Infrequent HIV Testing and Late HIV Diagnosis Are Common Among a Cohort of Black Men Who Have Sex With Men in 6 US Cities

Sharon B. Mannheimer, MD,† Lei Wang, PhD,‡ Leo Wilton, PhD,§‖ Hong Van Tieu, MD,¶ Carlos del Rio, MD,# Susan Buchbinder, MD,** Sheldon Fields, PhD,†† Sara Glick, PhD,‡‡ Matthew B. Connor, MS,‡ Vanessa Cummings, BS,§§ Susan H. Eshleman, MD,§§ Beryl Koblin, PhD,¶ and Kenneth H. Mayer, MD‖‖ on behalf of the HPTN 061 Study Team*

Objective: US guidelines recommend at least annual HIV testing for those at risk. This analysis assessed frequency and correlates of infrequent HIV testing and late diagnosis among black men who have sex with men (BMSM).

Methods: HIV testing history was collected at enrollment from participants in HPTN 061, an HIV prevention trial for at-risk US BMSM. Two definitions of late HIV diagnosis were assessed: CD4 cell count <200 cells per cubic millimeter or <350 cells per cubic millimeter at diagnosis.

Results: HPTN 061 enrolled 1553 BMSM. HIV testing questions were completed at enrollment by 1284 (98.7%) of 1301 participants with no previous HIV diagnosis; 272 (21.2%) reported no HIV test in previous 12 months (infrequent testing); 155 of whom (12.1% of the 1284 with testing data) reported never testing. Infrequent HIV testing was associated with: not seeing a medical provider in the previous 6 months (relative risk [RR]: 1.08, 95% confidence interval [CI]: 1.03 to 1.13), being unemployed (RR: 1.04, CI: 1.01 to 1.07), and having high internalized HIV stigma (RR: 1.03, CI: 1.0 to 1.05). New HIV diagnoses were more likely among infrequent testers compared with men tested in the previous year (18.4% vs. 4.4%; odds ratio: 4.8, 95% CI: 3.2 to 7.4). Among men with newly diagnosed HIV, 33 (39.3%) had a CD4 cell count <350 cells per cubic millimeter including 17 (20.2%) with CD4 <200 cells per cubic millimeter.

Conclusions: Infrequent HIV testing, undiagnosed infection, and late diagnosis were common among BMSM in this study. New HIV diagnoses were more common among infrequent testers, underscoring the need for additional HIV testing and prevention efforts among US BMSM.

Key Words: HIV, HIV testing, late HIV diagnosis, men who have sex with men, black men, African American men

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From the *Department of Medicine, Harlem Hospital/Columbia University, New York, NY; †Department of Epidemiology, Mailman School of Public Health, Columbia University, New York, NY; ‡Vaccine and Infectious Disease Division, Fred Hutchinson Cancer Research Center, Seattle, WA; §Department of Human Development, College of Community and Public Affairs, Binghamton University, Binghamton, NY; ‖Faculty of Humanities, University of Johannesburg, Johannesburg, South Africa; ¶Laboratory of Infectious Disease Prevention, New York Blood Center, New York, NY; #Department of Global Health, Center for AIDS Research, Emory University Rollins School of Public Health, Atlanta, GA; **Bridge HIV, Population Health Division, San Francisco Department of Public Health, San Francisco, CA; ††College of Nursing and Health Sciences, Florida International University, Miami, FL; ‡‡Department of Epidemiology and Biostatistics, The George Washington University School of Public Health and Health Services, Washington, DC; §§Department of Pathology, Johns Hopkins University School of Medicine, Baltimore, MD; and ‖‖Infectious Disease, Beth Israel Deaconess Medical Center, Harvard Medical School, The Fenway Institute, Boston, MA.

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Correspondence to: Sharon B. Mannheimer, MD, Division of Infectious Diseases, Harlem Hospital Center, 506 Lenox Avenue, Room 3101A, New York, NY 10037 (e-mail: sbm20@columbia.edu).

INTRODUCTION

Men who have sex with men (MSM), particularly black MSM (BMSM), are disproportionately affected by HIV in the United States,[1–4] and national guidelines recommend at least annual HIV testing for MSM.[5] Recent reports of high infection rates among MSM who reported testing within the previous 12 months have led to recommendations for more frequent testing for all sexually active MSM, as often as every 3–6 months.[6–10] Reports have shown that not testing at least annually is common among MSM.[11] In recent surveys from the US Centers for Disease Control and Prevention (CDC), 38% of MSM reported not testing for HIV in the previous 12

months[6] and 17% of MSM reported that they had never been tested for HIV.[12]

The disparity in HIV infection among BMSM has not been linked to racial differences in sexual risk behavior.[13–18] Potential factors reported to be driving disparities in HIV infection among BMSM include racial differences in rates of untreated sexually transmitted infections (STIs), HIV viral load suppression, and assortative sexual mixing (choosing sexual partners of the same race/ethnicity).[14,17,19,20] Social determinants such as discrimination, stigma, and poverty also likely contribute to HIV racial disparities.[18,21,22] It also has been hypothesized that the disparity may be at least in part attributable to the higher likelihood of BMSM being unaware of their HIV status[11,13,23–26] or being diagnosed late.[1,14]

Receiving an initial HIV diagnosis late in the course of HIV disease can have serious consequences for the individual. Late initiation of antiretroviral therapy (ART) is associated with a diminished response to treatment,[27] and a higher risk for both progression to AIDS and mortality.[28–32] Late HIV diagnosis also has public health implications, since individuals unaware of their HIV status may be more likely to transmit HIV to others.[33–35] The phenomenon of late HIV diagnosis has a variety of names (eg, late diagnosis, late testing, and late presentation) and definitions in the literature.[29–31,36–44] Late diagnosis and late presentation definitions have ranged from having concurrent AIDS at the time of HIV testing[43]; having an initial CD4 cell count <200 cells per millimeter[3,29,43]; developing a CD4 cell count below 200 cells per cubic millimeter or AIDS within 3 months,[41] 1 year,[30,36] or 3 years[39] after HIV diagnosis; to having an initial CD4 cell count <350 cells per cubic millimeter at the time of HIV diagnosis,[38] or within 3 months of diagnosis.[44] In 2009, the European Late Presenter Consensus Working Group suggested a consensus definition for late presentation: persons presenting for care with a CD4 cell count below 350 cells per cubic millimeter or presenting with an AIDS-defining event, regardless of CD4 cell count.[42] The group also proposed a second category of "presentation with late disease," defined as persons presenting for care with a CD4 cell count <200 cells per cubic millimeter or presenting with an AIDS-defining event, regardless of CD4 cell count.[42]

Despite intensive efforts to promote routine HIV testing in the United States, late HIV diagnosis remains common.[30,37,39,41,45] Recent data revealed that approximately 38% of those diagnosed with HIV infection in the United States developed AIDS within a year of their HIV diagnosis.[39] Several factors have been associated with late diagnosis, including black or Latino race/ethnicity, older age, and male gender.[38,39] The most commonly reported reasons for not testing or late testing/late diagnosis include low perceived risk of HIV and fear of HIV diagnosis.[11,12,37,43,46] Structural barriers, confidentiality concerns, lack of social support, and marginalized status have been identified as additional risk factors.[12,37,47,48,49] Additional barriers to testing identified among BMSM include medical mistrust, stigma, and fear of discrimination.[43,47,50]

This study analyzed HIV testing data collected from BMSM participants in the HIV Prevention Trials Network BROTHERS study (HPTN 061) to assess the prevalence and covariates of infrequent HIV testing, defined as not testing for HIV in the 12 months before enrollment. This study also evaluated the frequency of late HIV diagnosis among those newly diagnosed with HIV infection and identified factors associated with late HIV diagnosis. Understanding factors associated with not testing and late HIV diagnosis are critical for developing more effective HIV prevention interventions for high-risk populations, including BMSM.

METHODS

This analysis used data collected from participants in HPTN 061, a multisite study designed to determine the feasibility and acceptability of a multicomponent HIV prevention intervention for BMSM. Study details have been previously described.[51,52] In HPTN 061, BMSM were recruited in 6 US cities (Atlanta, GA; Boston, MA; New York, NY; Los Angeles, CA; San Francisco, CA; and Washington, DC) from July 2009 to October 2010. HPTN 061 enrolled HIV-uninfected men, HIV-infected men who reported that they were unaware of their HIV status (newly diagnosed), and HIV-infected men who reported that they were aware of their status (previously diagnosed); a maximum of 10 men per study site were enrolled who reported that they were in HIV care. Men were eligible to participate in the study if they: self-identified as a man or were male at birth, self-identified as black, were at least 18 years of age, reported unprotected anal intercourse with a man in the previous 6 months, and resided in the metropolitan area where they were recruited. At the enrollment visit, eligibility was confirmed and written informed consent obtained.

Participant interviews were conducted to collect demographic data (age, sexual identity, education, employment, household income, housing, and student status) as well as healthcare-related information (healthcare insurance coverage, usual place of care, visits to a healthcare provider in the previous 6 months, and unmet healthcare needs in the previous 6 months). Previous HIV testing history was obtained through audio computer-assisted self-interview (ACASI) at baseline. Participants who answered "No," to the question "Have you ever been tested for HIV?" or who reported "zero" for number of times tested for HIV in the last year were considered to have infrequent HIV testing. Other data collected through ACASI included history of incarceration, sexual identity, and sexual risk behaviors in the 6 months before enrollment, partner HIV status, alcohol and other substance use,[53] internalized homophobia,[54] perceived racism,[55] internalized HIV stigma,[56] HIV conspiracy,[57] mistrust, and symptoms of depression.[58]

Perceived racism was measured with 28 items (α = 0.95), such as "being treated rudely or disrespectfully" because of "my race."[55] The extent that the event bothered the participant was measured with a 5-point scale from "not at all" to "extremely." Scores were summed for participants who answered all questions in the scale. The racism scale ranged from 0 to 140; the variable was categorized as "never happened/low" (score <48), "medium" (score from 48 to 94), and "high" (score >95).

Internalized HIV stigma was measured based on a scale developed by Sayles et al[56] to capture stigma as perceived and

experienced by the individual living with HIV. Participants responded, using a 5-point Likert scale from "disagree strongly" to "agree strongly" ($\alpha = 0.82$), to 5 items, such as "I am concerned that if I go to an AIDS organization someone I know might see me." Scores were summed for participants answering all 5 questions. A participant was categorized as having low (score ≤ 15) or high (score >15) internalized HIV stigma.

Conspiracy theory about HIV/AIDS was measured with a 9-item scale adapted from Bogart and Thornburn, which included statements such as, "There is a cure for AIDS, but it is being withheld from the poor," with responses on a 5-point Likert scale from "disagree strongly" to "agree strongly" ($\alpha = 0.92$).[57]

Participants also were asked to respond to the statement, "I trust the healthcare providers I see in my healthcare setting," using a 5-point Likert scale from "disagree strongly" to "agree strongly." Those who answered strongly disagree or disagree were coded as having mistrust.

Participants reporting previous HIV-negative or unknown status were offered HIV counseling and testing at study enrollment. HIV rapid testing was conducted after completion of interviews and pretest HIV/STI risk-reduction counseling. Reactive rapid HIV test results were confirmed by Western blot testing performed at a local laboratory. Quality assurance testing was performed retrospectively at the HPTN Laboratory Center to confirm the HIV infection status of all study participants at enrollment. Men who were HIV infected at enrollment and reported no previous diagnosis were provisionally characterized as newly diagnosed. A subset of those men had low or undetectable HIV RNA levels (<1000 copies/mL HIV RNA). Stored samples from those men were tested for the presence of antiretroviral drugs at the end of the study. Some of those men were reclassified as previously diagnosed based on the detection of drugs indicative of ART.[59]

Univariate and multivariate logistic regression models were used to identify the independent correlates of infrequent HIV testing. Variables examined as possible correlates included predefined baseline participant demographics, sexual identity, previous healthcare utilization, substance use, incarceration history, HIV risk behaviors, HIV status of sexual partners, perceived racism, internalized homophobia, internalized HIV stigma, HIV conspiracy, symptoms of depression, and study site. To reduce the number of modeled covariates and avoid overfitting the data, backward selection was implemented using the criterion for retention in the model of a *P* value less than 0.1. This analysis was performed on all complete cases (908 observations). After reducing the number of covariates, the model was then refit using complete cases from only the selected variables (1127 observations). City of recruitment was also adjusted for in the multivariate model, despite not reaching the desired threshold of significance during the selection procedure. Wald 95% confidence intervals (CIs) were computed for the estimated odds ratios (ORs) and risk ratios. All statistical analyses were performed using SAS version 9.2 (SAS Institute, Cary, NC).

Men identified as newly diagnosed at study enrollment, based on testing performed at study sites, had CD4 cell count testing. Two definitions of late HIV diagnosis were used for analysis: new HIV diagnosis with a CD4 cell count <200 cells per cubic milliliter, and new HIV diagnosis with a CD4 cell count <350 cells per cubic milliliter at the time of diagnosis. Correlates of late HIV diagnosis were assessed by univariate analysis using Fisher exact tests. Variables examined as possible correlates of late diagnosis were the same as those assessed as possible correlates of infrequent HIV testing, described above. No multivariate model was fitted because of relatively small sample size (only 84 newly diagnosed men had CD4 cell count data at enrollment).

RESULTS

Among 1553 BMSM participants enrolled, 252 (16%) participants were classified as having a previous HIV diagnosis based on self-report or information obtained by the study sites (N = 185) or based on antiretroviral drug testing performed at the HPTN Laboratory Center (N = 67). Of the remaining 1301 participants with no previous HIV diagnosis, 38 (2.9%) men either refused testing or did not have a sample stored to confirm HIV status. Of the 1263 men tested with confirmatory HIV data, 96 (7.6%) men were classified as newly diagnosed; 1167 (92.4%) were HIV uninfected at enrollment.

Baseline demographics of the 1301 HPTN 061 participants with no previous HIV diagnosis at enrollment included a median age of 38 years, 1.8% transgender, 8.0% Latino, 37.8% reported household incomes below US poverty level, 10.2% had unstable housing, 66.3% unemployed, and 41.7% reported being uninsured (Table 1).

HIV Testing History

Among 1301 participants who had no previous HIV diagnosis at enrollment, 1284 (98.7%) answered the HIV testing history questions in the study ACASI. Infrequent HIV testing was reported by 272 (21.2%) men, including 155 men (12.1% of the 1284) who reported never having been tested for HIV before study enrollment. In the 6 cities in this study, participants in Atlanta, GA, were most likely to report not testing for HIV within the previous year (28.5%), whereas those in Washington, DC, and Boston were least likely to report infrequent testing (15.3% and 16.6%, respectively).

Correlates of HIV Testing and HIV Testing Outcome

Univariate analyses identified several factors associated with infrequent HIV testing (Table 2), including: older age, lower household income, being unemployed, unstable housing, being uninsured, not identifying as gay or homosexual, not having seen a medical provider in the previous 6 months, and city of residence (Atlanta, San Francisco, or Los Angeles). Variables not associated with infrequent testing included: country of origin, being a student, being transgender, injection drug use, substance use, sexual risk behavior, partner HIV status, incarceration history, perceived racism, and belief in HIV conspiracy.

TABLE 1. Baseline Demographics of 1301 Participants Who Reported Having No HIV Diagnosis Before Enrolling to HPTN 061

Characteristic	Total (N = 1301), n (%)
Age group	
18–30	489/1301 (37.6)
>30	812/1301 (62.4)
Median age	38 yrs
Marital status	
Married/civil union or have a primary partner	146/1300 (11.2)
Single/divorced/widowed	1154/1300 (88.8)
Participant gender	
Male	1278/1301 (98.2)
Female	0/1301 (0.0)
Transgender	23/1301 (1.8)
Partner/spouse gender	
No partner/spouse	1154/1300 (88.8)
Male	89/1300 (6.8)
Female	52/1300 (4.0)
Transgender	5/1300 (0.4)
Exclusive sexual orientation	
Exclusively homosexual/gay	361/1273 (28.4)
Exclusively bisexual	383/1273 (30.1)
Other	529/1273 (41.6)
Ethnicity	
Latino	104/1301 (8.0)
Not Latino	1197/1301 (92.0)
Country of origin	
United States	1241/1301 (95.4)
Outside United States	60/1301 (4.6)
Highest education	
High school or less	686/1300 (52.8)
Some college or higher	614/1300 (47.2)
Student status	
Current student	269/1301 (20.7)
Not student	1032/1301 (79.3)
Current employment status	
Working currently	438/1300 (33.7)
Not working currently	862/1300 (66.3)
Housing status	
Have a stable home	1168/1301 (89.8)
Do not have a stable home	133/1301 (10.2)
Household income	
Less than $9,999	487/1288 (37.8)
$10,000–$49,999	641/1288 (49.8)
$50,000 or more	160/1288 (12.4)
Frequency of insufficient income	
Never	568/1300 (43.7)
Once in a while	417/1300 (32.1)
Fairly or very often	315/1300 (24.2)
Current healthcare coverage	
Yes	759/1301 (58.3)
No	542/1301 (41.7)
Enrollment HIV status	
Refused/unknown	38/1301 (2.9)
Negative	1167/1301 (89.7)
Positive, new diagnosis	96/1301 (7.4)
HIV testing history	
Never tested	155/1296 (12.0)
Tested >12 mo	117/1296 (9.0)
Tested ≤12 mo	1012/1296 (78.1)
Tested, time unknown	12/1296 (0.9)

By modeling the data in a multivariate framework, the number of modeled covariates was reduced from 12 significant associations ($P < 0.10$) in the univariate case to 4 in the multivariate case, including an adjustment for study site (Table 3). We identified 4 covariates of interest: employment status, housing status, internalized HIV stigma, and seeing a healthcare provider in the last 6 months. Because the outcome cannot be considered a rare event, the interpretation of the OR in this setting does not reflect the relative probability of an individual not adhering to testing guidelines. Therefore, risk ratios were used to quantify this probability. In multivariate testing, 3 variables were independently associated with infrequent HIV testing at the 0.05 level: not seeing a medical provider in the previous 6 months (relative risk [RR]: 1.08, 95% CI: 1.03 to 1.13), being unemployed (RR: 1.04, CI: 1.01 to 1.07), and having high levels of internalized HIV stigma (RR: 1.03, CI: 1.00 to 1.05). Although the association with housing status was not significant at the 0.05 level, it was included in the final multivariate model because it improved the overall fit of the model.

Fifty (18.4%) of the 272 participants with infrequent HIV testing were newly diagnosed with HIV at study enrollment, compared with only 45 (4.4%) of the 1012 participants who had an HIV test in the previous year (OR: 4.8, 95% CI: 3.2 to 7.4, $P < 0.0001$).

Late HIV Diagnosis

Among 1301 BMSM participants with no known previous HIV diagnosis, 96 (7.6% of the 1263 men who agreed to testing) were found to be HIV infected at enrollment, including 3 later identified as having acute HIV infection at enrollment. Acute infection was defined as having detectable HIV RNA with negative HIV antibody tests or with positive HIV antibody tests with a negative or indeterminate Western blot. All 3 men had positive Western blots at their 6-month visits. CD4 cell count data from enrollment was available for 84 (87.5%) of the 96 men with newly diagnosed infection. CD4 data were missing for 12 participants. In 8 cases, CD4 cell count testing was not performed because the initial HIV rapid test was non reactive; those men (including 3 with acute HIV infection) were retrospectively identified as HIV-infected at the HPTN Laboratory Center.[60] The median CD4 cell count for the 84 men was 404 cells per cubic milliliter (interquartile range [IQR], 209–581); 33 (39.3%) had a CD4 cell count <350 cells per cubic milliliter at enrollment,

TABLE 2. OR and 95% CI Obtained From Univariate Analysis That Predicts the Risk of Infrequent HIV Testing (Not Having an HIV Test in the Previous Year)

Characteristics	Level	n (%)	Univariate Model OR (95% CI)	*P*
Age	Older (>30)	186 (23.3)	**1.41 (1.06 to 1.88)**	**0.0173**
	Younger (≤30)	86 (17.7)		
Household income	<$10,000	119 (24.8)	**1.43 (1.09 to 1.88)**	**0.0101**
	≥$10,000	148 (18.7)		
Education	High school graduate or less	155 (23.0)	1.25 (0.96 to 1.64)	0.1040
	Some college and higher	117 (19.2)		
Employment status	Unemployed	205 (24.1)	**1.74 (1.29 to 2.36)**	**0.0003**
	Employed	67 (15.4)		
Housing status	Unstable	38 (28.8)	**1.59 (1.06 to 2.37)**	**0.0248**
	Stable	234 (20.3)		
Health insurance	Uninsured	129 (24.2)	**1.35 (1.03 to 1.77)**	**0.0281**
	Insured	143 (19.1)		
Gay/homosexual	Yes	103 (18.6)	**0.76 (0.58 to 1.00)**	**0.0481**
	No	169 (23.2)		
Poppers use	Yes	19 (15.2)	0.64 (0.39 to 1.07)	0.0883
	No	235 (21.8)		
City	LA	47 (23.2)	**1.67 (1.00 to 2.79)**	**0.0492**
	SF	43 (24.2)	**1.77 (1.05 to 2.98)**	**0.0328**
	Atlanta	72 (28.5)	**2.21 (1.37 to 3.57)**	**0.0012**
	Boston	33 (16.6)	1.10 (0.64 to 1.90)	0.7223
	NY	48 (18.4)	1.25 (0.76 to 2.07)	0.3840
	DC	29 (15.3)		
Depression	Yes	121 (23.4)	1.28 (0.97 to 1.69)	0.0862
	No	130 (19.3)		
See healthcare provider in last 6 mo	No	134 (26.0)	**1.60 (1.22 to 2.10)**	**0.0006**
	Yes	138 (18.0)		
Internalized homophobia	Medium/high (sum: 17–35)	129 (23.5)	1.27 (0.96 to 1.67)	0.0898
	Low (sum: 7–16)	130 (19.5)		
HIV stigma	High (sum >16)	106 (24.1)	1.32 (0.99 to 1.76)	0.0623
	Low (sum ≤15)	134 (19.5)		

Bold values indicate characteristics with statistical significance ($P < 0.05$).

including 17 (20.2%) who had a CD4 cell count <200 cells per cubic milliliter. In a univariate analysis of correlates of late testing, only age over 30 years was associated with late diagnosis using the definition of CD4 cell count <350 cells per cubic milliliter (47.4% vs. 22.2%; $P < 0.05$). Infrequent testing was not associated with an increased risk of late diagnosis in this small sample. The median CD4 cell count for the 37 newly diagnosed participants who had an HIV test in the previous year was 373 cells per cubic milliliter (IQR, 201–499), compared with 443 cells per cubic milliliter (IQR, 247–588) for the 46 newly diagnosed participants reporting infrequent testing ($P = 0.35$). No other variable was found to be associated with late HIV diagnosis by either definition.

DISCUSSION

Despite US guidelines recommending at least annual HIV testing for sexually active MSM and more frequent testing (every 3 to 6 months) for those at higher risk, over 1 in 5 BMSM participants reported not testing in the year before study enrollment and 12% reported never having had an HIV test. Although testing rates among BMSM in the current study were better than those reported previously,[6,12] infrequent testing was associated with severe consequences, namely a significantly higher frequency of newly diagnosed HIV infection compared with that among BMSM tested in the previous 12 months. Infrequent testing, however, was not associated with lower CD4 cell counts or late diagnoses in this sample. Many factors could have contributed to the lack of difference in CD4 between groups, including the small sample size and the possibility of men in either group being recently infected, which could transiently reduce CD4 cell count. Infrequent testing has the potential to result in later presentation with more advanced disease and ongoing HIV transmission by those unaware of their diagnoses. These findings highlight the need for further expansion of HIV testing in populations such as BMSM who are at high-risk for HIV infection. The high prevalence of newly diagnosed infections

TABLE 3. Multivariate Analysis of the Probability of Infrequent HIV Testing (No HIV Test in the Previous Year)

			Univariate Model		Multivariate Model		
Characteristics	**Level**	**N (%)**	**OR (95% CI)**	***P***	**OR (95% CI)**	***P***	**RR (95% CI)**
Employment status	Unemployed	205 (24.1)	1.74 (1.29 to 2.36)	0.0003	1.67 (1.19 to 2.33)	0.0028	1.04 (1.01 to 1.07)
Housing status	Unstable	38 (28.8)	1.59 (1.06 to 2.37)	0.0248	1.52 (0.97 to 2.40)	0.0692	1.04 (1.00 to 1.08)
Seen healthcare provider in last 6 mo	No	134 (26.0)	1.60 (1.22 to 2.10)	0.0006	1.60 (1.19 to 2.15)	0.0018	1.08 (1.03 to 1.13)
HIV stigma	High (>16)	106 (24.1)	1.32 (0.99 to 1.76)	0.0623	1.40 (1.05 to 1.89)	0.0242	1.03 (1.00 to 1.05)
City	LA	47 (23.2)	1.67 (1.00 to 2.79)	0.0492	1.22 (0.70 to 2.11)	0.6171	
City	SF	43 (24.2)	1.77 (1.05 to 2.98)	0.0328	1.35 (0.77 to 2.39)	0.2904	
City	Atlanta	72 (28.5)	2.21 (1.37 to 3.57)	0.0012	1.57 (0.93 to 2.63)	0.0220	
City	Boston	33 (16.6)	1.10 (0.64 to 1.90)	0.7223	0.80 (0.44 to 1.45)	0.0748	
City	NY	48 (18.4)	1.25 (0.76 to 2.07)	0.3840	0.98 (0.57 to 1.68)	0.3728	

among those who were tested within the previous 12 months (over 4%) confirms the need for even more frequent testing, as recommended by the CDC.[6–10]

Being unemployed, not seeing a medical provider in the previous 6 months, and having high levels of internalized HIV stigma were all independently associated with infrequent HIV testing. Presumably, those who had seen a medical provider in the previous 6 months would have had better access to HIV testing, which may explain this finding. Similarly, those participants who were employed may have had better financial resources and health insurance coverage to facilitate access to medical care and HIV testing, though insurance status by itself was not independently associated with HIV testing within the previous year. The recent US Preventive Services Task Force recommendations for routine HIV testing, rather than risk-based testing, should increase testing rates among BMSM who may be less likely than white MSM to disclose their sexual identity to healthcare providers.[32,61,62] In addition, healthcare reform has the potential to improve access to care and to HIV testing for populations lacking in resources, including health insurance. HIV-related stigma has been identified as a barrier to HIV testing in previous studies as well.[47,63] Greater outreach and prevention efforts are likely to be needed to reach at-risk populations such as BMSM, to increase awareness, overcome additional barriers such as stigma, and improve HIV testing rates. Anti-stigma social media campaigns targeting HIV-negative individuals have been suggested as one possible way to address stigma as a barrier to HIV testing.[63] The reasons for the differences seen in previous HIV testing rates between cities are unknown, although differences in recruitment strategies between sites may have been a contributing factor.

In this HIV prevention study conducted in 6 US cities, there was high uptake of HIV testing among BMSM study participants, with 97% agreeing to testing. Although this was a select sample of men who agreed to participate in an HIV prevention trial, the high uptake of testing suggests that expanded testing is possible for BMSM, particularly if recruitment and testing are conducted by trained staff focused on reaching this community.

Overall 7.6% of the BMSM participants tested had newly diagnosed HIV infection at enrollment. Over one-third of those men met one of the 2 definitions for late HIV diagnosis; 39% had a CD4 cell count <350 cells per cubic milliliter at diagnosis, and a subset of those (20% of those with newly diagnosed HIV infection) had a CD4 cell count <200 cells per cubic milliliter. Thus, 20% had concurrent AIDS at the time of HIV diagnosis. Late diagnosis was significantly associated with older age in this study. There was no association between late diagnosis and infrequent HIV testing in this study, although the sample was small with CD4 cell count data available for only 84 participants. The high prevalence of late diagnosis and concurrent AIDS again underscore the urgent need for expanded HIV testing among BMSM in the United States.

A strength of this study was the large number of BMSM participants in HPTN 061, recruited in 6 US cities with high HIV prevalence. One limitation of the study is that the men were selected based on an eligibility requirement of unprotected anal intercourse, and thus are not representative of all BMSM in the United States, but do represent a high-risk population. The study population also had high rates of poverty and unemployment, which is not representative of all BMSM populations in the United States, but is consistent with disparities seen among populations with HIV.[18,20] Being a study of entirely BMSM with few Latino men, this study could not assess differences in HIV testing behavior between black MSM and MSM in other racial/ethnic groups; though few racial differences have been seen in previous studies.[20,23] Another limitation is that the study relied primarily on HIV testing history obtained by self-report. Although HIV-testing data were collected through ACASI, it is possible that participants could have over-reported recent HIV testing due to social desirability. This could potentially have contributed to the lower than expected CD4 cell count among the group that reported testing within the previous 12 months. Antiretroviral drug testing was performed as a supplement to self-report for a subset of study participants likely to be on ART, who did not disclose knowledge of their HIV status. This testing was performed only for men with low or undetectable HIV RNA at enrollment, and only assessed 3 antiretroviral drug classes (nucleoside reverse transcriptase inhibitors, non-nucleoside reverse transcriptase inhibitors, and protease inhibitors).[59] It is possible that some of the men classified as

newly diagnosed in this report could have been on ART without viral suppression, or could have been taking medications in another drug class. Nondisclosure of HIV status and/or ART use has been identified previously in other settings, including in other HIV prevention trials and in STI clinics.[64–66] Some participants in HPTN 061 also did not agree to HIV testing or did not have samples stored for confirmation of HIV status, and some men with HIV infection were missing CD4 cell count data. Finally, because the current analyses used data collected in a large HIV prevention study, it was not possible to assess all factors or barriers potentially associated with testing.

The findings of this study highlight the fact that sexually active BMSM are not being tested for HIV according to the CDC guidelines. The results also underscore the need for expanding HIV testing and prevention efforts for this population at significant risk of HIV infection, as recommended in the US National HIV/AIDS Strategy.[67] The findings of this study also support recent CDC recommendations for more frequent HIV testing in BMSM.[6–10] Although the benefits of routine HIV testing are clear, and routine HIV testing should continue in all primary care settings,[5,32] additional efforts and resources are needed to reach BMSM, particularly those not engaged in healthcare. Further research is needed to understand the barriers to HIV testing among BMSM and to assess interventions that reduce stigma and promote the uptake of HIV testing for BMSM.

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