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Sex Practices by HIV Awareness and Engagement in the Continuum of Care Among MSM: A National HIV Behavioral Surveillance Analysis in 21 U.S. Cities

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Abstract

Using National HIV Behavioral Surveillance (NHBS) cross-sectional survey and HIV testing data in 21 U.S. metropolitan areas, we identify sex practices among sexually active men who have sex with men (MSM) associated with: (1) awareness of HIV status, and (2) engagement in the HIV care continuum. Data from 2008, 2011, and 2014 were aggregated, yielding a sample of 5079 sexually active MSM living with HIV (MLWH). Participants were classified into HIV status categories: (1) unaware; (2) aware and out of care; (3) aware and in care without antiretroviral therapy (ART); and (4) aware and on ART. Analyses were conducted examining sex practices (e.g. condomless sex, discordant condomless sex, and number of sex partners) by HIV status.

Approximately 30, 5, 10 and 55% of the sample was classified as unaware, aware and out of care, aware and in care without ART, and aware and on ART, respectively. Unaware MLWH were more likely to report condomless anal sex with a last male partner of discordant or unknown HIV status (25.9%) than aware MLWH (18.0%, p value < 0.0001). Unaware MLWH were 3 times as likely to report a female sex partner in the prior 12 months as aware MLWH (17.3 and 5.6%, p -value < 0.0001). When examining trends across the continuum of care, reports of any condom-less anal sex with a male partner in the past year (ranging from 65.0 to 70.0%), condomless anal sex with a male partner of discordant or unknown HIV status (ranging from 17.7 to 21.3%), and median number of both male and female sex partners were similar. In conclusion, awareness of HIV and engagement in care was not consistently associated with protective sex practices, highlighting the need for continued prevention efforts.

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Disclaimer The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

Compliance with Ethical Standards

Conflict of interest The authors have no conflicts of interest.

Ethical Approval All NHBS survey procedures were approved by the Institutional Review Boards and were in accordance with the ethical standards of each of the 21 participating metropolitan statistical areas (MSAs).

Informed Consent Informed consent was obtained from all individual participants included in the study.

Keywords

Human immunodeficiency virus (HIV); HIV care continuum; Men who have sex with men (MSM); Men who have sex with men and women (MSMW); Sex practices

Introduction

In 2015, sexual transmission of HIV among gay, bisexual, and other men who have sex with men (MSM) accounted for an estimated 67% of new diagnoses in the United States (based on preliminary data) [1]. As such, reducing HIV acquisition and transmission among this high-risk population represents a key public health priority.

Common behavioral prevention practices include condom use, abstinence, oral sex only, and serosorting. While condom use has been demonstrated to reduce risk of HIV transmission [2, 3], condoms are often incorrectly and/or inconsistently used [4]. Serosorting (i.e. selecting a sex partner assumed to be of the same HIV serostatus to reduce risk of acquiring or transmitting HIV) is used as a prevention strategy; however, estimates of its effectiveness in reducing HIV incidence are varied [5, 6]. Current biomedical prevention strategies include viral suppression for people with living with HIV (use of anti-retroviral therapy (ART) to reduce HIV viral load and subsequent risk of transmission) and pre-exposure prophylaxis (PrEP) (daily use of HIV medications among those at risk of acquiring HIV to prevent infection), both of which have clinically demonstrated high efficacy [7–9].

Previous studies have found that sex practices among MSM vary based on awareness of HIV status and stage of HIV disease, with many indicating that knowledge of HIV-positivity reduces risky sex practices (e.g. condomless anal sex) [4, 10–12]. However, little is known about how sex practices vary as MSM living with HIV (MLWH) move along the HIV care continuum (i.e., diagnosis, engagement in care, and treatment). Understanding the prevalence of risky sex practices among MLWH along the HIV care continuum can directly inform the development of tailored HIV prevention efforts. Additionally, current research indicates that MSM who also have sex with women (MSMW) may potentially contribute substantially to HIV transmission among heterosexual women [13–15]. Better understanding of both the prevalence and characteristics of sex with female partners is needed to inform the limited body of literature on this topic and potential interventions.

Using National HIV Behavioral Surveillance (NHBS) data for MSM, we examined sex practices by: (1) HIV awareness status (unaware vs. aware MLWH), and (2) engagement in the HIV care continuum (among aware MLWH, stratified by care and ART status). Specifically, we report the percentage engaged in selected sex practices and the annual number of male and female sex partners.

Methods

National HIV Behavioral Surveillance (NHBS)

NHBS conducts surveying and HIV testing in three populations at risk for HIV acquisition: MSM, persons who inject drugs, and heterosexuals at high risk for HIV infection. Survey

populations are annually rotated such that each population is surveyed every 3 years. From 2008 through 2014, sampling occurred in up to 21 metropolitan statistical areas (MSAs) with a high prevalence of stage 3 HIV disease (AIDS). Inclusion criteria for participation in NHBS among MSM were: male, self-reported sex with a male (ever), 18 years age, MSA resident, ability to complete the survey in English or Spanish, and provision of informed consent. MSM participants were recruited using venue-based, time-space sampling as described in prior publications [16, 17]. Briefly, recruitment activities included: (1) formative research to identify venues and optimal times to recruit MSM; (2) development of sampling frames of eligible venues and time periods; (3) random selection of venues and day-time periods; and (4) recruitment, administration of a standardized anonymous questionnaire, and HIV testing during sampled events. HIV testing was based on blood or oral specimens using laboratory testing or rapid testing in the field followed by laboratory confirmation. Based on locally determined rates, participants received compensation separately for the interview and HIV testing components of the study. NHBS was determined to be non-engaged research by the Centers for Disease Control and Prevention (CDC) and was approved by the Institutional Review Boards for each MSA.

Data and Measures

Data from MSM surveying conducted in 2008, 2011, and 2014 were aggregated for the present analysis ($n = 27,414$). Only those participants with a valid positive HIV test result were included ($n = 5935$). Additionally, to focus on those MSM who pose a potential transmission risk, only those MLWH who reported having a male anal sex partner in the prior 12 months were included ($n = 5079$). Sexually active MLWH were then classified into 1 of 4 categories: (1) unaware of HIV-positivity; (2) aware, out of care; (3) aware, in care without ART; and (4) aware, in care on ART. Those who self-reported that they were uninfected or unsure of their status but had a positive HIV test as part of NHBS were classified as 'MLWH, unaware'. Engagement in care was defined as having received HIV care in the 6 months prior to being interviewed. Current ART use was self-reported at the time of the interview.

For the present analysis, sex was defined as anal or vaginal intercourse. Someone with whom the participant had sex and to whom he felt most committed, such as a boyfriend, spouse, significant other, or life partner was defined as a main partner. Someone with whom the participant had sex but did not feel committed to, did not know very well, or had sex with in exchange for something such as money or drugs was defined as a casual partner. Total number of sex partners was the sum of main and casual sex partners. Condomless anal sex with someone of discordant HIV status was defined based on the participant's self-reported perceived HIV status and knowledge of his last sex partner's status. Importantly, condomless anal sex between unaware MLWH and perceived negative partners is classified as concordant so that this measure examines behavioral intentions.

Analysis

To assess differences in sex practices by HIV diagnosis (i.e. awareness of HIV status), categories 2, 3, and 4 were collapsed to collectively represent 'aware MLWH' and compared

to category 1 (unaware MLWH). Subsequently, to assess differences in sex practices by engagement in care, categories 2, 3, and 4 were compared with each other.

For each of the two research aims, frequencies of sex practices were calculated and compared. Potential clustering effects by recruiting event were examined; however, intraclass correlations (ICC) across outcomes of interest were nominal (i.e. < 0.02) and accounting for ICC had no effect on findings of statistical significance. Therefore, statistical testing for differences were conducted using logistic regression with Bonferroni corrections of outputted p -values to account for multiple comparisons (with Type I error set at < 0.05). Race and survey year were adjusted for to account for potential confounding effects [18]. The median and 5th–95th percentiles for annual number of sex partners are presented (in total and for casual partners only). Due to the highly right skewed distributions for annual number of sex partners, we also quantified the percentage of participants who reported 10 annual sex partners to examine the tail of each distribution. Results for male partners and female partners are presented separately.

Similar analyses including those who were sexually inactive were also conducted (see Supplement, Tables A to C).

All analyses were conducted in SAS software 9.3 (SAS Institute Inc., Cary, NC, USA).

Results

Sample Demographics

A total of 5079 MLWH were included in the present analysis (Table 1). In comparing the 2008 through 2014 samples, there was a decrease in the percentage of MLWH who were unaware of their HIV-positive status (38.8 to 23.1%, respectively, p -value < 0.0001), as well as an increase in MLWH in care and on ART (41.3 to 66.8%, respectively, p -value < 0.0001). Over half of the sample was younger than 40, identified as Black or Hispanic, attended at least some college, were employed, had health insurance, and were circumcised.

HIV Awareness

Reports of condomless anal sex with a male partner in the prior 12 months were similar across the two categories of HIV awareness, unaware MLWH and aware MLWH (64.5 and 69.2%, respectively) (Table 2). Of the total sample, 9.1% reported having vaginal or anal sex with females in the prior 12 months. Unaware MLWH were three times as likely to report a female sex partner in the prior 12 months as aware MLWH (17.3 and 5.6%, respectively, p -value < 0.0001). Aware MLWH were significantly more likely to report non-HIV sexually transmitted infections (STIs) during the prior 12 months than unaware MLWH (p -value < 0.0001). The high-risk practice of condomless anal sex with a male partner of discordant or unknown HIV status was more commonly reported among unaware MLWH (25.9%) than aware MLWH (18.0%, p -value < 0.0001).

The median number of annual male anal sex partners was similar across the two categories of HIV awareness for total and casual partnerships overall, as well as total and casual partnerships in which condomless sex occurred. However, when examining the skewed tails

for the distributions of annual number of male anal sex partners two findings emerge. First, aware MLWH were significantly more likely to report 10 male anal sex partners in the prior year when compared to unaware MLWH. Second, this pattern was present when examining total and casual partnerships overall, as well as total and casual partnerships in which condomless sex occurred.

When examining female sex partners, there were no marked differences across the two categories of HIV awareness in terms of the median number of partners (for both total and casual partnerships overall, as well as total and casual partnerships in which condomless sex occurred). However, unaware MLWH were over three times as likely to report 10 female sex partners as aware MLWH (for both total and casual partnerships overall, as well as total and casual partnerships in which condomless sex occurred). For instance, 12.1% of unaware MLWH reported having 10 female sex partners in comparison to 4.0% of aware MLWH (p -value = 0.0066). Notably, these observed differences were statistically significant for total and casual partnerships, as well as partnerships in which condomless sex occurred.

Engagement in the HIV Care Continuum

When examining sex practices across the continuum of care, we find that reports of condomless anal sex with a male partner in the past year (ranging from 65.0 to 70.0%), and condomless anal sex with a male partner of discordant or unknown HIV status (ranging from 17.7 to 21.3%) were similar across all categories of aware MLWH (Table 3). Aware MLWH who were in care without ART (category 3) were significantly more likely to report having an STI in the past year when compared to aware MLWH who were not in care and aware MLWH who were in care and on ART (categories 2 and 4, respectively). Aware MLWH who were in care on ART (category 4) were significantly less likely to report having a female sex partner in the prior year than MLWH without ART (categories 2 and 3) (ranging from 10.3 to 4.8% across the continuum).

When examining number of male sex partners across the 3 continuum of HIV care categories, three findings emerge. First, the median number of total annual male anal sex partners was similar across all categories of aware MLWH. This pattern was present when examining total and casual partnerships overall, as well as total and casual partnerships in which condomless sex occurred. Second, the percentage reporting 10 total and casual anal sex partners was consistent across all categories of aware MLWH. Third, aware MLWH who were in care and on ART (category 4) were significantly less likely than MLWH who were out of care to report 10 total and casual partnerships in which condomless sex occurred.

Across the continuum of care, there were no meaningful differences in the median number of annual female sex partners or the percentage reporting 10 female sex partners (for both total and casual partnerships overall, as well as total and casual partnerships in which condomless sex occurred).

Discussion

Among this sample of sexually active MLWH, neither awareness of HIV-positivity nor engagement in HIV care were consistently associated with protective sex practices.

Nonetheless, awareness of HIV was associated with increases in some protective behaviors. For instance, aware MLWH were less likely to engage in condomless sex with someone of unknown or discordant HIV status than unaware MLWH. This finding is consistent with prior research [4, 10–12], including a meta-analysis conducted by Marks et al. [11]. When examining female partnerships, aware MLWH were less likely to report having had a female partner in the prior 12 months and less likely to report 10 female partners during that time. Importantly, this finding suggests that unaware MLWH may play a key role in HIV transmission to women. Women with an MSMW partner are at increased risk of HIV infection due to high HIV prevalence among the MSM population [13, 19–21]. In a recent phylogenetic analysis of HIV surveillance data from 2001 through 2012, 29% of infections among heterosexual women were linked to MSMW sexual contact [14]. Notably, awareness of HIV status was not uniformly associated with protective sex practices. Aware MLWH were more likely to report 10 male anal sex partners (for both total and casual partnerships overall, as well as total and casual partnerships in which condomless sex occurred).

Engagement in the HIV care continuum was similarly associated with both protective and risky sex practices. Across the 3 categories of the HIV care continuum, there was a monotonic decrease in the percentage of MLWH who also reported having a female sex partner in the prior 12 months. There were no differences in median number of total partners and condomless partners across the 3 categories of the HIV care continuum. Literature examining sex practices across the continuum of care is extremely limited. In merging three national HIV surveillance data sources, Skarbinski et al. [22] found steep sequential reductions in reported number of sex partners and discordant condom-less sex along the continuum of care. However, this finding could be an artifact of sampling as different study sample populations represented each stage in the continuum of care.

Importantly, there were notable decreases from 2008 through 2014 in the percentage who were unaware of their HIV infection, and increases in engagement in care and ART use. While HIV awareness was not uniformly associated with protective sex practices, our findings highlight the continued need for frequent testing among the high-risk population of MSM. Furthermore, use of viral suppression as a protective measure is not currently captured in the data; as a result, we cannot determine whether the impact of risky sex practices among those on ART are mitigated by low viral loads and corresponding reductions in transmission risk. Therefore, proactive efforts to improve engagement in care and adherence to ART among MLWH may yield meaningful public health benefits despite these findings. Those MLWH who are aware and in care without ART present an interesting potential for intervention. Current guidelines recommend ART for all persons living with HIV, regardless of CD4 cell count [23]. Thus, this category represents a missed opportunity to meet current standards for clinical care and the indirect benefits of reducing transmission risk with viral suppression. Efforts to engage this population more fully to improve access and adherence to ART should be made. Finally, as 9.1% of MLWH overall reported having a female sex partner in the prior 12 months, targeted prevention education for the subpopulation of MSMW should be considered in order to reduce potential transmission to heterosexual women.

This study has a number of limitations. Participants were recruited from distinct venues (primarily bars and clubs) in large MSAs with a high prevalence of AIDS. Thus, results may not be generalizable to the broader population of MSM. Analyses of sex practices were based on self-reported data, which may be subject to recall and social-desirability biases. Data were not weighted to account for the sampling methodology used to recruit MSM participants. Observed increases in reported STIs among MLWH who are engaged in care may partially be a result of heightened screening among this group (i.e., diagnostic screening bias). Due to limited sample sizes, caution should be taken in interpreting null statistical test results for data regarding female sex partners. As data were aggregated across three survey waves covering a span of 7 years, it is possible that behavioral trends across time were masked, although this covariate was adjusted for in statistical testing. Lastly, this analysis does not account for possible viral suppression (among MLWH and on ART, category 4) and PrEP, which may have been used by MSM to reduce transmission risk.

Conclusions

As MSM are at increased risk of both acquiring and transmitting HIV, comprehensive understanding of sex practices among this high-risk population is needed to inform optimal prevention strategies. Using multiple years of NHBS surveying, this analysis provides data on sex practices among a large, racially and geographically diverse sample of MLWH, with insights into the impact of HIV awareness and the HIV care continuum. This study found that awareness of HIV and engagement in care was not consistently associated with those protective sex practices examined as part of this analysis, highlighting the continued need to provide testing, proactively engage MLWH in care, and achieve viral suppression in order to reduce HIV transmission among this high-risk population and heterosexual women.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Abbreviations

HIV	Human immunodeficiency virus
AIDS	Autoimmune deficiency syndrome
NHBS	National HIV Behavioral Surveillance
ART	Antiretroviral therapy
MSM	Gay, bisexual, and other men who have sex with men
MLWH	MSM living with HIV
CDC	Centers for Disease Control and Prevention
PrEP	Pre-exposure prophylaxis

References

- Centers for Disease Control and Prevention. [Accessed Jan 2017] HIV Surveillance Report. 2015. <http://www.cdc.gov/hiv/library/reports/surveillance/>
- Smith DK, Herbst JH, Zhang X, Rose CE. Condom effectiveness for HIV prevention by consistency of use among men who have sex with men in the United States. *J Acquir Immune Defic Syndr*. 2015; 68:337–44. [PubMed: 25469526]
- Weller S, Davis K. Condom effectiveness in reducing heterosexual HIV transmission. *Cochrane Database Syst Rev*. 2002; 1:CD003255.
- Crepaz N, Marks G, Liao A, et al. Prevalence of unprotected anal intercourse among HIV-diagnosed MSM in the United States: a meta-analysis. *AIDS*. 2009; 23:1617–29. [PubMed: 19584704]
- Vallabhaneni S, Li X, Vittinghoff E, Donnell D, Pilcher CD, Buchbinder SP. Seroadaptive practices: association with HIV acquisition among HIV-negative men who have sex with men. *PLoS ONE*. 2012; 7:e45718. [PubMed: 23056215]
- Snowden JM, Wei C, McFarland W, Raymond HF. Prevalence, correlates and trends in seroadaptive behaviours among men who have sex with men from serial cross-sectional surveillance in San Francisco, 2004–2011. *Sex Transm Infect*. 2014; 90:498–504. [PubMed: 24687128]
- Grant RM, Lama JR, Anderson PL, et al. Preexposure chemoprophylaxis for HIV prevention in men who have sex with men. *N Engl J Med*. 2010; 363:2587–99. [PubMed: 21091279]
- Anglemyer A, Rutherford GW, Egger M, Siegfried N. Antiretroviral therapy for prevention of HIV transmission in HIV-discordant couples. *Cochrane Database Syst Rev*. 2011; 11:CD009153.
- Loutfy MR, Wu W, Letchumanan M, et al. Systematic review of HIV transmission between heterosexual serodiscordant couples where the HIV-positive partner is fully suppressed on antiretroviral therapy. *PLoS ONE*. 2013; 8:e55747. [PubMed: 23418455]
- Centers for Disease Control and Prevention. HIV testing and risk behaviors among gay, bisexual, and other men who have sex with men—United States. *MMWR Morb Mortal Wkly Rep*. 2013; 62:958–62. [PubMed: 24280915]
- Marks G, Crepaz N, Senterfitt JW, Janssen RS. Meta-analysis of high-risk sexual behavior in persons aware and unaware they are infected with HIV in the United States: implications for HIV prevention programs. *J Acquir Immune Defic Syndr*. 2005; 39:446–53. [PubMed: 16010168]
- Eaton LA, Kalichman SC. Changes in transmission risk behaviors across stages of HIV disease among people living with HIV. *J Assoc Nurses AIDS Care*. 2009; 20:39–49. [PubMed: 19118770]
- Lauby JL, Millett GA, LaPollo AB, Bond L, Murrill CS, Marks G. Sexual risk behaviors of HIV-positive, HIV-negative, and serostatus-unknown Black men who have sex with men and women. *Arch Sex Behav*. 2008; 37:708–19. [PubMed: 18521734]

14. Oster AM, Wertheim JO, Hernandez AL, Ocfemia MC, Saduvala N, Hall HI. Using molecular HIV surveillance data to understand transmission between subpopulations in the United States. *J Acquir Immune Defic Syndr*. 2015; 70:444–51. [PubMed: 26302431]
15. Gopalappa C, Farnham PG, Chen YH, Sansom SL. Progression and transmission of HIV/AIDS (PATH 2.0). *Med Decis Making*. 2017; 37:224–33. [PubMed: 27646567]
16. MacKellar DA, Gallagher KM, Finlayson T, Sanchez T, Lansky A, Sullivan PS. Surveillance of HIV risk and prevention behaviors of men who have sex with men—a national application of venue-based, time–space sampling. *Public Health Rep*. 2007; 122(Suppl 1):39–47. [PubMed: 17354526]
17. Finlayson TJ, Le B, Smith A, et al. HIV risk, prevention, and testing behaviors among men who have sex with men—National HIV Behavioral Surveillance System, 21 U.S. cities, United States, 2008. *MMWR Surveill Summ*. 2011; 60:1–34.
18. Hoots BE, Finlayson TJ, Wejnert C, Paz-Bailey G, Group NS. Early linkage to HIV care and antiretroviral treatment among men who have sex with men—20 cities, United States, 2008 and 2011. *PLoS ONE*. 2015; 10:e0132962. [PubMed: 26176856]
19. Dodge B, Jeffries WL, Sandfort TG. Beyond the down low: sexual risk, protection, and disclosure among at-risk Black men who have sex with both men and women (MSMW). *Arch Sex Behav*. 2008; 37:683–96. [PubMed: 18512140]
20. Gorbach PM, Murphy R, Weiss RE, Hucks-Ortiz C, Shoptaw S. Bridging sexual boundaries: men who have sex with men and women in a street-based sample in Los Angeles. *J Urban Health*. 2009; 86(Suppl 1):63–76. [PubMed: 19543837]
21. Tieu HV, Spikes P, Patterson J, et al. Sociodemographic and risk behavior characteristics associated with unprotected sex with women among black men who have sex with men and women in New York City. *AIDS Care*. 2012; 24:1111–9. [PubMed: 22533637]
22. Skarbinski J, Rosenberg E, Paz-Bailey G, et al. Human immuno-deficiency virus transmission at each step of the care continuum in the United States. *JAMA Intern Med*. 2015; 175:588–96. [PubMed: 25706928]
23. Panel on Antiretroviral Guidelines for Adults and Adolescents. [Accessed Janu 2017] Guidelines for the use of antiretroviral agents in HIV-1-infected adults and adolescents. <http://www.aidsinfo.nih.gov/ContentFiles/AdultandAdolescentGL.pdf>

Sample characteristics by HIV awareness and care continuum status, sexually active MLWH, NHBS 2008–2014

Table 1

	Overall											
	HIV awareness and care continuum status											
	Unaware MLWH		Aware MLWH		Aware MLWH		Aware MLWH		In Care, No ART (3)		In care, On ART (4)	
(1)	N	Row (%)	(2)	N	Row (%)	(3)	N	Row (%)	(4)	N	Row (%)	
Total	5079	1528	30.1	253	5.0	506	10.0	2792	55.0			
NHBS MSM survey year												
2008	1609	624	38.8	102	6.3	219	13.6	664	41.3			
2011	1592	470	29.5	78	4.9	170	10.7	874	54.9			
2014	1878	434	23.1	73	3.9	117	6.2	1254	66.8			
Age group												
18–29	1566	657	42.0	102	6.5	234	14.9	573	36.6			
30–39	1450	435	30.0	84	5.8	155	10.7	776	53.5			
40–49	1376	315	22.9	50	3.6	80	5.8	931	67.7			
50–59	581	102	17.6	15	2.6	30	5.2	434	74.7			
60 +	106	19	17.9	2	1.9	7	6.6	78	73.6			
Race/ethnicity												
White, non-Hispanic	1590	226	14.2	72	4.5	161	10.1	1131	71.1			
Black, non-Hispanic	2046	837	40.9	109	5.3	205	10.0	895	43.7			
Hispanic	1126	364	32.3	56	5.0	96	8.5	610	54.2			
Other	317	101	31.9	16	5.0	44	13.9	156	49.2			
Highest level of education												
High school	1710	655	38.3	99	5.8	181	10.6	775	45.3			
Some college	1900	563	29.6	95	5.0	195	10.3	1047	55.1			
Bachelor's degree	1032	238	23.1	46	4.5	103	10.0	645	62.5			
Graduate school	437	72	16.5	13	3.0	27	6.2	325	74.4			
Employment status												
Employed full time	2452	710	29.0	120	4.9	218	8.9	1404	57.3			
Employed part time	765	263	34.4	33	4.3	79	10.3	390	51.0			
Student	196	73	37.2	10	5.1	41	20.9	72	36.7			

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	HIV awareness and care continuum status																				
	Unaware MLWH (1)				Aware MLWH (2)				Aware MLWH (3)				Aware MLWH (4)								
	N	Col (%)	N	Row (%)	N	Row (%)	N	Row (%)	N	Row (%)	N	Row (%)	N	Row (%)							
Overall	156	3.1	23	14.7	3	1.9	9	5.8	121	77.6	1510	29.7	459	30.4	87	5.8	159	10.5	805	53.3	
Retired																					
Unemployed/disabled/unable to work due to health																					
Currently have health insurance																					
Yes	3811	75.0	958	25.1	120	3.1	356	9.3	2377	62.4											
No	1268	25.0	570	45.0	133	10.5	150	11.8	415	32.7											
Circumcised																					
Yes	3767	74.2	1085	28.8	186	4.9	390	10.4	2106	55.9											
No	1312	25.8	443	33.8	67	5.1	116	8.8	686	52.3											

Table 2

Sex practices by HIV awareness, sexually active MLWH, NHBS 2008–2014

	Overall		HIV awareness*				Adj. <i>p</i> -value
			Unaware MLWH		Aware MLWH		
	(1)	(2, 3, and 4)	(1)	(2, 3, and 4)	(1)	(2, 3, and 4)	
Total	5079	1528	3551				
Sex practices in prior 12 months	n	col (%)	n	col (%)	n	col (%)	
Had any condomless anal sex with a male partner	3441	67.8	985	64.5	2456	69.2	0.9563
Had a female (vaginal and/or anal) sex partner	464	9.1	264	17.3	200	5.6	<0.0001
STIs (bacterial and viral, non-HIV)	1029	20.3	236	15.5	793	22.3	<0.0001
Last male anal sex partner	n	col (%)	n	col (%)	n	col (%)	
Condomless, discordant or unknown HIV status ^a	1036	20.4	396	25.9	640	18.0	<0.0001
Number of male anal sex partners in prior 12 months	Median	5–95 %	Median	5–95 %	Median	5–95 %	
Total number of male anal partners	3.0	1–30	3.0	1–26	3.0	1–32	
Percent reporting 10	19.6%		15.1%		21.6%		0.0045
Total number of male anal partners, condomless ^b	1.0	0–20	1.0	0–10	1.0	0–21	
Percent reporting 10	10.6%		6.2%		12.5%		0.0002
Number of casual male anal partners	2.0	0–30	2.0	0–25	2.0	0–30	
Percent reporting 10	17.4%		12.8%		19.4%		0.0015
Number of casual male anal partners, condomless ^b	0.0	0–18	0.0	0–10	0.0	0–20	
Percent reporting 10	9.5%		5.2%		11.3%		0.0001
Number of female sex partners in prior 12 months ^c	Median	5–95 %	Median	5–95 %	Median	5–95 %	
Total number of female partners	2.0	1–12	2.0	1–15	2.0	1–8	
Percent reporting 10	8.6%		12.1%		4.0%		0.0066
Total number of female partners, condomless ^b	1.0	0–8	1.0	0–10	0.0	0–5	
Percent reporting 10	4.3%		6.4%		1.5%		0.0226
Number of casual female partners	2.0	0–12	2.0	0–13	1.0	0–8	
Percent reporting 10	7.3%		10.2%		3.5%		0.0204
Number of casual female partners, condomless ^b	0.0	0–7	0.0	0–10	0.0	0–4	
Percent reporting 10	3.9%		5.7%		1.5%		0.0493

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col/column, *pctl*/percentile

* Tests for statistical significance were conducted using logistic regression (comparing groups horizontally, within rows), with adjustment for race and survey round

^a Self-reported condomless anal sex with someone who is of the opposite or unknown HIV status (i.e. someone in the partnership could be at risk of acquiring or transmitting HIV)

^b The number of partners with whom condomless sex occurred at least once (among sexually active MLWH)

^c Among those who reported having a female sex partner (vaginal or anal sex) in the prior year (n = 464)

Sex practices by HIV continuum of care status, sexually active MLWH, NHBS 2008–2014

Table 3

	Overall		HIV care continuum*			
			Aware MLWH		Aware MLWH	
	Out of care (2)	In care, no art (3)	In care, on aRT (4)			
Total	3551	253	506	2792		
Sex practices in prior 12 months	n	col (%)	n	col (%)	n	col (%)
Had any condomless anal sex with a male partner	2456	69.2	172	68.0 ^a	329	65.0 ^a
Had a female (vaginal and/or anal) sex partner	200	5.6	26	10.3 ^a	41	8.1 ^a
STIs (bacterial and viral, non-HIV)	793	22.3	43	17.0 ^a	136	26.9 ^b
Last male anal sex partner	n	col (%)	n	col (%)	n	col (%)
Condomless, discordant or unknown HIV status ^c	640	18.0	54	21.3 ^a	93	18.4 ^a
Number of male anal sex partners in prior 12 months	Median	5–95 %	Median	5–95 %	Median	5–95 %
Total number of male anal partners	3.0	1–32	3.0	1–27	3.0	1–30
Percent reporting 10	21.6%		23.7% ^a		21.2% ^a	
Total number of male anal partners, condomless ^d	1.0	0–21	1.0	0–20	1.0	0–21
Percent reporting 10	12.5%		15.0% ^a		11.3% ^{ab}	
Number of casual male anal partners	2.0	0–30	2.0	0–25	2.0	0–30
Percent reporting 10	19.4%		22.1% ^a		18.6% ^a	
Number of casual male anal partners, condomless ^d	0.0	0–20	0.0	0–19	0.0	0–20
Percent reporting 10	11.3%		14.2% ^a		9.5% ^{ab}	
Number of female sex partners in prior 12 months ^e	Median	5–95 %	Median	5–95 %	Median	5–95 %
Total number of female partners	2.0	1–8	2.0	1–8	2.0	1–6
Percent reporting 10	4.0%		3.9% ^a		4.9% ^a	
Total number of female partners, condomless ^d	0.0	0–5	1.0	0–8	0.0	0–3
Percent reporting 10	1.5%		3.9% ^a		0.0% ^a	
Number of casual female partners	1.0	0–8	2.0	0–6	1.0	0–6
Percent reporting 10	3.5%		3.9% ^a		4.9% ^a	

	HIV care continuum*			
	Aware MLWH		Aware MLWH	
	Out of care (2)	In care, no art (3)	In care, on aRT (4)	Aware MLWH
Overall				
Number of casual female partners, condomless ^d	0.0	0-4	0.0	0-4
Percent reporting 10	1.5%	3.9% ^a	0.0% ^a	1.5% ^a

co/column, *ptl*/percentile

* Tests for statistical significance were conducted using logistic regression (comparing sexual behaviors across HIV status categories), with adjustment for race and survey round

^{a,b} For each comparison (reading from left to right within row), cells that share a letter are not significantly different (Type I error = 0.05 with Bonferroni correction of outputted p-values for multiple comparisons)

^c Self-reported condomless anal sex with someone who is of the opposite or unknown HIV status (i.e. someone in the partnership could be at risk of acquiring or transmitting HIV)

^d The number of partners with whom condomless sex occurred at least once (among sexually active MLWH)

^e Among those who reported having a female sex partner (vaginal or anal sex) in the prior year (n = 200)