5	
Unknown	1200	40.2	896	37.1	1611	38.2	
Anal sex without a condom with last male sex partner by partners status							
Discordant	76	2.6	80	3.3	162	3.8	0.52
Concordant	2532	84.9	2032	84.4	3532	83.8	
Unknown	374	12.5	297	12.3	523	12.4	
Type of male sex partners, past 12 mo							
Main only	1024	34.3	395	16.3	506	12.0	<0.0001
Casual only	1118	37.4	835	34.5	1514	35.8	
Main and casual	845	28.3	1188	49.1	2205	52.2	
Exchanged sex, past 12 mo							
Yes	388	13.0	229	9.5	438	10.4	<0.0001
No	2598	87.0	2188	90.5	3786	89.6	
Tested for HIV, past 12 mo							

	Internet Usage						
	Never		Infrequent		Frequent		
	n	%	n	%	n	%	*P*
Yes	1716	57.6	1631	67.6	3011	71.4	<0.0001
No	1264	42.4	782	32.4	1209	28.7	
HIV test result[†]							
Positive	673	24.9	437	20.0	781	20.1	<0.0001
Negative	2025	75.1	1745	80.0	3097	79.9	
	Mean/Median		**Mean/Median**		**Mean/Median**		
No. of male sex partners, past 12 mo							
Mean (range)	6.1 (1–1000)		7.5 (1–500)		14.2 (1–1000)		<0.0001
Median (IQR)	2 (1–4)		4 (2–7)		5 (3–12)		<0.0001
No. of casual male anal sex partners with inconsistent condom use, past 12 mo							
Mean (range)	1.1 (0–500)		1.8 (0–500)		3.5 (0–320)		<0.0001
Median (IQR)	0 (0–0)		0 (0–1)		0 (0–2)		<0.0001

Numbers might not add to total because of missing or unknown data. Percentages might not sum to 100 because of rounding.

[*] Includes men who consented to and completed the survey, had a male sex partner in the past 12 months and reported their HIV status.

[†] Limited to those with a valid HIV test result in NHBS.