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Suboptimal Recent and Regular HIV Testing Among Black Men Who Have Sex With Men in the United States: Implications From a Meta-Analysis

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Abstract

Background: The continuum of HIV care among black men who have sex with men (BMSM) continues to be the least favorable in the United States. BMSM are disproportionately HIV-infected-but-unaware, despite expanded HIV testing efforts among this subgroup.

Methods: We meta-analytically analyzed various HIV testing patterns [lifetime, after 24 months, after 12 months, after 6 months, and frequent (every 3–6 months) testing] among BMSM using the PRISMA guideline. PubMed, MEDLINE, Web of Science, and PsycINFO were searched for relevant articles, reports, conference proceedings, and dissertations published between January 1, 1996, and April 25, 2018. Two independent investigators reviewed and abstracted data into a standardized form. We used the DerSimonian–Laird random-effect model to pool the HIV testing prevalence and I-square statistics to measure heterogeneity. Funnel plots and Egger tests were used to assess for publication bias. We also performed subgroup and meta-regression analyses to explore aggregate-level characteristics that explain the heterogeneity across studies.

Results: Our meta-analysis includes a total of 42,074 BMSM pooled from 67 studies. Lifetime HIV testing prevalence was high, 88.2% [95% confidence interval (CI): 86.2% to 90.1%], but recent (after 6 months = 63.4%; 95% CI: 59.3% to 67.4%) and frequent (42.2%, 95% CI: 34.1% to

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50.3%) HIV testing prevalence was low. Meta-regression suggests that younger age (borderline significant), lower annual income, and homelessness were correlated with lower lifetime/recent HIV testing prevalence; while ever having condomless insertive/receptive sex, alcohol consumption, and illicit drug use were associated with higher lifetime/recent HIV testing prevalence.

Conclusions: Recent and frequent HIV testing remains suboptimal among BMSM. Future testing programs should prioritize strategies to enhance self-initiated, regular HIV testing among BMSM.

Keywords

HIV testing; black/African American; men who have sex with men; United States; the continuum of HIV care

INTRODUCTION

Black or African American men who have sex with men (BMSM) continue to be the most HIV-affected populations in the United States.^{1,2} Despite the decline and stabilization of new HIV infections in recent years, BMSM have not benefited from this trend, who accounted for 1 of every 4 new HIV infections in 2016.³ Given BMSM's disproportionate HIV risk, targeted prevention and treatment efforts are continuously needed to reduce HIV-related syndemics⁴ and enhance pre-exposure prophylaxis uptake⁵ as well as "test-and-linkage-to-care" among this high-risk subgroup.⁶⁻⁸

Frequent HIV testing and knowledge of HIV serostatus is the premise before further biomedical interventions can follow [ie, antiretroviral therapy (ART) for HIV-positive patients; pre-exposure prophylaxis for HIV-negative patients].^{6,9,10} Frequent HIV testing, along with pre-test or post-test counseling, is also an important step to strengthen HIV awareness and safer sex skills to behaviorally reduce HIV risks.¹¹ Behavioral risk factors for HIV, such as condomless sex, elevated lifetime sexual partners, multiple concurrent partners, substance use before sex, and suboptimal HIV services utilization are common among MSM of various race/ethnicity.¹² Nonetheless, evidence suggests that the elevated HIV risk does not stem from the substantially riskier portfolios among BMSM than that among MSM of other races.¹³⁻¹⁷ In fact, BMSM are more likely than other groups to encounter individual (eg, poverty, low HIV awareness and depressive symptoms)¹⁸ and contextual (eg, violence/stigma/discrimination due to race, sexual orientation, and HIV in their living environments)¹⁹ barriers to HIV testing, resulting in a higher proportion of HIV-positive BMSM who are unaware of their infections.^{13,20} BMSM with undiagnosed or found with late-stage HIV infection may remain untreated,²¹ which fuels onward HIV transmission through condomless sex and poor HIV care engagement (ie, linkage-to-care, ART initiation, and viral suppression).^{22,23}

The US Centers for Disease Control and Prevention (CDC) recommends at least annual HIV testing for high-risk populations (eg, MSM), with some experts highlighting that more frequent (eg, every 3–6 months) testing, may benefit individuals at elevated HIV risk.²⁴⁻²⁶ However, studies have reported significant variations in HIV testing patterns among BMSM.

A study in Baltimore, Maryland, reported as high as 74% of young BMSM had undiagnosed infection²⁷; whereas Carrico et al²⁸ found 93% of young BMSM had tested and were aware of their serostatus before study participation. In the 2014 National Health Behavior Survey (NHBS), approximately 75% of BMSM reported past-12-month HIV testing; however, other studies^{29,30} found only half of the BMSM participants tested in the last year. At the national level, the CDC estimates at least 20% of BMSM are living with HIV but are unaware of their infection.³

To echo with the needs in strengthening HIV testing among BMSM, we conducted the first comprehensive meta-analysis of various HIV testing patterns and investigated particular contexts that can be inferred to improve HIV testing uptake among BMSM. Specifically, we meta-analytically summarized the prevalence (proportion) of HIV testing patterns and explored an array of study-level design as well as sociobehavioral characteristics that may explain the HIV testing heterogeneity among BMSM.

METHODS

The Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA; see Supplemental Material 1, Supplemental Digital Content, <http://links.lww.com/QAI/B296>) was used as the guideline to conduct and report the current meta-analysis.³¹

Literature Search Strategy

We comprehensively searched PubMed (MEDLINE), Web of Science, and PsycINFO for manuscripts, reports, conference proceedings, and dissertation/thesis published in English between January 1, 1996, and April 25, 2018. A logical combination of keywords and terminology for the search included “men who have sex with men” or “MSM” or “gay” or “homosexual” or “bisexual”; “HIV” or “human immunodeficiency virus”; “testing” or “test” or “diagnosis”; “black” or “African American” and were adapted to the search mechanism in each database (see Supplemental Material 2: search keyword for PubMed, Supplemental Digital Content, <http://links.lww.com/QAI/B296>). We also conducted crossreferencing by reviewing the bibliographies of included citations to identify potential references for consideration.

Selection/Exclusion Criteria

Studies were selected if they met the following criteria: (1) exclusively focused on or had a clearly defined subgroup of black/African American MSM; (2) reported HIV testing prevalence (as proportion), or had available data for direct calculation; and (3) were published in English and conducted in the United States. Because we were only interested in pooling HIV testing prevalence among BMSM living in the United States, we excluded studies that did not differentiate population subgroups (ie, no segregate data for BMSM) and included a mixed sample of transgender women/men or BMSM from other countries. We excluded studies that specifically targeted Hispanic, Caribbean, or multiethnic BMSM. We also excluded studies if they were a systematic review or meta-analysis, a qualitative study without relevant quantitative data, or intervention/randomized controlled trials without baseline or preintervention assessment of HIV testing prevalence.

Study Screening and Data Extraction

The titles and abstracts of all searched bibliographic records were initially screened for relevancy and duplication removal by 2 independent reviewers (Y.L. and C.Z.) before retrieving the full texts for further review. Reviewer discrepancies were discussed until agreement was reached, with a third reviewer (V.M.B.S.) as an arbitrator for unresolved disagreement. We also contacted the study authors if further clarification was needed or if full text was unavailable in our accessible databases. An experienced meta-analyst (Y.L.) reviewed the manuscripts and used a standardized form for data extraction, including source (author name, publication year), study period, setting (city, state), study type (eg, cross-sectional, cohort, case-control), sampling/recruitment strategy (eg, convenience, venue-based, respondent-driven), population characteristics (eg, awareness of HIV status, age range or mean/median, aggregate socioeconomic characteristics, and risk behavior distributions), source of HIV testing data (eg, self-report vs. others), and patterns of HIV testing prevalence (lifetime, recent, or frequent HIV testing). All extracted data were audited by an investigator (C.Z.) for accuracy.³²

Statistical Analysis

The primary outcome of interest was HIV testing prevalence. We assigned HIV testing patterns into 1 of the 3 categories: (1) lifetime HIV testing [ever tested (yes or no) before study participation]; (2) recent HIV testing [ever tested (yes or no) in the past 6 months, past 12 months, or past 24 months before study participation]; and (3) frequent HIV testing. We used the CDC expert-recommended HIV testing frequency (eg, every 3–6 months) to define our “frequent HIV testing” category. Therefore, frequent HIV testing patterns that fall in this frequency window were assigned to this group (ie, self-reported testing at least twice during the past 12 months, testing at least 3 times during the past 24 months, or testing at a frequency of every 3–6 months).²⁴ Because HIV testing was ascertained through self-report by the participants regarding their testing experiences before the survey in each included study, our categorization of “frequent HIV testing” does not make any temporal consistency assumption on their future frequent HIV testing uptake.

To account for the heterogeneity and generate a weighted-mean estimate of prevalence across all included studies,³² we used the DerSimonian–Laird random-effects approach to pool the proportion and calculate the corresponding 95% confidence intervals (CIs).³³ We used the I-square statistics to quantify the between-study heterogeneity.^{34,35} We used visual inspection and the Egger test to assess the asymmetry of funnel plots to detect potential publication bias.³⁶ We also examined the residuals in relation to the corresponding standard error in the pooled analysis to identify potential outliers.³⁷

Subgroup analyses were conducted to assess whether lifetime and past-12-month HIV testing varied by selected study-level characteristics. The stratified variables included the following: year of study (we used 2013 as the cut-off because the US Preventive Services Task Force confirmed CDC-recommended annual HIV testing for MSM as a reasonable approach in 2013),²⁵ HIV status on inclusion (HIV-negative or status-unknown vs. a mixed sample of HIV-negative or status-unknown and HIV-positive participants), age inclusion criteria used in the original study (< 18 years vs. 18–24 years vs. ≥ 25 years), sampling strategy

[venue-based sampling (eg, bars, pubs, gay clubs), referral-based sampling, Gay/MSM community-based organization-based sampling (eg, MSM-friendly HIV service and care provision institutions), online/social media sampling, and multiple convenience sampling], sample size [<300 vs. 300 (median)], and study site (cities with elevated HIV epidemics among BMSM and had available data for the current meta-analysis: Atlanta, Baltimore, Washington DC, New York City, Philadelphia, San Francisco, and Chicago). A modified meta-regression analysis³⁵ was conducted to assess the heterogeneous effect of aggregate-level sociobehavioral factors in HIV testing across studies. Specifically, our meta-regression explored the relationship between the prevalence of an interested factor and HIV testing among participants in each included study. The meta-regression and subgroup analyses were not performed for the past 24 months, past 6 months, or frequent HIV testing due to sparse data. We used Stata 14.0 (Stata Corporation, College Station, TX) to conduct all statistical analyses.

RESULTS

Search Results and Study Characteristics

Our search identified 1040 citations published between January 1996 and April 2018. After duplication removal ($k = 332$) and exclusion from title/abstract screening ($k = 496$; violation of at least 1 inclusion criterion), 212 studies were selected for full-text review screening, with 67 studies being retained for the meta-analysis (Fig. 1). Of the 67 studies, sample size ranges from 22 to 3244. Twenty-two of the studies were conducted among youth or young adult BMSM (age range: 13–35). A majority of the studies were based in large US cities with elevated HIV epidemics among BMSM (ie, New York City, Atlanta, Philadelphia, Washington DC, Chicago, San Francisco, and Baltimore). All except 5 studies used cross-sectional design. Forty-four studies were based on a larger project/trial or national surveillance survey (eg, *Young Men's Survey*, *NHBS*, *HPTN 061*, *Brothers y Hermanos*, *The UConnect Study*, etc.). Regarding the sampling/recruitment strategy, 24 studies used gay-frequented venue-based sampling; 16 studies used referral-based recruitment methods (ie, respondent-driven sampling, modified chain-referral, peer referral, and network-based referral); 5 studies recruited an internet-based sample of BMSM; 14 studies used multiple convenience sampling; 6 studies used gay-friendly organization-based recruitment, and 2 studies used HIV clinic database or clinic-based visit for recruitment. HIV testing history was assessed through self-report across all included studies, with 44 studies among HIV-negative or status-unknown BMSM, 22 studies among a mix sample of HIV-negative or status-unknown and HIV-positive BMSM, and 1 study among HIV-positive MSM only (see Supplemental Material 3, Supplemental Digital Content, <http://links.lww.com/QAI/B296>).

Meta-Analytical Summary of HIV Testing Prevalence

Our meta-analysis comprised a total of 42,074 BMSM pooled from 67 studies (98 findings). Of the 67 studies, 41 studies contributed 57 findings (pooled $N = 20,222$) to aggregate the prevalence of lifetime HIV testing [pooled prevalence = 88.2%, 95% CI: 86.2% to 90.1%]; 5 studies contributed 7 findings (pooled $N = 835$) to aggregate the prevalence of past-24-month HIV testing (pooled prevalence = 71.7%, 95% CI: 64.3% to 79.0%); 31 studies contributed 52 findings (pooled $N = 18,253$) to aggregate the prevalence of past-12-month

HIV testing (pooled prevalence = 67.4%, 95% CI: 64.1% to 70.7%); 7 studies contributed 10 findings (pooled N = 13,165) to aggregate the prevalence of past-6-month HIV testing (pooled prevalence = 63.4%, 95% CI: 59.3% to 67.4%), and 11 studies contributed 16 findings (pooled N = 5202) to aggregate the prevalence of frequent HIV testing (pooled prevalence = 42.2%, 95% CI: 34.1% to 50.3%). A significant decreasing trend ($P_{\text{trend}} < 0.05$) was seen from lifetime HIV testing to frequent HIV testing (see Table 1 and Supplemental Material 4, Supplemental Digital Content, <http://links.lww.com/QAI/B296>).

Heterogeneity, Publication Bias, and Outlier Assessment

High between-study heterogeneity was detected across studies in all groups of HIV testing: lifetime HIV testing ($I^2 = 95.8\%$, $P < 0.001$), past-24-month HIV testing ($I^2 = 74.4\%$, $P = 0.002$), past-12-month HIV testing ($I^2 = 96.1\%$, $P < 0.001$), past-6-month HIV testing ($I^2 = 95.5\%$, $P < 0.001$), and frequent HIV testing ($I^2 = 97.2\%$, $P < 0.001$). Asymmetry was seen in the funnel plots across all HIV testing patterns (Fig. 2). Nonetheless, the Egger test only suggested significant ($P < 0.001$) publication bias among studies used to pool the past-12-month HIV testing prevalence. Our residual analyses identified outliers among studies used to pool the lifetime [McGee et al (2013-D.C. site)], past-12-month [Manning et al (2015)] and past-6-month [Wilton et al (2014)] HIV testing prevalence. The sensitivity analysis by removing the outlier(s) shows a slight increase in lifetime (89.0% vs. 88.2%), past-12-month (67.9% vs. 67.4%) and past-6-month (67.6% vs. 63.4%) HIV testing prevalence.

Subgroup and Meta-regression Analysis

We did a stratified analysis of lifetime HIV testing and past-12-month HIV testing by selected study-level variables (Table 2). Several patterns converged for both types of testing were assessed. A higher pooled lifetime and past-12-month HIV testing prevalence was seen among studies that were conducted in 2014 or later, included a mixed sample of both HIV-positive and HIV-negative BMSM, used online/social media recruitment strategy, or had relatively smaller sample size ($N < 300$). Pooled lifetime and past-12-month HIV testing prevalence was lower among studies that purposively sampled younger BMSM (< 25 years for inclusion).

The meta-regression results are shown in Table 3. Studies with a greater proportion of BMSM aged 25 years or younger (borderline significant), who had \$20k or less annual income, or had ever been homeless were more likely to report a lower lifetime or and past-12-month HIV testing prevalence. On the contrary, studies with a greater proportion of BMSM who were health insured or noninjection drug users were more likely to show a higher prevalence of lifetime and past-12-month HIV testing. Studies reporting higher prevalence of condomless receptive anal sex were associated with increased lifetime HIV testing prevalence; whereas greater proportion of condomless insertive anal sex was associated with increased past-12-month HIV testing.

DISCUSSION

To the best of our knowledge, this is the first comprehensive meta-analysis of HIV testing patterns among BMSM in the United States. We found a substantial decreasing trend from

lifetime HIV testing (88%) to recent (eg, past-6-month, 63%) or frequent (eg, every 3–6 months, 42%) HIV testing. Our results were similar to a meta-analysis among 83,186 internet-using MSM in the United States, which found approximately 85% had ever tested and 60% had tested for HIV in the preceding year.³⁸ It is not uncommon to see higher HIV testing prevalence among BMSM compared with MSM of other racial subgroups. A study in a mid-western US city found smaller proportion of past-12-month HIV testing among Latino and non-Hispanic white MSM than among BMSM.³⁹ Another study among Grinder-based MSM in New York City reported substantially higher lifetime and recent HIV testing prevalence among BMSM compared with white or Latino MSM.⁴⁰ Nonetheless, evidence suggests that infrequent HIV testing is more common among BMSM as a result of intersectional stigma (eg, HIV, sexuality, and race), resulting in delayed HIV diagnosis, missed treatment opportunities, and unfavorable HIV care outcomes among this subgroup.^{41–43} In the current study, less than half of the BMSM participants reported HIV testing on a frequent basis. Universal voluntary HIV testing and immediate ART (eg, test-and-treat), combined with present prevention approaches, is the cornerstone to maximize the benefit of “treatment-as-prevention” strategy in reducing generalized HIV/AIDS epidemics.^{44,45} Strategies to promote repeated HIV testing are imperative for the success of HIV control among BMSM.

Our subgroup and meta-regression analyses revealed clues to help prioritize future HIV testing interventions among BMSM. We found studies that specifically targeted youth or young adult BMSM (age < 25 years) who showed the lowest pooled prevalence of lifetime and past-12-month HIV testing. The meta-regression results also found that studies with a greater proportion of BMSM aged below 25 years were associated (borderline significant) with a lower prevalence of lifetime or past-12-month HIV testing. Although young black men who have sex with men may be more aware of different types of HIV testing services because of research-driven projects targeting this subgroup in recent years,⁴⁶ the time-evolving reasons that young BMSM are favorably adopting the testing services should be investigated. Our meta-regression further showed that low annual income (< \$20,000), history of homelessness, and lack of health insurance were associated with a lower likelihood of having lifetime and past-12-month HIV testing among BMSM. The association between low socioeconomic status and suboptimal HIV care access has been shown in recent studies.^{47,48} Although efforts are continuously needed in reducing structural barriers and stigma among BMSM who are socioenvironmentally disadvantaged, future studies should also be innovative in mobilizing intrinsic motivation (ie, HIV testing self-efficacy) and decision-making (ie, behavioral economics) to meet the needs of those who may benefit the most from frequent HIV testing.^{49–51} Finally, we found BMSM ever engaged in condomless receptive anal intercourse and condomless insertive anal intercourse were more likely to report past-12-month and lifetime HIV testing, respectively. A possible explanation would be that high-risk behavior may raise HIV risk perception and the use of HIV prevention services to reduce anxieties. Future HIV prevention programs should strategize risk perception education and sexual risk reduction, targeting BMSM during their routine HIV care visits.

The high lifetime HIV testing and low recent HIV testing prevalence should be interpreted with caution. Participants who are aware of their HIV-positivity before study participation

would probably report ever testing for HIV. These individuals may not report recent HIV testing, especially when HIV infection was diagnosed before the interested timeframe in the survey (ie, individuals who were diagnosed HIV-positive 12 months before the survey uptake are unlikely to report any HIV testing within the past 6 months of study participation). Therefore, the proportion of HIV-positive participants in the study sample is likely to inflate lifetime HIV testing prevalence or underestimate recent HIV testing. We found more than half of the studies include both HIV-positive and HIV-negative or status-unknown BMSM to calculate HIV testing prevalence. Our subgroup analyses also revealed higher lifetime HIV testing prevalence among BMSM of mixed HIV status. Future studies should be attentive to the knowledge of HIV status before the study when assessing various HIV testing patterns.

Our meta-analysis also identified several research gaps of HIV testing among BMSM. First, we found surprisingly few studies published in 2014 and after that targeted BMSM to specifically assess HIV testing, highlighting an urgent need of conducting up-to-date research of HIV testing among BMSM. Second, more than half of the included studies were secondary data analyses from a larger trial or survey (eg, HPTN 061, NHBS); few were specifically designed to study the epidemiology of HIV testing or to test the efficacy of an HIV testing intervention. Third, the instruments for assessing HIV testing patterns are universally singular; most studies used binary or categorical assessment, whereas few assessed recent (eg, past 3–6 months) or repeat/frequent HIV testing patterns (eg, every 3, 6, or 12 months). Therefore, more hypothesis-driven studies with primary data collection methods are needed to explore a full array of HIV testing characteristics (eg, number of lifetime/recent HIV tests, HIV testing intervals, and time of the first and most recent test) and their multilevel determinants (eg, years of homosexual activities, HIV testing self-efficacy, HIV risk score, and network risk portfolios) among BMSM to inform targeted intervention development. Although some studies were specifically targeting youth and young adult BMSM, no study purposively sampled middle-aged or older BMSM. Although young black men who have sex with men represent the primary driver of HIV epidemics in the United States, older BMSM (eg, 50 years) are suggested to be more likely to have late-stage HIV infection at the time of diagnosis.⁵² Finally, the majority of these studies were conducted in large US cities or metropolitan areas (ie, New York City, Washington DC, Baltimore, San Francisco, Chicago, etc.); HIV testing and BMSM-focused studies are very limited in small and mid-size cities (ie, cities in Mid-South and Deep South regions) where HIV epidemics among MSM of color are surging. Data from 20 Southern US Departments of Health highlight that in 2016, BMSM received only 6% of all community-based HIV tests but accounted for 36% of all new HIV infections.⁵³ More research in these regions is needed to address the HIV risk and care disparity among BMSM.

The results and implications of this study should be interpreted in light of their limitations. First, our meta-analysis is vulnerable to the impact of social desirability bias that occurred in each included study, which may predispose BMSM to over-report HIV testing frequency and underreport risk behaviors. This bias may potentially inflate the pooled HIV testing prevalence and the protected effect of HIV testing in reducing risk behaviors. Second, our meta-analysis is subject to high heterogeneity across studies of different designs, settings, as well as sociobehavioral characteristics among the study participants. Third, owing to the

limited quantity of eligible studies and sparse data in certain subgroups, residual heterogeneity cannot be fully assessed or interpreted. There were also too few data to allow subanalyses of various types of HIV testing (eg, HIV self-testing, home-based testing, and community-based HIV testing). Some meta-analytic findings were only based on a small set of studies (ie, past-6-month testing, frequent HIV testing, and subgroup by locations). Although the present meta-analysis reflects a noteworthy signal, causal inference cannot be drawn. Fourth, because measurement and categorization of any given variable may vary across studies, we had to make arbitrary grouping to increase the subgroup size for the meta-regression, which may also impact on the heterogeneity and generalizability. Finally, publication bias was present among studies used to pool the past-12-month HIV testing, indicating studies with a lower past-12-month HIV testing prevalence tend to be more likely to be published. This publication bias may thus result in a lower pooled past-12-month HIV testing prevalence in the published studies. Nonetheless, our trim-and-fill analysis did not reflect a significant impact.⁵⁴

Despite these limitations, our study comprehensively summarized evidence across various HIV testing patterns in BSM and revealed important prevention–intervention gaps. Achieving the 90-90-90 UNAIDS goal among BSM is particularly challenging in many contexts; improved case finding is the priority.⁵⁵ Despite the widely implemented HIV testing campaigns among BSM, frequent and regular HIV testing remains a substantial challenge in this subgroup. Future studies should focus on developing programs that are sustainable in engaging BSM for frequent HIV testing and subsequent linkage to biomedical prevention or treatment.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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FIGURE 1.
Flowchart of study selection and inclusion procedure.

FIGURE 2.
Funnel plots for assessing the publication bias of reported HIV testing prevalence among the included studies.

Meta-Analytical Summary and Trend Across Different Types of Frequency-Based HIV Testing Prevalence Among Black/African American Men Who Have Sex With Men in the United States

TABLE 1.

Frequent testing denotes self-report HIV testing experiences that represent or can be translated to the frequency of every 3–6 months before the survey.

* Including any of the 3 categories: (1) tested at least twice during the past 12 months; (2) tested at least 3 times during the past 24 months; (3) tested at a frequency of every 3–6 months.

[†] P for trend analysis shows a significant ($P < 0.05$) decreasing trend from the pooled proportion reporting ever testing for HIV to the proportion reporting any repeat HIV testing among participants in the reviewed studies.

I², between-study heterogeneity with random-effect models to aggregate effect sizes when $I^2 > 25\%$; K, number of individual finding in the aggregated analysis; N, sample size; P24t, tested for HIV in the past 24 months; P12t, tested for HIV in the past 12 months; P6t, tested for HIV in the past 6 months.

TABLE 2.

Subgroup Analysis of Lifetime and Recent (Past-12-Month) HIV Testing Prevalence by Study and Design Characteristics

Stratified Variable	Ever Tested for HIV		Past-12-Month HIV Testing	
	k	Pooled Prevalence, % (95% CI)	k	Pooled Prevalence, % (95% CI)
Year of study				
2013 and earlier	47	87.9 (85.8 to 90.0)	45	66.0 (62.2 to 69.7)
2014 and later	10	89.3 (84.8 to 93.8)	7	76.3 (73.6 to 78.9)
HIV status (inclusion criteria)				
HIV– or status unknown	27	84.0 (80.6 to 87.5)	21	65.2 (60.0 to 70.4)
Mix (HIV–, status unknown, and known HIV+)	30	92.0 (90.3 to 93.6)	31	68.8 (64.4 to 73.2)
Sampling strategy				
Venue-based sampling [*]	23	88.9 (85.7 to 92.1)	30	66.1 (62.3 to 70.0)
Referral-based sampling	16	88.5 (85.1 to 91.9)	12	71.4 (64.4 to 78.5)
Gay/MSM community-based organization-based [†]	2	82.5 (61.9 to 93.1)	1	70.6 (52.1 to 89.1)
Online or social media recruitment	3	91.4 (89.6 to 93.1)	2	71.7 (65.8 to 77.6)
Multiple convenience sampling	12	85.6 (81.4 to 89.9)	6	67.1 (60.4 to 73.8)
Sample size				
<300	36	89.5 (87.0 to 91.9)	27	69.3 (65.5 to 73.0)
300	21	86.1 (83.2 to 89.0)	25	65.5 (60.6 to 70.5)
Age range (inclusion criteria)				
18 yrs	40	88.8 (86.6 to 91.1)	29	66.2 (61.2 to 71.2)
30 yrs	6	90.1 (87.4 to 92.7)	8	72.4 (69.1 to 75.7)
25 yrs	9	82.5 (74.2 to 90.7)	9	63.3 (53.0 to 73.7)
Study location				
Atlanta	6	85.1 (82.3 to 88.0)	1	66.3 (61.2 to 71.4)
Baltimore	3	88.3 (80.3 to 96.3)	3	62.4 (52.3 to 72.6)
Washington DC	10	84.9 (76.9 to 92.9)	6	67.7 (58.8 to 76.6)
New York City	5	94.4 (91.9 to 96.9)	4	66.1 (46.4 to 85.8)
Philadelphia	4	89.1 (81.8 to 96.4)	4	68.0 (59.0 to 77.0)
San Francisco	4	92.9 (90.8 to 95.1)	2	67.6 (61.5 to 73.7)
Chicago	2	91.4 (79.5 to 93.4)	2	72.9 (63.0 to 82.8)

^{*} Gay-frequented entertainment facility, such as bars, pubs, clubs etc.

[†] Private or public gay-friendly HIV service/care provision institutions.

TABLE 3.

Meta-Regression Analysis of Selected Sociodemographic/Behavioral Characteristics and Aggregate HIV Testing Prevalence Across Studies Conducted Among Black Men Who Have Sex With Men

Characteristics	Ever Tested for HIV				Past-12-Month HIV Test			
	k	% Range	Coefficient (95% CI)	P	k	% Range	Coefficient (95% CI)	P
Age 25yrs	13	5.9–84.1	−0.057 (−0.311 to 0.195)	0.071	7	10.6–45.0	−0.261 (−0.694 to −0.173)	0.068
Had at least some college and above education	28	19.0–87.0	−0.003 (−0.251 to 0.251)	0.998	17	19.0–81.7	0.285 (0.035 to 0.604)	0.094
Currently being health insured	18	48.9–86.8	0.199 (0.009 to 0.399)	0.051	20	48.9–86.8	0.242 (0.073 to 0.253)	0.031
Current annual income \$20,000 USD	13	16.0–85.6	−0.113 (−0.253 to 0.026)	0.101	9	44.6–85.6	−0.431 (−1.275 to 0.414)	0.025
Currently being employed	27	13.7–86.1	−0.101 (−0.110 to 0.131)	0.864	18	13.7–86.1	−0.161 (−0.319 to −0.003)	0.046
Ever been incarcerated	18	12.4–93.3	0.042 (0.092 to 0.176)	0.512	17	12.0–93.3	0.195 (0.136 to 0.377)	0.247
Ever been homelessness	17	1.5–62.7	−0.097 (−0.243 to 0.049)	0.018	14	8.8–62.7	−0.226 (−0.392 to −0.061)	0.012
Ever used drugs (noninjection)	24	37.2–85.9	0.202 (0.017 to 0.387)	0.034	16	37.7–68.4	0.802 (0.242 to 1.362)	0.008
Ever used alcohol	15	53.0–97.2	−0.019 (−0.325 to 0.287)	0.897	9	61.6–97.2	0.772 (0.173 to 1.371)	0.021
Ever had transactional sex	8	14.9–47.6	0.106 (−0.401 to 0.614)	0.613	7	11.7–47.6	−0.229 (−0.767 to 0.308)	0.301
Ever had condomless anal sex	19	19.0–66.0	−0.013 (−0.369 to 0.342)	0.938	7	30.5–66.0	0.427 (0.261 to 1.118)	0.197
Ever had condomless receptive anal sex	10	8.3–55.0	0.313 (0.058 to 0.569)	0.022	7	8.3–55.0	0.443 (0.252 to 1.138)	0.162
Ever had condomless insertive anal sex	9	20.5–75.0	0.172 (0.142 to 0.487)	0.236	6	20.5–75.0	0.594 (0.136 to 1.052)	0.023
Ever had sexually transmitted infections	6	11.0–66.1	0.089 (−0.105 to 0.283)	0.271	5	11.0–66.1	−0.551 (−1.139 to 0.296)	0.107

k, the number of the studies that measured and reported the frequency distribution of the selected characteristics and were included in the meta-regression analyses. Noninjection drug use is not confined to the type of drug but to the definition of the drug-using pattern.