



ELSEVIER

 JOURNAL OF
 ADOLESCENT
 HEALTH

www.jahonline.org

Original article

Low Rates of Human Immunodeficiency Virus Testing Among Adolescent Gay, Bisexual, and Queer Men

Gregory Phillips II, Ph.D., M.S.^a, Michele L. Ybarra, M.P.H., Ph.D.^b, Tonya L. Prescott^b, Jeffrey T. Parsons, Ph.D., M.A.^c, and Brian Mustanski, Ph.D.^{a,*}

^a Department of Medical Social Sciences, Feinberg School of Medicine, Northwestern University, Chicago, Illinois

^b Center for Innovative Public Health Research, San Clemente, California

^c Hunter College and the Graduate Center of the City University of New York, Center for HIV/AIDS Educational Studies and Training (CHEST), New York, New York

Article history: Received April 8, 2015; Accepted June 18, 2015

Keywords: HIV; YMSM; HIV testing

A B S T R A C T

Purpose: Adolescent gay and bisexual men (AGBM) are disproportionately affected by human immunodeficiency virus (HIV), but little is known about testing rates among men aged 18 years and under or about the barriers that they face when contemplating an HIV test. Therefore, we investigate here the testing behaviors and barriers among a diverse national sample of AGBM.

Methods: A total of 302 AGBM aged 14–18 years were recruited via Facebook ads to participate in an mHealth (text messaging-based) HIV prevention program. Recruitment was stratified to ensure approximately 50% were sexually inexperienced.

Results: Only 30% of sexually active participants had ever been tested for HIV, and nearly half of them did not know where they could go to get tested for HIV (42.9%). Based on exploratory factor analysis, nine questions assessing potential barriers to HIV testing factored into three subscales: external factors, fear, and feelings of invincibility. Among sexually active participants, those who had never tested for HIV had significantly greater scores on the external factors (odds ratio, 1.63; 95% confidence interval, 1.01–2.66) and fear (odds ratio, 1.88; 95% confidence interval, 1.11–3.19) subscale. Older (16–18 years old) youth were especially likely to be affected by external factor barriers, and fear was associated with never testing among gay-identified individuals.

Conclusions: HIV testing rates were low among AGBM. Several modifiable barriers emerged, especially a lack of knowledge about the closest testing site. Interventions and programs that target high school–age adolescents could address external barriers by introducing HIV testing services into high schools.

IMPLICATIONS AND CONTRIBUTION

Although adolescent gay and bisexual men are disproportionately affected by human immunodeficiency virus (HIV), little is known about their HIV testing rates. This study highlights low testing rates among 14- to 18-year-old sexual minority males and classifies testing barriers into three categories: external factors, fear, and feelings of invincibility.

© 2015 Society for Adolescent Health and Medicine. All rights reserved.

Clinical Trials Registry: ClinicalTrials.gov (NCT02113956).

Disclaimer: The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institute of Mental Health or the National Institutes of Health.

* Address correspondence to: Brian Mustanski, Ph.D., Department of Medical Social Sciences, Feinberg School of Medicine, Northwestern University, 625 N. Michigan Avenue, Suite 2700, Chicago, IL 60611.

E-mail address: brian@northwestern.edu (B. Mustanski).

Adolescent gay and bisexual men (AGBM), along with other young men who have sex with men (YMSM) but who do not identify with these labels, are disproportionately affected by human immunodeficiency virus (HIV). In the United States, YMSM aged 13–24 years represent one of the only risk group in which the number of new HIV diagnoses has continued to increase from 2009 to 2013 [1]. This also does not account for 63%

of YMSM and 54% of racial/ethnic minority men who have sex with men (MSM) who are unaware of their HIV infection [2]. In one of the few epidemiologic studies of HIV prevalence among YMSM that included individuals aged <18 years, the Young Men's Study conducted between 1994 and 1998 found that 5.6% of YMSM between the ages of 15 and 19 years were HIV positive [3].

Despite the Centers for Disease Control and Prevention (CDC) recommendations that sexually active MSM get tested for HIV at least every 6 months [4], HIV testing rates of YMSM are suboptimal [5–9]. In the National HIV Behavioral Surveillance System (NHBS), the lowest lifetime testing rate among MSM was in the youngest age group of 18- to 19-year-olds (75%), and only 64% had been tested in the past year [5]. In the Community Intervention Trial for Youth, conducted in 1999, researchers found that only 50% of YMSM aged 15–17 years had tested for HIV [6]. Nearly fifteen years later, the 2013 Youth Risk Behavior Survey found that only 11% of high school males, across sexual identities, had ever been tested for HIV. This proportion was only slightly greater in later grades (13% each of 11th- and 12th-grade males) [7]. As HIV testing is the first step in the HIV continuum of care, it is vitally important to improve testing rates to decrease the HIV burden among AGBM.

Research has also highlighted a lag time between the first sex and the first HIV test. For example, several studies have shown that black and Latino YMSM have their first HIV test an average of 2 years after sexual debut [8,9]. This delay in testing constitutes a significant period of time in which YMSM remain unaware of their HIV status and could be the reason why one study found that one-third of racial/ethnic minority YMSM tested positive on their first HIV test [8]. In comparison, NHBS found that 16% of adult MSM tested HIV positive on their first HIV test [10]. We need to not only invigorate testing rates but also reduce the time between the first sex and the first HIV test.

Investigating barriers and facilitators to HIV testing is vital in understanding the reason for low testing rates among AGBM. Frequently endorsed reasons for testing include wanting to know an HIV-negative status, concerns about potential HIV exposure, presence of social support, and exposure to HIV prevention information [6,8,9]. However, not much is known about factors that hinder HIV testing, particularly those that relate to structural and psychological barriers, among young men. Therefore, we proposed to investigate the HIV testing behaviors and reported obstacles among a diverse national sample of AGBM aged 14–18 years.

Methods

Between June and November 2014, 302 gay, bisexual, or queer identified males aged 14–18 years from across the United States were enrolled into a randomized controlled trial testing, a text messaging-based HIV prevention program (Guy2Guy). The research protocol was reviewed and approved by both the Chesapeake Institutional Review Board and the Northwestern University Institutional Review Board. A waiver of parental permission was obtained to prevent youth from being required to disclose their sexual identity to their parents to participate in the study [11].

Participants

To take part in the study, respondents needed to self-identify as gay, bisexual, and/or queer; have a male sex assigned at birth;

have a male gender identity; be between the ages of 14 and 18 years; speak English; report being the exclusive owner of a cell phone with an unlimited text messaging plan; have used text messaging for at least 6 months; intend to have the same number for the next 6 months; and provide informed assent/consent. Participants also completed an assessment of decisional capacity as part of the assent process [12]. Regarding threats to external validity because of the requirement that participants have a cell phone and unlimited text messaging, recent national data show that 78% of teens have a cell phone [13] and 63% exchange texts with people in their lives on a daily basis [14]. Of our screened participants, only three (.9%) were deemed ineligible because of lack of a cell phone; two of these individuals were still able to exchange text messages through their tablet computers.

Recruitment

All participants were recruited through national advertisements placed on Facebook. These advertisements asked viewers to take part in a “text messaging-based healthy sexuality program” that was designed for “gay, bi, & queer teen guys like you!” To ensure a demographically representative sample of AGBM, targeted ads were also used to enroll individuals from particular subgroups with low response rates for this study (e.g., 14-year-olds, black males). Anyone who clicked on the link in the advertisement was directed to an online screener form. Based on their responses, individuals who appeared eligible were contacted sequentially, based on recruitment targets, to confirm eligibility; those who were ineligible were e-mailed HIV prevention resources. Recruitment targets included the following: sexual experience (50% experienced), race (65% white, 20% black, and 15% other), ethnicity (20% Hispanic), age (40% 14–15 years and 60% 16–18 years), and urban versus rural living situation determined by ZIP code (80% urban and 20% rural). These recruitment targets were developed through reviewing U.S. Census and American Community Survey data and oversampling minority populations (e.g., 13.2% of people living in the United States identified as black, so the target was increased to 20%) [15]. Once eligibility was determined, the participant was provided with more details about the study, and verbal assent/consent was obtained. The participant was then sent a link to the online survey via text message and e-mail.

An individual was not considered enrolled in the study until he completed the baseline survey and was randomized into one of the study arms. Of the 321 gay, bisexual, and/or queer males who were eligible and provided consent, all but 19 (5.9%) completed the baseline assessment and were enrolled in the study. There were no significant demographic differences between those who were enrolled and those who were not except for Hispanic ethnicity: those who did not complete the baseline survey were significantly more likely to identify as Hispanic than those who completed the survey ($p = .02$).

Measures

Baseline data were used in this article. Demographic characteristics assessed included age, race, ethnicity, and sexual identity. Participants could identify multiple sexual identities; to identify differences between bisexually identified and gay-identified youth, those who identified as both categories were excluded from analyses addressing sexual identity. There were no significant differences in characteristics between youth who

identified as both gay and bisexual, and those who identified as only one of those sexual identities.

Human immunodeficiency virus testing behaviors. Participants were asked a series of questions regarding their HIV testing behaviors. Specifically, they were asked how many times they had ever been tested, if they had been tested in the prior 3 months, and their status on their most recent HIV test. Additional questions collected information on knowledge about where to get tested and distance to the closest HIV testing location. Finally, a series of items were included to assess components of the information-motivation-behavioral skills (IMB) model [16]. Related to this analysis, the item “Most people my age who have sex get tested for HIV” from the questionnaire was used.

Human immunodeficiency virus testing barriers. A nine-item scale to assess barriers to HIV testing was adapted from a 13-item scale developed by Awad et al. [17]. In this adaptation, items were revised to be more applicable to adolescent males (e.g., most adolescents would have difficulties responding to the item, “You are afraid of losing your health insurance,” and so it was dropped). Additionally, scoring was changed to three response options: “not important,” “somewhat important,” and “very important.” All participants were asked these questions regardless of their sexual experience or HIV testing history; however, the introductory text was altered based on whether they had ever tested and if they had tested in the prior 3 months.

Consensual sexual experience. Participants were classified as sexually experienced if they indicated at least one person in response to the question: “With how many people have you ever had anal sex (where a penis goes into someone’s anus) or vaginal sex (where a penis goes into someone’s vagina) when you wanted to (you were not forced)?”

Statistical analysis

Univariate analyses were conducted to determine the distribution of participant responses to each of the HIV testing behavior and barrier questions. Odds ratios (ORs) and χ^2 test statistics were calculated to assess significant associations between sexual experience, demographic characteristics, and HIV testing behaviors and barriers.

An exploratory factor analysis (EFA) using maximum likelihood estimation and varimax rotation was conducted to identify the factor structure of the nine HIV testing barriers items using PROC FACTOR. Hypothesis testing was conducted to determine if there were any common factors and the optimal number of factors. Model fit was assessed using root mean square error of approximation [18] and the Tucker-Lewis index [19]. Variables that loaded onto a particular factor were determined by extracting all items with loadings $>.30$, and reviewing this complement of variables to ensure that they comprised a meaningful factor. Cronbach’s α was calculated for each factor to assess internal consistency.

Logistic regression modeling was used to identify significant associations between having tested for HIV and these subscales. Bivariate and multivariate analyses using factor scores were limited to sexually experienced participants. Stratified analyses were conducted to explore potential associations between testing for HIV and factor scores within three demographics believed to experience differential barriers—age, sexual identity,

and race. All analyses were conducted using SAS version 9.4 (SAS Institute, Cary, NC).

Results

Because of purposeful sampling, most of the 302 AGBM participants were identified as white (67.6%), followed by 14.2% black, and 18.2% other race (Table 1). Nearly one-quarter (22.5%) identified their ethnicity as Hispanic. Approximately one third (38.4%) were aged 14–15 years, and a similar proportion (32.3%) identified as bisexual. Study participants came from geographically diverse areas, representing 43 states.

Human immunodeficiency virus testing behaviors

One fifth of all participants had ever tested for HIV (20.2%), and less than half of those had been tested within the prior 3 months (42.6%). AGBM, including sexually experienced and inexperienced youth, reported a mean of .4 lifetime HIV tests (standard deviation = 1.15). Nearly half of all participants did not know where they could go to get tested for HIV (42.9%). Not surprisingly, knowing where to get tested was significantly associated with having ever been tested (OR, 9.38; 95% confidence interval [CI],

Table 1
Bivariable associations with ever testing for HIV among sexually experienced and inexperienced adolescent gay and bisexual men (n = 302)

	Total, n (column %)	Tested, n (row %)	Never tested, n (row %)	OR (95% CI)
Sexually experienced				
Yes	152 (50.3)	46 (30.3)	106 (69.7)	3.91 (2.07–7.38)
No	150 (49.7)	15 (10.0)	135 (90.0)	1.00 (—)
Age (years)				
14–15	116 (38.4)	19 (16.4)	97 (83.6)	1.00 (—)
16–18	186 (61.6)	42 (22.6)	144 (77.4)	1.49 (.82–2.71)
Race				
Black	43 (14.2)	6 (14.0)	37 (86.1)	.61 (.24–1.53)
Other	55 (18.2)	12 (21.8)	43 (78.2)	1.05 (.51–2.15)
White	204 (67.6)	43 (21.1)	161 (78.9)	1.00 (—)
Hispanic ethnicity				
Yes	61 (20.2)	12 (17.7)	56 (82.4)	.81 (.40–1.63)
No	241 (79.8)	49 (20.9)	185 (79.1)	1.00 (—)
Type of community				
Urban area	101 (34.0)	16 (15.8)	85 (84.2)	.69 (.33–1.45)
Suburban area	107 (36.0)	23 (21.5)	84 (78.5)	1.01 (.51–2.00)
Rural area	89 (30.0)	19 (21.4)	70 (78.7)	1.00 (—)
Family income				
Lower than average	72 (24.7)	13 (18.1)	59 (81.9)	.80 (.35–1.87)
Average	154 (52.9)	33 (21.4)	121 (78.6)	.99 (.49–2.01)
Higher than average	65 (22.3)	14 (21.5)	51 (78.5)	1.00 (—)
Sexual identity^a				
Gay	191 (67.7)	37 (19.4)	154 (80.6)	.97 (.52–1.83)
Bisexual	91 (32.3)	18 (19.8)	73 (80.2)	1.00 (—)
Sexual behaviors—ever (yes vs. no)				
		n (column %)	n (column %)	
Vaginal sex	46 (15.2)	18 (29.5)	28 (11.6)	3.18 (1.62–6.27)
Receptive anal sex	123 (40.7)	39 (63.9)	84 (34.9)	3.31 (1.84–5.95)
Insertive anal sex	114 (37.8)	36 (59.0)	78 (32.4)	3.01 (1.67–5.36)

CI = confidence interval; HIV = human immunodeficiency virus; OR = odds ratio.

^a Excludes 19 who identified as both gay and bisexual and one who identified as queer.

3.89–22.6). Of those participants who were aware of a testing location, 36.1% said the nearest HIV testing place was <15 minutes away, 51.2% said it was between 15 and 30 minutes away, and 12.6% said it was more than 30 minutes away. All but three participants (4.9%) who had ever tested for HIV provided their HIV status, and all were reported HIV negative.

Approximately one half of participants (50.3%) reported ever having vaginal or anal sex in their lifetime. These sexually experienced adolescents were significantly more likely to have been tested for HIV than sexually inexperienced adolescents (OR, 3.91; 95% CI, 2.07–7.38; Table 1). HIV testing did not vary by demographic characteristics, including age, race, ethnicity, sexual identity, family income, or type of community resided in (urban vs. rural).

In addition, participants who had never tested were more likely than those who had been tested to endorse “very untrue” or “somewhat untrue” in response to the statement “Most people my age who have sex get tested for HIV” (71.6% vs. 55.0%; $\chi^2 = 13.9$; $p = .008$).

Human immunodeficiency virus testing barriers

The most frequently endorsed barriers to getting tested for HIV among all youth included not knowing where to get tested (41.5% reported this item as a “very important” barrier), believing oneself to not be at risk for HIV (34.7%), and not wanting other people to learn that they had been tested (33.8%; Table 2). Conversely, thinking that testing is only for older people (10.5%) and preferring not to know if one was HIV infected (10.6%) were the least commonly cited barriers.

An EFA was used to determine the number of subscales within the items measuring the HIV testing barriers. Significance tests showed that there was at least one common factor (H_0 : no common factors; $\chi^2 = 430.8$; $p < .0001$) and that a three-factor solution was an excellent fit to the data ($\chi^2 = 10.9$; $p = .54$). Reflecting the nonsignificant chi-square test of model fit, the three-factor model was an excellent fit for the data (root mean square error of approximation, .000; Tucker-Lewis index = 1.00).

The three subscales identified by the EFA were named as follows: barriers due to external factors, barriers due to fear, and barriers due to feelings of invincibility (Table 3). All factor scores were scaled to mean = 0 and standard deviation = 1. Therefore, an increase of one in the OR represents a one standard deviation increase in the factor score. Among sexually experienced participants, those with greater scores for external factors (OR, 1.63; 95% CI, 1.01–2.66) and fear (OR, 1.88; 95% CI, 1.11–3.19; Table 4) were significantly more likely to have never tested for HIV. There was no significant association between a history of testing and feelings of invincibility ($p = .32$). No factors were associated with HIV testing among sexually inexperienced youth.

Among gay-identified sexually active participants, only fear was significantly associated with not testing for HIV (OR, 3.32; 95% CI, 1.35–8.18; Table 4). For bisexual-identified sexually active participants, there were no significant associations between HIV testing and factor scores. Although no factor scores were associated with HIV testing among sexually active individuals aged 14–15 years, those aged 16–18 years had an association between fear and not testing for HIV similar to, but weaker than, that found among gay-identified youth (OR, 1.92; 95% CI, 1.06–3.48). Finally, among sexually experienced youth stratified by race, only white individuals had an association between external factors and fear and never testing for HIV.

Table 2

Barriers to HIV testing among sexually experienced and inexperienced adolescent gay and bisexual men (n = 302)

There are many reasons why people do not get tested for HIV. For each of the following items, please tell us how important the reason is for not testing	Total, n (%)	Tested, n (%)	Never tested, n (%)	χ^2 (p value)
I don't have a way to get to the testing site/the site is too far away				1.00 (.61)
Very important	81 (27.4)	14 (23.0)	67 (28.5)	
Somewhat important	75 (25.3)	15 (24.6)	60 (25.5)	
Not important	140 (47.3)	32 (52.5)	108 (46.0)	
I don't know where to go to get tested				9.64 (.008)
Very important	124 (41.5)	15 (24.6)	109 (45.8)	
Somewhat important	61 (20.4)	14 (23.0)	47 (19.8)	
Not important	114 (38.1)	32 (52.5)	82 (34.4)	
I don't think the people who work at the testing site are friendly to gay/bisexual/queer guys				.60 (.74)
Very important	62 (21.0)	12 (19.7)	50 (21.3)	
Somewhat important	72 (24.3)	13 (21.3)	59 (25.1)	
Not important	162 (54.7)	36 (59.0)	126 (53.6)	
I might run into people I know at the testing site				1.17 (.56)
Very important	42 (14.1)	6 (9.8)	36 (15.3)	
Somewhat important	74 (24.9)	16 (26.2)	58 (24.6)	
Not important	181 (60.9)	39 (63.9)	142 (60.2)	
I don't want people I know (like parents or friends) to find out I was tested				10.52 (.005)
Very important	101 (33.8)	10 (16.4)	91 (38.2)	
Somewhat important	82 (27.4)	20 (32.8)	62 (26.1)	
Not important	116 (38.8)	31 (50.8)	85 (35.7)	
I hate needles				.63 (.73)
Very important	49 (16.4)	12 (19.7)	37 (15.6)	
Somewhat important	54 (18.1)	11 (18.0)	43 (18.1)	
Not important	196 (65.6)	38 (62.3)	158 (66.4)	
I would rather not know if I have HIV				2.18 (.34)
Very important	31 (10.6)	8 (13.1)	23 (9.9)	
Somewhat important	31 (10.6)	9 (14.8)	22 (9.5)	
Not important	231 (78.8)	44 (72.1)	187 (80.6)	
I'm not at risk for HIV				.84 (.66)
Very important	102 (34.7)	20 (33.9)	82 (34.9)	
Somewhat important	67 (22.8)	16 (27.1)	51 (21.7)	
Not important	125 (42.5)	23 (39.0)	102 (43.4)	
I'm young—testing is something people do when they are older				1.33 (.51)
Very important	30 (10.5)	4 (6.9)	26 (11.4)	
Somewhat important	55 (19.2)	10 (17.2)	45 (19.7)	
Not important	202 (70.4)	44 (75.9)	158 (69.0)	

HIV = human immunodeficiency virus.

Discussion

Similar to previous studies of adolescent men [5–7], HIV testing rates were low among sexually active AGBM in this sample, with less than one third having ever been tested. Three times as many 18- to 19-year-old YMSM (75%) reported ever being tested in NHBS [5]. Perhaps, there is an increase in testing in the transition from adolescence to young adulthood as defined by age 18 years, potentially because of newfound independence in attending college or moving out of one's parents' home. Given that adolescent males <18 years are having sex, the need to invigorate testing at an earlier age is clear. One potential reason

Table 3

Exploratory factor analysis of HIV testing barriers and factor loadings among adolescent gay and bisexual men

	Testing barriers		
	External factors	Fear	Feelings of invincibility
I don't have a way to get to the testing site/ the site is too far away	.6322		
I don't know where to go to get tested	.7770		
I don't think the people who work at the testing site are friendly to gay/bisexual/ queer guys	.3991		
I might run into people I know at the testing site		.7501	
I don't want people I know (like parents or friends) to find out I was tested		.6059	
I hate needles		.3444	
I would rather not know if I have HIV			.6182
I'm not at risk for HIV			.3864
I'm young—testing is something people do when they are older			.5872
Cronbach's α	.673	.594	.533
Variance explained (weighted)	3.013		(33.5%) ^a
2.539 (28.2%) ^a	1.643		(18.3%) ^a

HIV = human immunodeficiency virus.

^a Combination of three factors explains 79.9% of total variance = 9.

for the dearth of HIV testing could be lack of knowledge about testing locations: nearly half of AGBM were unaware of a local facility where they could get tested for HIV. Unfamiliarity with testing locations could easily be addressed by solutions offered by the CDC, which include school-based testing or school-based referral programs that link students with HIV testing sites [20] or by use of an online locator designed to find nearby testing sites, such as <https://aids.gov/locator/>. However, interventions such as those described by the CDC might encounter difficulties in gaining traction; only 33 states and the District of Columbia mandate HIV education in schools. Many students therefore never receive information about the importance of regular HIV testing on becoming sexually active [21]. Increasing awareness of the necessity of HIV testing and awareness of testing facilities, possibly through school-based programs, could easily address these knowledge gaps identified within this study. In locations where school-based programs may not be acceptable, online or text messaging-based programs such as Guy2Guy could be successful at addressing these deficiencies.

Barriers to HIV testing among AGBM fell into three factors: external factors, fear, and feelings of invincibility. Although external factors and fear barriers were significantly associated with not testing for HIV, there was no corresponding association for feelings of invincibility as a barrier. Many prior studies have cited a perception of invincibility or invulnerability among youth as a key factor in HIV acquisition, especially among YMSM [22,23]. However, this study suggests that feelings of HIV invincibility are not the main obstacle preventing AGBM from testing for HIV. Thus, by focusing attention and resources on combating invincibility, we may be missing the most effective targets. Instead, we should continue to focus on these external and fear barriers to have a maximum impact on increasing HIV testing rates. Predominant among these barriers are an inability to access testing sites, worry about the testing process, and fear of potential disclosure to family or friends. Knowledge and education are the best ways we have to overcome these barriers for youth; however, these should focus more on the HIV testing

Table 4

Multivariate associations between factor scores and never testing for HIV among all youth and among specific subpopulations of interest

	N	External factors; OR (95% CI)	Fear; OR (95% CI)	Feelings of invincibility; OR (95% CI)
Full model (all youth)	289	1.49 (1.03–2.16)	1.28 (.86–1.89)	.80 (.54–1.19)
Sexually inexperienced ^a	141	1.08 (.56–2.10)	.94 (.48–1.84)	.95 (.46–1.89)
Sexually experienced ^a	138	1.63 (1.01–2.66)^b	1.88 (1.11–3.19)	.77 (.46–1.28)
Among sexually experienced AGBM				
Gay-identified ^a	85	1.33 (.73–2.44)	3.32 (1.35–8.18)	.56 (.28–1.15)
Bisexual-identified ^a	45	2.41 (.84–6.98)	.87 (.39–1.93)	1.27 (.48–3.38)
14–15 year old ^a	52	1.33 (.52–3.38)	2.19 (.89–5.38)	.65 (.24–1.79)
16–18 year old ^a	86	1.92 (1.06–3.48)	1.61 (.82–3.14)	.84 (.46–1.53)
Black ^a	22	3.06 (.42–22.2)	4.21 (.60–29.6)	.30 (.05–1.87)
White ^a	97	1.79 (1.00–3.21)	1.85 (1.03–3.33)	.84 (.43–1.64)
Other race ^a	19	.43 (.09–2.18)	1.86 (.25–13.8)	.35 (.08–1.68)

Bold: $p < .05$.

AGBM = adolescent gay and bisexual men; CI = confidence interval; HIV = human immunodeficiency virus; OR = odds ratio.

^a Mutually exclusive categories.^b That is, among sexually experienced AGBM, a one-unit increase in the external factors score is associated with a 1.63 times increase in the odds of having never tested for HIV.

experience to empower them to seek HIV testing resources. Ensuring all adolescents know places where they can get tested, and addressing fears by communicating that adolescents can be tested confidentially or anonymously and without the use of needles would likely help to invigorate HIV testing among AGBM because these items had the largest effects within the barrier scales.

Of additional interest are the demographic differences in scores on these subscales. Although these analyses are exploratory and results should be interpreted with caution, they provide insight into potential areas of future study. Again, feelings of invincibility were not associated with testing within any demographic subgroup. Surprisingly, although rates of sexual experience were similar to older youth, none of the factors were associated with testing within the youngest age group. We anticipated that lack of testing among 14- and 15-year-old AGBM would be strongly associated with external factor barriers, particularly because they are unable to drive and have likely received less information about HIV testing than their older counterparts. One possible explanation for this is also related to access to transportation; youth who are fully reliant on their parents to drive them places are less likely to have opportunities to engage in sex and would therefore be less likely to appear as sexually active in our sample.

This study had several limitations. Findings may not be generalizable to AGBM samples recruited through other strategies, including those that are face to face. They also may not extend to MSM but do not self-identify with a gay or bisexual identity. Additionally, because participants were purposefully recruited, the percentages should not be seen as estimates of population prevalence, although they are likely more representative than many samples given the purposeful diversity of participants. The Cronbach α statistics for each of the subscales was suboptimal—this may be due to the small number of items within

each factor [24]; future researchers should develop and test additional questions that can strengthen these measures. Furthermore, all data were reliant on self-report and could have been affected by social desirability bias. However, this was minimized by using an Internet-based survey in which participants did not need to interact with study staff when providing responses. Inability to accurately recall behaviors (i.e., time of last HIV test) may have affected participant answers. This was mitigated by time anchoring questions to the last act or the last 3 months, and participants were asked to provide a memorable event that occurred 3 months before the survey to facilitate memory. Finally, our adapted scale of barriers to HIV testing might not fully capture the array of perceived barriers among AGBM as youth were not fully involved in the development of the scale.

As one of the first studies to investigate the HIV testing behaviors of AGBM, findings highlight the many modifiable barriers that young men face in accessing testing services. Barriers such as lack of knowledge about the closest testing site are ones that can easily be addressed through interventions and programs that target high school–age adolescents.

Acknowledgments

The authors acknowledge all study participants for their vital role in completing this study.

Funding Sources

This study was supported by a grant from the National Institute of Mental Health (R01MH096660).

References

- [1] Centers for Disease Control and Prevention. HIV surveillance—Men who have sex with men; 2015.
- [2] Centers for Disease Control and Prevention. Prevalence and awareness of HIV infection among men who have sex with men—21 cities, United States, 2008. *2010*;1201–1207.
- [3] Valleroy LA, MacKellar DA, Karon JM. HIV prevalence and associated risks in young men who have sex with men: Young Men's Survey Study Group. *J Am Med Assoc* 2000;284:198–204.
- [4] Workowski KA, Berman S. Sexually transmitted diseases treatment guidelines, 2010. Atlanta, GA: Centers for Disease Control and Prevention. *MMWR Recomm Rep* 2010;59:1–110.
- [5] 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.
- [6] Sumartojo E, Lyles C, Choi K, et al. Prevalence and correlates of HIV testing in a multi-site sample of young men who have sex with men. *AIDS Care* 2008;20:1–14.
- [7] Kann L, Kinchen S, Shanklin SL, et al. Youth risk behavior surveillance—United States, 2013. *MMWR Surveill Summ* 2014;63(Suppl 4):1–168.
- [8] Phillips 2nd G, Hightow-Weidman LB, Arya M, et al. HIV testing behaviors of a cohort of HIV-positive racial/ethnic minority YMSM. *AIDS Behav* 2012;16:1917–25.
- [9] Leonard NR, Rajan S, Gwadz MV, Aregbesola T. HIV testing patterns among urban YMSM of color. *Health Educ Behav* 2014;41:673–81.
- [10] Centers for Disease Control and Prevention. HIV testing among men who have sex with men—21 cities, United States, 2008. *MMWR Morb Mortal Wkly Rep* 2011;60:694–9.
- [11] Mustanski B. Ethical and regulatory issues with conducting sexuality research with LGBT youth. San Juan, PR: International Academy of Sex Researchers; 2009.
- [12] Mustanski B. Ethical and regulatory issues with conducting sexuality research with LGBT adolescents: A call to action for a scientifically informed approach. *Arch Sex Behav* 2011;40:673–86.
- [13] Pew Internet & American Life Project. Teens and technology; 2013.
- [14] Pew Internet & American Life Project. Teens, smartphones & texting; 2012.
- [15] United States Census Bureau. Selected characteristics of the native and foreign-born populations. 2013 American community survey 1-year estimates; 2013.
- [16] Misovich SJ, Fisher WA, Fisher JD. A measure of AIDS prevention information, motivation, behavioral skills, and behavior. In: Davis C, Yarber W, Bauserman R, et al., eds. *Handbook of Sexuality-Related Measures*. Thousand Oaks, CA: SAGE; 1998:328–37.
- [17] Awad GH, Sagrestano LM, Kittleson MJ, Sarvela PD. Development of a measure of barriers to HIV testing among individuals at high risk. *AIDS Educ Prev* 2004;16:115–25.
- [18] Steiger JH. Structural model evaluation and modification—an interval estimation approach. *Multivariate Behav Res* 1990;25:173–80.
- [19] Tucker LR, Lewis C. The reliability coefficient for maximum likelihood factor analysis. *Psychometrika* 1973;38:1–10.
- [20] HIV testing among adolescents: What schools and education agencies can do. 2014. Available at: http://www.cdc.gov/healthyouth/sexualbehaviors/pdf/hivtesting_adolescents.pdf. Accessed January 8, 2015.
- [21] Guttmacher Institute. State policies in brief: Sex and HIV education; 2015.
- [22] Flores 3rd DD, Blake BJ, Sowell RL. “Get them while they’re young”: Reflections of young gay men newly diagnosed with HIV infection. *J Assoc Nurses AIDS Care* 2011;22:376–87.
- [23] Mustanski B, Rendina HJ, Greene GJ, et al. Testing negative means I'm lucky, making good choices, or immune: Diverse reactions to HIV test results are associated with risk behaviors. *Ann Behav Med* 2014;48:371–83.
- [24] Tavakol M, Dennick R. Making sense of Cronbach's alpha. *Int J Med Education* 2011;2:53–5.