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High HIV incidence and prevalence and associated factors among young MSM, 2008

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Abstract

Objective—To estimate HIV prevalence, annual HIV incidence density, and factors associated with HIV infection among young MSM in the United States.

Design—The 2008 National HIV Behavioral Surveillance System (NHBS), a cross-sectional survey conducted in 21 US cities.

Methods—NHBS respondents included in the analysis were MSM aged 18–24 with a valid HIV test who reported at least one male sex partner in the past year. We calculated HIV prevalence and estimated annual incidence density (number of HIV infections/total number of person-years at risk). Generalized estimating equations were used to determine factors associated with testing positive for HIV.

Results—Of 1889 young MSM, 198 (10%) had a positive HIV test; of these, 136 (69%) did not report previously testing HIV positive when interviewed. Estimated annual HIV incidence density was 2.9%; incidence was highest for blacks. Among young MSM who did not report being HIV infected, factors associated with testing HIV positive included black race; less than high school education; using both alcohol and drugs before or during last sex; having an HIV test more than 12 months ago; and reporting a visit to a medical provider in the past year.

Conclusion—HIV prevalence and estimated incidence density for young MSM were high. Individual risk behaviors did not fully explain HIV risk, emphasizing the need to address sociodemographic and structural-level factors in public health interventions targeted toward young MSM.

Keywords

HIV seroprevalence; MSM; risk factors; sexual behaviors; young adult

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Conflicts of interest

There are no conflicts of interest.

Introduction

More than 30 years since the first reported cases of AIDS, HIV infection continues at epidemic proportions in the United States. The Centers for Disease Control and Prevention (CDC) estimates that approximately 50 000 new HIV infections occur each year and 1.2 million Americans are living with HIV [1,2]. Young MSM remain disproportionately affected by HIV, and this disparity continues to grow. Based on incidence surveillance, between 2006 and 2009, there was a 21% increase in new infections for people aged 13–29 years, driven by a 34% increase among MSM in this age group. This risk was especially notable for young MSM from minority racial or ethnic groups. During 2006 and 2009, there were more new HIV infections among young, black MSM than among any other age or racial group of MSM and there was a 48% increase over this time period in HIV incidence for this population. Among Hispanic MSM, the largest number of new infections occurred among 13–29-year-olds [2].

The burden of undiagnosed infection is particularly high for young MSM. MacKellar *et al.* [3] found that 77% of HIV-infected 15–29-year-old MSM (and 91% of HIV-infected young black MSM) tested in six US cities were unaware of their infection. Increasing the percentage of HIV-infected persons who are aware of their serostatus is a central tenet of HIV prevention and care, as persons who know that they are HIV infected can implement behavioral changes and begin clinical treatment that optimize clinical outcomes and reduce the risk of transmission to others [4–6].

The research to date highlights the growing burden of HIV on young MSM, particularly young, minority MSM. Although estimates of HIV incidence are an essential element for monitoring the epidemic, estimates of HIV incidence rates among young MSM in the United States remain limited. Data from HIV case surveillance can provide an estimate of the number of incident infections among this population; however, as the size of the population of young MSM is difficult to assess, these data cannot be used to calculate an incidence rate.

In addition, the characteristics and behaviors associated with HIV infection and diagnosis in this population require further investigation. Previous studies have identified individual-level factors that put young MSM at increased risk for acquiring HIV [7,8]. However, individual-level risk behaviors have not adequately explained the HIV-related racial disparities between black and white MSM [9,10]. Although partner-level factors may partially explain disparities, there has been limited research on the role of partner characteristics and relationship dynamics in young MSM's risk for HIV [8]. Moreover, sociocultural and structural determinants of health, including community, political, educational, and economic factors are now understood to play a role in HIV risk [11].

In this study, we used data from the second round of the National HIV Behavioral Surveillance System (NHBS) among MSM (NHBS-MSM2), conducted during 2008, to estimate HIV prevalence, annual HIV incidence density, and factors associated with being HIV-infected among MSM aged 18–24 years.

Methods

National HIV Behavioral Surveillance System

NHBS conducts surveys and HIV testing in populations at risk of HIV infection, including MSM, injection drug users, and heterosexuals at increased risk of infection [12]. NHBS-MSM2 was conducted in 21 metropolitan statistical areas (MSAs), selected based on a high number of people living with AIDS (Atlanta, Georgia; Baltimore, Maryland; Boston, Massachusetts; Chicago, Illinois; Dallas, Texas; Denver, Colorado; Detroit, Michigan; Houston, Texas; Los Angeles, California; Miami, Florida; Nassau, New York; Newark, New Jersey; New Orleans, Louisiana; New York City, New York; Philadelphia, Pennsylvania; San Diego, California; San Francisco, California; San Juan, Puerto Rico; Seattle, Washington; St. Louis, Missouri; and Washington, District of Columbia.). MSM were recruited using venue-based, time-space sampling [13]. Activities included formative research to identify venues and times to recruit MSM [14]; development of sampling frames of eligible venues and day-time periods; random selection of venues and day-time periods; and recruitment, interviewing, and testing during sampled events.

The eligibility criteria included being male, at least 18 years of age, a resident of the MSA, able to complete the survey in English or Spanish, and able to provide informed consent. Trained interviewers used handheld computers to administer a standardized questionnaire. Anonymous HIV testing was offered to all participants regardless of self-reported HIV infection status. NHBS project sites could choose to collect blood or oral specimens for either conventional laboratory testing or rapid testing in the field followed by laboratory confirmation. As blood-based testing is more sensitive than oral fluid testing for detecting early HIV infection, the variation in the use of oral or blood specimens may have had a small impact on HIV prevalence estimates [15]. Activities for NHBS-MSM2 were approved by the local institutional review boards for each participating MSA.

Data analysis

Participants were included in this analysis if they had a completed, valid survey; reported at least one male sex partner in the past 12 months; had a positive or negative HIV test result, and were aged 18–24 years. Results are unweighted.

First, we described sociodemographic characteristics and behaviors of young MSM. Next, we derived estimates of annual HIV incidence density [16] by including the number who tested positive for HIV infection as the numerator and the total number of person-years at risk as the denominator. Person-years at risk was calculated by subtracting age at first anal sex with a man from first positive HIV test (for persons who reported having previously been diagnosed with HIV infection) or current age minus age at first anal sex with a man (for all others). Age at first sex with a man was derived from a single question that asked respondents how old they were the first time they had oral or anal sex with a man. The minimum value for age at first sex with a man was set as 11 years. Because oral sex confers low risk for HIV acquisition and it has been demonstrated that, among young MSM, first oral sex precedes first anal sex by approximately 1.5 years [17–19], we adjusted age at first sex by 1.5 years for all respondents to reflect estimated age at first anal sex. Using this

method, we calculated estimated annual incidence density for the entire group, as well as by each racial/ethnic group (white, black, Hispanic, other) and US census region (Boston, Nassau, New York City, Newark, Philadelphia = Northeast; Baltimore, Atlanta, Dallas, Houston, Miami, New Orleans = South, Chicago, Detroit, St Louis = Midwest; Denver, Los Angeles, San Francisco, Seattle, San Diego = West; San Juan = US Territories). We used the Wilcoxon–Mann–Whitney nonparametric test to compare the distributions of continuous variables (current age and age at first anal sex with a man).

We also described select characteristics of the most recent sexual encounter among young MSM, stratified by whether that partner was considered a main partner [a man with whom the participant had sex and to whom he felt most committed (e.g. boyfriend, spouse, significant other, or life partner)] or a casual partner (a man with whom the participant had sex but to whom he did not feel committed or whom he did not know very well, or with whom the participant had sex in exchange for things like money or drugs). We computed likelihood ratio square tests to determine statistically significant differences ($P < 0.05$) between main and casual partners.

Finally, in order to identify risk factors that may contribute to HIV acquisition among young MSM, we excluded those who reported being previously diagnosed with HIV and determined the proportion who tested positive during NHBS overall and by sociodemographic characteristics and behaviors. We first created univariable generalized estimating equations, clustered on MSA of interview, to determine factors that were associated with testing positive for HIV. We then created a multivariable model that included all factors associated with HIV infection at P less than 0.1 level in the univariable models as well as age, annual household income, and sexual identity. When examining how HIV infection varied by region, we did not cluster on MSA of interview for the univariate results as this produced imprecise estimates and we did not include region in the multivariable model because clustering was already accounted for by MSA.

Results

In total, 28 468 persons were approached for participation at 626 venues; 12 474 (44%) persons were screened for participation, 11 074 (89%) of whom were eligible for the survey. A total of 1400 were not eligible: 1138 lived outside the MSA, 45 were aged less than 18 years, 71 were previous participants, 91 did not identify themselves as men, and 83 were not able to provide their consent to the survey (e.g. men who were intoxicated or who did not speak either English or Spanish well); exclusion categories were not mutually exclusive. Among the persons who were eligible, 10 645 (86%) completed the survey with valid responses. Of these, 9342 (88%) consented to HIV testing and had a valid test result, 8153 (87%) of whom reported male–male sex during the past 12 months. Of these, 1889 (23%) were aged 18–24 years and are included in this analysis. There were 203 individuals who were aged 18–24 years and eligible for the study who were excluded from this analysis because they did not have a complete survey or a valid HIV test result. Those excluded were more likely to be non-Hispanic black ($P = 0.009$).

Mean age was 21.4 years. Of the young men, 36% identified as non-Hispanic black, 29% as Hispanic, and 27% as non-Hispanic white (Table 1). Most (90%) young men reported completing at least a high school degree and almost half (47%) reported less than $20 000 in annual household income. The majority (76%) of young men identified as gay or homosexual. Most (65%) of the young men were recruited in bars and dance clubs.

During the past 12 months, almost half (46%) of participants reported using marijuana, over a quarter reported using stimulants [cocaine, ecstasy, poppers (amyl nitrate), or methamphetamine], whereas few (2%) reported injection drug use. A majority of participants had health insurance (60%), visited a healthcare provider during the past 12 months (75%), and reported being tested for HIV during the past 12 months (67%).

Mean age of estimated anal sexual debut with a male partner was 17.8 years (interquartile range, 16.5–19.5). Both current age of participant and age at first anal sex with a man were highest for whites. Of 1889 young MSM, 198 (10.5%) had a positive HIV test; 6.2% of whites, 16.5% of blacks, 6.9% of Hispanics, and 11.0% of MSM of other races tested positive for HIV infection. Overall, the estimated annual HIV incidence density was 2.9%. Incidence was 1.6% for whites, 5.1% for blacks, 1.9% for Hispanics, and 2.9% for MSM of other races (Table 2). By region, the incidence was 3.0% in cities in the Northeast, 3.8% in cities in the South, 3.0% in cities in the Midwest, 1.8% in cities in the West, and 1.2% in city of San Juan the US Territory of Puerto Rico.

Table 3 presents characteristics of the most recent sexual encounter with a man, stratified by whether he was a main or casual partner. Of all young MSM, 956 (52%) reported that their last partner was a main partner, and 870 (48%) a casual partner. Forty-two percent of casual partners compared to 31% of main partners were 5 or more years older. Forty-eight percent of casual partners and 23% of main partners were of unknown HIV status. Nineteen percent of main partnerships and 62% of casual partnerships were less than 3 months in duration. Concurrent sexual relationships were more likely to occur with casual partners. Among men with casual partners, 51% reported that during the time that they were having a sexual relationship with their last partner, they were also having sex with other people and 62% reported that their most recent partner definitely or probably had sex with other people during the same time. For men with main partners, the percentages were 28 and 29, respectively. Young MSM were significantly more likely to report anal sex or unprotected anal sex with a main partner and less likely to report use of drugs or alcohol with main partners, compared with their casual partners.

To identify risk factors that may contribute to HIV acquisition among young MSM, we excluded those who reported being previously diagnosed with HIV and analyzed characteristics associated with being HIV-infected in the remaining sample (Table 4). Of these, 136 (7.4%) young MSM tested positive for HIV infection. In multivariable analysis, young MSM were less likely to be HIV infected if they were of ages 18–19 [adjusted prevalence ratio (aPR) 0.39, confidence interval (CI) 0.22–0.70] compared to ages 23–24. Young MSM were more likely to be HIV infected if they were black (aPR 3.08, 95% CI 1.89–5.00) or of other race/ethnicity (aPR 2.02, CI 1.06–3.86) compared to white; had less than a high school degree (aPR 1.87, CI 1.08–3.23) compared to some college or more; used

both alcohol and drugs before or during last sex (aPR 1.97, 95% CI 1.20–3.55); had their most recent HIV test more than 12 months ago (aPR 1.57, CI 1.18–2.10) compared to less than 12 months ago; or reported a visit to a medical provider in the past 12 months (aPR 1.84, CI 1.21–2.81).

Of the 136 young MSM who were HIV infected, 16 (11%) had never been tested, 32 (24%) had their most recent test more than 12 months ago, and 87 (64%) had been tested in the past 12 months.

Discussion

HIV prevalence and estimated annual incidence density for young MSM were high. These findings were particularly pronounced for young black MSM, who had an HIV prevalence of 16.5% and an estimated annual incidence of 5.1%. This is comparable to the 5.9% HIV incidence found among 18–30-year-old black MSM in a recent longitudinal study conducted in six cities [20] and the 6.4% incidence found among a young sample of black MSM enrolled in a prospective HIV/STI incidence cohort study in Atlanta [21]. The similarity of these cohort study HIV incidence estimates to the incidence density calculated for the current study provides validation for an approach to estimating incidence that is less complex and more cost-effective.

The high prevalence and estimated annual incidence density among MSM aged 18–24 in our study underscores the need for this group to be considered a priority for HIV prevention. CDC currently recommends the use of a High-Impact Prevention approach to reduce new HIV infections. This approach uses a combination of targeted, scientifically proven interventions that are cost-effective and scalable [22]. For young MSM, this would include reaching the population with proven approaches such as condom distribution and behavioral interventions before they become infected [8,23]. In addition, it is imperative to implement effective strategies among HIV-infected young MSM to prevent transmission of HIV to others [8]. We found that one-third of sexually active young MSM had not been tested in the past 12 months; this suggests that efforts to improve the uptake of current CDC recommendations [24] that all sexually active MSM test for HIVat least annually, need to be expanded. However, the proportion reporting testing for HIV in the past year is higher than for MSM of other age groups [25]. Even among those young MSM who were HIV infected at the time of interview, 41% reported a negative HIV test result in the past year, supporting previous data suggesting that more frequent testing, such as every 3–6 months, of some groups of MSM may be warranted [26].

Similar to previous research [27–30], our analysis found that young MSM were more likely to have unprotected anal intercourse (UAI) with a main partner than a casual partner. This pattern may be linked to characteristics of main partnerships, such as greater trust and familiarity, the perception that condoms interfere with intimacy, and in some cases, a representation of relationship power differentials [29,31,32]. We also found that almost half of relationships with main partners were less than 6 months in duration. This is consistent with other studies [29,33] suggesting a tendency for serial monogamy among young MSM, increasing the likelihood of main partner change. The short duration of relationships

combined with the higher occurrence of UAI could substantially increase HIV risk. Studies have suggested that the majority of HIV transmissions among MSM, and particularly young MSM, occur between main partners [33,34]. Our findings support the continuing examination of the association between partnership characteristics and HIV risk and suggest the importance of developing relationship-level HIV prevention interventions for young MSM.

Whereas UAI was more common with main partners, those who had a casual partner were more likely to use drugs or alcohol before or during the last sexual encounter, and an association was found between combined drug and alcohol use and being HIV infected. Although not examined in this analysis, previous research has found a relationship between the use of drugs and alcohol and sexual risk-taking [7,8]. Together, these findings emphasize the need for HIV prevention strategies aimed at young MSM to address the association between substance use and sexual risk-taking [7].

A high percentage of young men with casual partners reported that their partner had concurrent sexual relationships. Although research on concurrency among MSM is rare [35,36], mathematical modeling studies have suggested that differential rates of concurrency across populations may explain population differences in HIV prevalence, as well as racial disparities in HIV observed within the United States [37–40].

We also found that sociodemographic variables (including race and education status) were more strongly associated with HIV infection than were individual risk behaviors, emphasizing the continued need to look beyond individual-level factors to explain disparities in HIV infection [9,10]. Likewise, interventions focusing on individual behaviors need to be paired with community-level interventions that raise awareness about HIV and improve the community response to the epidemic; structural interventions that address social and economic disparities of HIV infection are also needed. As there remains a dearth of HIV prevention interventions targeting young MSM [41], it is imperative that future efforts be directed toward developing, testing, and implementing efficacious interventions for this population.

Among respondents who did not previously report being HIV infected, those who tested HIV positive during NHBS were more likely than those who tested HIV negative to have seen a healthcare provider in the past year. It is possible that some of these individuals saw a healthcare provider for symptoms related to their HIV infection or another sexually transmitted disease (STD), but were not offered HIV testing as part of their visit. A goal of the National HIV/AIDS Strategy is to increase the proportion of persons who are aware of their status [42], and CDC recommends HIV screening as part of regular healthcare in clinical settings [24].

This study has several limitations. First, participants were recruited at venues in 21 US cities with high AIDS prevalence and are not representative of all young MSM. Second, the data in this study are not weighted to account for variations in venue attendance or likelihood of being selected to participate in the survey. Third, because of the sensitive nature of HIV status, some participants who had previously been diagnosed with HIV infection may not

have reported their positive HIV status, resulting in their inclusion in the analysis presented in Table 4. Fourth, all of our survey data were self-reported and may, therefore, have associated biases. Finally, our calculations of estimated annual incidence density are likely an under-estimate. Because we do not have the actual date of seroconversion, we calculated person-years at risk using the date of first positive HIV test. This likely inflates the denominator for this calculation and results in our estimate being a conservative one.

Conclusion

Given the complexity of factors associated with HIV infection among young MSM, the use of High-Impact Prevention holds promise as a way to implement a multifaceted approach that addresses HIV testing, care and treatment services for HIV and other STDs, prevention with persons already diagnosed with infection, and prevention among persons at greatest risk for HIV infection. As individual behaviors do not fully explain HIV risk, sociodemographic and structural-level factors need to be incorporated in public health interventions targeted toward young MSM.

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Table 1

Selected characteristics of young men who have sex with men, National HIV Behavioral Surveillance System, 2008

Characteristic	*N*	%
Age (years)		
18	181	10
19	242	13
20	193	10
21	319	17
22	312	16
23	340	18
24	302	16
Race/ethnicity		
Black, not Hispanic	678	36
White, not Hispanic	503	27
Hispanic	552	29
Asian, Native Hawaiian/Pacific Islander/American Indian/Alaska Native	51	2
Other[a]	104	6
Education		
Less than high school graduate	190	10
High school diploma or equivalent	688	36
Some college or technical college, college degree or higher education	1011	54
Annual household income		
0 to $19 999	899	47
$20000 to $39 999	485	26
$40000 or more	505	27
Region[b]		
Northeast	336	18
South	711	37
Midwest	358	19
West	376	20
US Territories	108	6
Sexual identity		
Homosexual	1439	76
Bisexual	426	23
Heterosexual	21	1
Age at first male–male anal sex[c]		
≤14	314	16
15–16	313	16
17–18	604	32
≤19	658	35

Characteristic	*N*	%
Marijuana use, past 12 months		
No	1015	54
Yes	873	46
Stimulant use, past 12 months[d]		
No	1375	73
Yes	513	27
Injection drug use, past 12 months		
No	1859	98
Yes	30	2
Health insurance		
No	743	40
Yes	1121	60
Visited provider, past 12 months		
No	475	25
Yes	1411	75
Most recent HIV test		
Never	307	16
More than 12 months	326	17
Less than or equal to 12 months	1251	67
Participated in an individual or group HIV behavioral intervention, past 12 months		
No	1376	73
Yes	513	27
HIV test results		
Positive, self-reported positive	62	3
Positive, did not self-report positive	136	7
Negative	1691	90
Recruitment venue		
Bar	655	35
Dance club	573	30
Social organization	235	12
Café or restaurant, retail business, fitness club or gym	136	7
Street location, park, or beach	84	4
Sex establishment or environment	77	4
Gay Pride or a similar event	44	2
Other	85	6
Total	1889	100

Numbers might not add to total because of missing data.

[a]Includes persons who indicated multiple races or other race.

[b]Boston, Nassau, New York City, Newark, Philadelphia = Northeast; Baltimore, Atlanta, Dallas, Houston, Miami, New Orleans = South; Chicago, Detroit, St Louis = Midwest; Denver, Los Angeles, San Francisco, Seattle, San Diego = West; San Juan = US Territories.

[c] Respondents were asked about age at first oral or anal sex with a man. Because first oral sex precedes first anal sex by approximately 1.5 years [16–18], we adjusted age at first sex by 1.5 years to reflect estimated age at first anal sex.

[d] Cocaine, ecstasy, poppers (amyl nitrate), or methamphetamine.

Table 2

Current age, age at start of anal intercourse, and estimated annual HIV incidence density among young MSM, National HIV Behavioral Surveillance System, 2008

	All *n* = 1889	White, not Hispanic *n* = 503	Black, not Hispanic *n* = 678	Hispanic *n* = 552	Other[a] *n* = 155	*P* value
Current age (mean)	21.4	22.0	20.9	21.2	21.7	<0.0001
Age at first male–male anal sex[b] (mean)	17.8	18.1	17.6	17.6	17.9	0.001
No. HIV positive	198	31	112	38	17	NA
% HIV positive	10.5	6.2	16.5	6.9	11.0	<0.0001
No. person-years at risk	6746.5	1959.5	2212.0	1988.5	583.0	NA
Estimated HIV incidence density	2.9	1.6	5.1	1.9	2.9	NA

NA, not applicable.

[a]Includes persons who indicated American Indian/Alaska Native, Asian, Native Hawaiian/Pacific Islander, multiple races, or other race.

[b]Respondents were asked about age at first oral or anal sex with a man. The minimum value for age at first sex with a man was set as 11 years. Because oral sex confers low risk for HIV acquisition and it has been demonstrated that, among young MSM, first oral sex precedes first anal sex by approximately 1.5 years [16–18], we adjusted age at first sex by 1.5 years to reflect estimated age at first anal sex.

Table 3

Characteristics of most recent sexual encounter with a male partner, young MSM, National HIV Behavioral Surveillance System, 2008

	Main partner[a] (*n* = 956)		Casual partner[b] (*n* = 870)		
Characteristic	**No.**	**%**	**No.**	**%**	***P* value**
Partner was 5 or more years older					<0.0001
No	662	69	506	58	
Yes	293	31	362	42	
Partner's HIV status					<0.0001
HIV positive	25	3	10	1	
HIV negative	700	74	435	51	
Unknown	223	23	416	48	
Where met this partner					<0.0001
Internet	140	16	163	19	
Bar/club	266	30	313	37	
Circuit party/rave or private sex party	30	3	14	2	
Public sex environment[c]	33	4	72	9	
Other	413	47	273	33	
Length of sexual relationship					<0.0001
Less than 3 months	184	19	513	62	
3–6 months	256	27	111	13	
7–12 months	260	27	128	15	
More than 12 months	255	27	78	10	
Participant had a concurrent sexual relationship					<0.0001
No	686	72	400	49	
Yes	269	28	420	51	
Partner had a concurrent sexual relationship					<0.0001
Definitely or probably no	658	69	245	29	
Definitely or probably yes	277	29	511	62	
Do not know	20	2	74	9	
Anal sex					<0.0001
No	102	11	217	25	
Yes, insertive only	333	35	252	29	
Yes, receptive only	272	28	256	29	
Yes, both insertive and receptive	248	26	145	17	
Unprotected anal sex					<0.0001
No	536	56	666	77	
Yes, insertive only	161	17	74	9	
Yes, receptive only	135	14	90	10	
Yes, both insertive and receptive	123	13	39	4	
Alcohol or drugs before or during last sex					<0.0001

Characteristic	Main partner[a] (*n* = 956) No.	%	Casual partner[b] (*n* = 870) No.	%	*P* value
No	703	74	455	53	
Alcohol only	176	18	272	31	
Drugs only	39	4	45	5	
Alcohol and drugs	38	4	98	11	

[a] A man with whom the participant had sex and to whom he felt most committed (e.g. boyfriend, spouse, significant other, or life partner).

[b] Aman with whom the participant had sex but to whom he did not feel committed or whom he did not know very well or with whom the participant had sex in exchange for something such as money or drugs.

[c] Cruising area, adult bookstore, bath house, sex club, or sex resort.

Table 4

Characteristics associated with being HIV infected[a] among young MSM who did not self-report being HIV positive, National HIV Behavioral Surveillance System, 2008

Characteristic	Total (*n*)	HIV-infected (*n*)	(%)	PR (95% CI)	aPR[b] (95% CI)	*P* value
Age (years)						
18–19	416	21	5.0	0.60 (0.33–1.09)	0.39 (0.22–0.70)	0.002
20–22	790	63	8.0	0.95 (0.66–1.37)	0.73 (0.47–1.13)	0.16
23–24	621	52	8.4	1.00	1.00	
Race/ethnicity						
Black, not Hispanic	644	78	12.1	3.30 (2.14–5.08)	3.08 (1.89–5.00)	<0.0001
Hispanic	542	28	5.2	1.41 (0.68–2.90)	1.45 (0.69–3.04)	0.32
Other[c]	150	12	8.0	2.18 (1.13–4.19)	2.02 (1.06–3.86)	0.03
White, not Hispanic	490	18	3.7	1.00	1.00	
Education						
Less than high school graduate	180	19	10.6	1.56 (1.06–2.30)	1.87 (1.08–3.23)	0.02
High school diploma or equivalent	663	60	9.0	1.82 (1.18–2.82)	1.68 (0.97–2.91)	0.06
Some college or technical college, college degree or higher education	984	57	5.8	1.00	1.00	
Region[d]						
Northeast	328	29	8.8	2.46 (1.32–4.59)	___ [e]	–––
South	682	63	9.2	2.57 (1.43–4.64)	–––	–––
Midwest	347	27	7.8	2.17 (1.12–4.19)	–––	–––
US Territories	108	4	3.7	1.03 (0.34–3.13)	–––	–––
West	362	13	3.6	1.00	–––	–––
Sexual identity						
Bisexual or heterosexual	439	41	9.3	1.36 (0.97–1.90)	1.14 (0.85–1.53)	0.35
Homosexual or gay	1385	95	6.9	1.00	1.00	
Unprotected anal sex with male partner, past 12 months						
Yes	978	75	7.1	0.90 (0.52–1.56)	–––	–––
No	713	61	7.9	1.00	–––	–––
At least one main partner, past 12 months[f]						
Yes	1359	99	7.3	0.92 (0.64–1.33)	–––	–––
No	468	37	7.9	1.00	–––	–––
At least one casual partner, past 12 months[g]						
Yes	1273	99	7.8	1.16 (0.85–1.60)	–––	–––
No	554	37	6.7	1.00	–––	–––
Incarceration, past 12 months[h]						

Characteristic	Total (*n*)	HIV-infected (*n*)	(%)	PR (95% CI)	aPR[b] (95% CI)	*P* value
Yes	153	20	13.1	1.89 (1.15–3.09)	1.13 (0.64–1.99)	0.66
No	1674	116	6.9	1.00	1.00	
Alcohol or drugs before or during last sex						
No	1158	84	7.3	1.00	1.00	
Alcohol only	448	26	5.8	0.80 (0.56–1.14)	0.89 (0.62–1.26)	0.49
Drugs only	84	6	7.1	0.98 (0.40–2.41)	0.96 (0.40–2.29)	0.93
Alcohol and drugs	136	20	14.7	2.03 (1.15–3.56)	1.97 (1.20–3.55)	0.02
Last sexual partner was 5 or more years older						
Yes	655	39	6.0	0.72 (0.49–1.05)	0.71 (0.44–1.15)	0.15
No	1168	97	8.3	1.00	1.00	
Where met last sexual partner						
Internet	303	19	6.3	0.83 (0.46–1.47)	0.96 (0.57–1.63)	0.89
Bar/club	579	37	6.4	0.84 (0.60–1.19)	0.91 (0.64–1.29)	0.58
Circuit party/rave or private sex party	44	2	4.5	0.60 (0.16–2.24)	0.59 (0.14–2.48)	0.47
Public sex environmen[i]	105	13	12.4	1.63 (0.94–2.85)	1.33 (0.70–2.53)	0.38
Other	686	52	7.6	1.00	1.00	
Health insurance						
No	718	61	8.5	1.24 (0.72–2.13)	– – –	– – –
Yes	1084	74	6.8	1.00	– – –	– – –
Visited provider, past 12 months						
Yes	1349	112	8.3	1.64 (1.17–2.30)	1.84 (1.21–2.81)	0.006
No	475	24	5.1	1.00	1.00	
Most recent HIV test						
Never	307	16	5.2	0.73 (0.43–1.24)	0.88 (0.56–1.38)	0.56
More than 12 months	296	32	10.8	1.52 (1.14–2.02)	1.57 (1.18–2.10)	0.003
Less than or equal to 12 months	1220	87	7.1	1.00	1.00	
Participated in an individual or group HIV behavioral intervention, past 12 months						
No	1347	90	6.7	0.70 (0.46–1.06)	0.72 (0.48–1.08)	0.11
Yes	480	46	9.6	1.00	1.00	
Total	1827	136	7.4			

Numbers might not add to total because of missing data. aPR, adjusted prevalence ratio; CI, confidence interval; PR, prevalence ratio.

[a] Excludes men who reported being HIV positive during the interview.

[b] Adjusted for all variables in this column. Utilized generalized estimating equations and accounted for clustering by city of interview. $N = 1803$.

[c] Includes persons who indicated American Indian/Alaska Native, Asian, Native Hawaiian/Pacific Islander, multiple races or other race.

[d] Boston, Nassau, New York City, Newark, Philadelphia = Northeast; Baltimore, Atlanta, Dallas, Houston, Miami, New Orleans = South; Chicago, Detroit, St Louis = Midwest; Denver, Los Angeles, San Francisco, Seattle, San Diego = West; San Juan = US Territories.

[e] Region was not included as the multivariable model already controlled for differences at the metropolitan statistical area (MSA) level.

[f] A man with whom the participant had sex and to whom he felt most committed (e.g. boyfriend, spouse, significant other, or life partner).

[g] A man with whom the participant had sex but to whom he did not feel committed or whom he did not know very well or with whom the participant had sex in exchange for something such as money or drugs.

[h] Held in a detention center, jail, or prison, for more than 24 h.

[i] Cruising area, adult bookstore, bath house, sex club, or sex resort.