HHS Public Access

Author manuscript

J Assoc Nurses AIDS Care. Author manuscript; available in PMC 2023 May 15.

Published in final edited form as:

J Assoc Nurses AIDS Care. 2023 ; 34(2): 135–145. doi:10.1097/JNC.0000000000000384.

What factors are associated with willingness to use HIV pre-exposure prophylaxis (PrEP) among U.S. men who have sex with men not on PrEP?: A Systematic Review and Meta-Analysis

Emiko Kamitani, PhD, MPH, MS, RN* **[Senior Service Fellow]**,
Megan E. Wichser, MPH [Programmer Analysis, II, SeKON],
Yuko Mizuno, PhD [Associate Chief for Science],
Julia B. DeLuca, MLIS [Health Communication Specialist],
Darrel H. Higa, PhD, MSW [Deputy Team Lead]

Division of HIV Prevention, Centers for Disease Control and Prevention, Atlanta, Georgia, U.S.

Abstract

PrEP, an antiretroviral medication to prevent HIV, is widely available in the United States since the Federal Drug Administration approved it in 2012. However, PrEP use among MSM is still limited and many MSM who are willing to take PrEP are not on PrEP. We performed a systematic review to identify factors associated with willingness to use PrEP among MSM who are not on PrEP. The majority of the 23 relevant studies had low risk of bias and used a cross-sectional design. Willingness was associated with being Hispanic/Latino (OR=1.68[95%CI:1.01-2.78]), Black (OR=1.41 [95%CI:1.02-1.95]), younger (OR=1.08 [95%CI:1.02-1.15]), having no college degree (OR=1.37 [95%CI:1.12-1.59]) or low-income (OR=1.21 [95%CI:1.12-1.32]). A higher proportion of MSM who had recent condomless anal sex (OR=1.85 [95%CI:1.49-2.29]), were diagnosed with sexually transmitted infection (OR=1.60 [95%CI:1.27-2.01]) or had multiple sex partners (OR=1.58 [95%CI:1.07-2.32]) were more willing to use PrEP compared to their respective counterparts. Findings suggest that MSM with racial/ethnic minority status, low-socioeconomic status, younger age, and engagement in HIV risky behaviors are willing to take PrEP but may lack access. Study limitations include the inability to conduct meta-analyses on certain predictor variables due to a small number of studies. This review identified MSM sub-populations who may benefit from interventions increasing PrEP access.

*Corresponding author: Emiko Kamiatani, ybo9@cdc.gov.

Author Contributions:

Emiko Kamitani, PhD, MPH, MS, RN was responsible for conceptualizing the review including the development of methodology, provided leadership, wrote the original draft, and oversaw revisions of the manuscript. Megan E. Wichser, MPH contributed to the screening, data abstraction, and quality assessment. Yuko Mizuno, PhD contributed to the screening, data abstraction, and quality assessment, and contributed to the original draft and revision of the manuscript. Julia B. DeLuca, MLIS, was responsible for the search and contributed to the original draft of the manuscript. Darrel H. Higa, PhD, MSW contributed to the development of the study's methodology and the original draft and revision of the manuscript All authors on this paper meet the four criteria for authorship as identified by the International Committee of Medical Journal Editors (ICMJE); all authors have contributed to the conception and design of the study, drafted or have been involved in revising this manuscript, reviewed the final version of this manuscript before submission, and agree to be accountable for all aspects of the work.

Disclosure: . There are no conflicts of interest to report, or financial disclosures.

Keywords

Pre-exposure prophylaxis; HIV; national HIV goals; associated factors; PrEP uptake

Introduction

HIV Pre-Exposure Prophylaxis (PrEP) use has significantly increased among men who have sex with men (MSM) since the U.S. Food and Drug Administration (FDA) approved the first antiretroviral medication to prevent HIV transmission in 2012 (Finlayson et al., 2019). PrEP is widely available in the U.S., and approximately 1.2 million people or 34% of sexually active MSM in the U.S. are eligible for PrEP (Centers for Disease Control and Prevention, 2021; Weiss et al., 2020). However, PrEP use among MSM is still limited; only 25% of MSM who were eligible for PrEP were prescribed it (Centers for Disease Control and Prevention, 2021; Kamitani et al., 2020). Despite these discouraging findings, a high level of willingness to take PrEP has been reported among MSM who were not on PrEP (Young & McDaid, 2014). This gap may indicate inequities in PrEP access and healthcare disparities (Huang et al., 2018; Siegler et al., 2018). To better understand how to effectively decrease the disparity and increase PrEP use among MSM in the U.S. and how best to design interventions in this effort, the objective of the systematic review and meta-analysis was to identify factors associated with willingness to use PrEP among MSM not on PrEP in the U.S.

Methods

The study protocol was registered in PROSPERO (CRD42019112390) (Kamitani et al., 2019). This review only includes primary quantitative studies reporting factors associated with willingness to use PrEP among MSM who were not on PrEP.

Search

A search was conducted in the CDC's Prevention Research Synthesis (PRS) Project database. The PRS database is a collection of HIV literature focused on behavioral risk reduction, medication adherence, linkage/retention/re-engagement in HIV care, structural interventions, PrEP, and systematic reviews. Searches were performed in the following databases: MEDLINE (OVID), EMBASE (OVID), CINAHL (EBSCOhost), Global Health (OVID), PsycINFO (OVID), and Sociological Abstracts (ProQuest). For this review, authors queried the PRS database from 1 January 2000 – 31 December 2020; the search was last queried on 15 July 2020 to ensure identification of all eligible literature (Appendix 1). We also searched for any newly published literature in PubMed using HIV, PrEP, PrEP use, PrEP willingness, and MSM terms (last searched 15 February 2022).

Each search was developed in MEDLINE using indexing and keyword terms cross-referenced with Boolean logic and no language limits (DeLuca et al., 2008). The finalized search was tailored to the other databases' proprietary indexing systems. Supplementary searches included a manual search of journals (available from the PRS website), online

non-indexed databases (e.g., Scopus), gray literature (e.g., NY Academy of Medicine), and reference lists from relevant HIV literature.

For this review, a librarian (author, Julia B. DeLuca) queried the PRS database using PRS coding criteria and key terms specific to PrEP (e.g., pre-exposure prophylaxis, chemoprophylaxis). For the complete PRS database query, see Appendix 1.

Inclusion Criteria

Inclusion criteria were primary quantitative studies (e.g., cross-sectional, cohort) that 1) assessed factors associated with willingness to take daily PrEP, 2) reported the strength of association such as odds ratios (ORs) and/or adjusted ORs, 3) were conducted in the U.S., and 4) were published in English. We excluded studies that reported factors associated with willingness to take PrEP identified among MSM who were already on PrEP. Studies reporting correlated factors of non-daily oral PrEP (e.g., long-acting injectable PrEP), commentaries, reviews and non-peer-reviewed publications were also not eligible for this review.

Screening and Data Abstraction

A two-step approach was applied to select studies for the review. First, a reviewer screened the citations by title and abstract to identify PrEP primary studies that met the study inclusion criteria. Citations that were excluded by the first reviewer were verified by a second reviewer. Second, two reviewers independently reviewed the full text of included citations to confirm study eligibility. Disagreements were resolved through discussion. If the two reviewers failed to reach agreement, a third reviewer resolved the discrepancy, but this step was not needed in this review since the reviewers were able come to consensus. All screening forms were pilot tested and revised as necessary. Identified citations were exported to DistillerSR (a systematic review software, Evidence Partners, Ottawa, Canada), for data management to identify eligible studies, screen studies, and conduct data abstraction.

For all eligible studies, two reviewers independently extracted data on population characteristics and factors associated with willingness to use PrEP with a standard data abstraction form. Willingness to use PrEP was defined as being very likely or intending to use PrEP, or willing to accept PrEP or a referral for PrEP care. Two reviewers abstracted unadjusted and adjusted ORs. Unadjusted ORs were calculated from descriptive data if not reported. Study population characteristics were abstracted from the primary study's participant eligibility criteria, and a third reviewer resolved discrepancies.

For studies that used the same data source, we only abstracted unique data from each study. Three studies used the National HIV Behavioral Surveillance (NHBS) study that was conducted in 2014 (Adams et al., 2016; Hoots et al., 2016; Patrick et al., 2017). We also excluded Grov (2015) because the study used the same data source as Grov (2016) (C. Grov et al., 2016) and Grov (2016) (Christian Grov et al., 2016), which included multivariable analyses along with bivariate analyses.

Quality Assessment

Risk of bias assessment was conducted by using an adapted Newcastle-Ottawa Quality Assessment Scale (Mata et al., 2015; Stang, 2010). The quality assessment scale to assess cross-sectional studies and PrEP uptake outcomes (Kamitani et al., 2020; Kamitani et al., 2019). The scale consisted of five questions with “Yes” or “No” responses. A total score of 5 was possible, with 3 or higher being considered as “low risk of bias.”

Data Synthesis

We narratively synthesized characteristics and findings of the included studies. We were unable to synthesize adjusted point estimates because confounders adjusted in multivariable analysis varied in studies. Thus, we used reported unadjusted odds ratios or if not reported, unadjusted odds ratios calculated from descriptive data in our meta-analyses to calculate point estimates of associations. Multiple estimates from the same study were included when the samples were independent.

Heterogeneity, Sensitivity Analysis, and Publication bias

We estimated the heterogeneity among effect sizes (I^2) by using the Q statistic. When I^2 was more than 75%, effect sizes indicated substantial heterogeneity, and thus we further explored heterogeneity by conducting meta-regression. Since our previous study showed that year of study was associated with PrEP use, we conducted meta-regressions by adjusting study years (Kamitani et al., 2020). We were not able to add other covariates (e.g., study participant characteristics) due to the limited number of studies. We assessed publication bias using the Begg and Mazumdar rank correlation test and Egger’s test of the intercept (Rothstein et al., 2006). Analyses were conducted using Comprehensive Meta-Analysis Software Versions 3 (Biostat, Englewood, NJ). *P* values less than 0.05 were considered statistically significant.

Results

We screened 2,429 citations and identified 23 relevant studies (please see the PRISMA flow diagram illustrated in Figure 1). Of these, 21 studies conducted multivariable and bivariate analyses, and the remaining two studies only reported findings from bivariate analyses (please refer to Table 1). The majority had a low risk of bias based on the adapted Newcastle-Ottawa Quality Assessment Scale and were cross-sectional studies conducted in urban areas. Five studies focused on MSM who are Black or African American (hereafter referred to as Black) (Arrington-Sanders et al., 2016; Brooks et al., 2015; Eaton et al., 2017; Mansergh et al., 2015; Rolle et al., 2017) and three on MSM who are Hispanic/Latino (Blashill et al., 2020; Mansergh et al., 2015; Moctezuma & Guan, 2019) (not mutually exclusive). Two studies included only MSM at high risk for HIV infection (Golub et al., 2010; Christian Grov et al., 2016), and four studies focused on young populations, defined as aged 15-30 years (Arrington-Sanders et al., 2016; Holloway et al., 2017; Moctezuma & Guan, 2019; Rolle et al., 2017). Study years are from 2007 (Golub et al., 2010) to 2017 (Blashill et al., 2020; Katz et al., 2019), and sample sizes ranged from 147 (Arrington-Sanders et al., 2016) to 8338 (Li et al., 2019). We identified 20 factors independently associated with willingness to use PrEP among MSM who were not on PrEP. Nine

were sociodemographic factors, seven were behavioral factors, and four were PrEP/HIV perceptions.

Sociodemographic Factors

Among MSM who were not on PrEP, willingness to use PrEP was associated with being Hispanic/Latino (OR=1.68, 95%CI: 1.01-2.78, k[studies applied]=11, I^2=96.0) or Black (OR=1.41, 95%CI:1.02-1.95, k=12, I^2=87.5) vs. being White, having no college degree (OR=1.37, 95%CI:1.19-1.59, k=4, I^2=7.6) vs. having a college degree or more, having incomes of less than $20,000 (OR=1.30, 95%CI:1.09-1.59, k=7, I^2=68.4) vs. $20,000 or more, and being younger (OR=1.08, 95%CI: 1.02-1.15, k=8, I^2=86.1) vs. older (Figure 2). Employment status, sexual identity, and insurance status were not associated with willingness to use PrEP. We were not able to estimate the strength of association with location due to the variation of study cities reported. Out of those studies, one study (Mansergh et al., 2015) found MSM living in the Southern United States were more willing to use PrEP compared to men living elsewhere while the other study found less willingness to use PrEP (Rendina et al., 2017).

Behavioral Factors

Findings from the meta-analysis indicated that having a history of recent condomless anal sex (OR=1.85, 95% CI:1.49-2.29, k=8, I^2=78.4), diagnosed with a sexually transmitted infection (STI) in the past 12 months (OR=1.60, 95% CI:1.27-2.01, k=6, I^2=69.8), having six or more sex partners in the past 12 months (OR=1.58, 95% CI:1.07-2.32, k=4, I^2=0), and receiving a HIV behavioral intervention (i.e., talking to a counselor or group about HIV prevention except for HIV testing) in the past 12 months (OR=1.40, 95% CI:1.02-1.91, k=2, I^2=0) were associated with increased odds of being willing to use PrEP compared to their respective counterparts (Figure 3). Being in a polygamous relationship and non-injection drug use were not associated with the willingness to use PrEP.

PrEP and HIV Perception Factors

MSM who had less concerns about long-term drug side effects (OR=2.93, 95% CI:2.28-3.78, k=2, I^2=0) or perceived more PrEP benefits (OR=2.78, 95 %CI:1.42-5.43, k=3, I^2=78.0) had more than twice the odds of being willing to use PrEP as their respective counterparts (Figure 4). A greater perception that one is at risk for HIV infection was also associated with increased odds of being willing to use PrEP (OR=1.33, 95% CI:1.01-1.76, k=4, I^2=82.3). HIV-related stigma perceived by the respondent was not associated with willingness to use PrEP.

Heterogeneity/Sensitivity Analysis/Publication Bias

Controlling for study years in meta-regressions, we were able to reduce some heterogeneity, but it remained high for Hispanic/Latino persons (I^2=91.5), Black persons (I^2=86.0), age (I^2=91.0), and recent condomless anal sex (I^2=75.7). The high heterogeneity implies variability in the study outcomes included in each of the meta-analyses. We were unable to run sensitivity analysis for perception of HIV-risk (k=4), perception of PrEP benefits (k=3), relationship type (k=2) and HIV behavioral interventions (k=2) due to limited number of

available studies. The Begg and Mazumdar rank correlation test and Egger's test of the intercept respectively for Hispanic/Latino persons (p = 0.35, p = 0.69), Black persons (p = 0.24, p= 0.47), age (p = 0.54, p = 0.21) and condomless anal sex engagement (p = 0.11, p = 0.07) indicated no publication bias nor did the visual inspection of a funnel plot.

Discussion

Increasing PrEP use among MSM is an important public health goal and can help to reduce HIV disparities. This review identified that among MSM not on PrEP, subpopulations of MSM who may be most vulnerable to HIV (i.e., Black and Hispanic/Latino men, those with no college degree or low-income, young men, and those engaging in behaviors that may increase the chance of HIV infection) were more likely to be willing to take PrEP than their counterparts. Previous studies have found that populations who are more likely to become infected with HIV were less likely to be on PrEP (Kamitani et al., 2020; Kanny et al., 2019), but our review findings suggest that those who are not on PrEP and vulnerable to HIV may be interested in taking PrEP. The findings further suggest that these men may not have equal access to PrEP care compared to White, more educated, and older MSM. Hispanic/Latino persons, Black persons, and youth have been identified as priority populations in the recently released *HIV National Strategic Plan* (2021-2025) (U.S. Department of Health and Human Services, 2021). Future interventions to help these priority populations access and initiate PrEP are essential in achieving national prevention goals.

We also found that willingness to start PrEP was not associated with employment or insurance status, although MSM with lower income (< $20,000) were more willing to take PrEP. A possible reason for this finding, particularly the lack of association with insurance status, is the availability of medication assistance programs such as the Gilead Advancing Access (Gilead, 2022) program that help those without insurance or whose insurance did not cover PrEP after Truvada was approved by FDA in 2012. More recently, the "Grade A Recommendation" issued by the U. S. Preventive Services Task Force (USPSTF) (U.S. Preventive Services Task Force, 2019) in November 2018 and the *Ready, Set, PrEP* program initiated by the U.S. Department of Health and Human Services (DHHS; Office of Infectious Disease and HIV/AIDS Policy & U.S. Department of Health and Human Services, 2020) in December 2019 has expanded PrEP use. The USPSTF recommendation and DHHS program facilitate access to PrEP medication and resources to cover other PrEP-related service fees (e.g., office visit, labs), that are recommended for PrEP care. However, none of the included studies in our review were conducted after these government support programs were implemented. Future research may need to assess the impact of these assistance programs on increasing PrEP access and use among low income MSM and on decreasing health disparities.

While we were unable to examine the associations with geographic location, it may be another important variable to consider. Approximately 38% of the U. S. population live in the South, yet more than half of new HIV infections occur in the region, and people residing in the Southern U.S. are considered a priority population in the national strategic plan (Centers for Disease and Control Prevention, 2020a, 2020b; U.S. Department of Health and Human Services, 2021). Our previous review also found that a lower proportion of MSM

use PrEP in the South (Kamitani et al., 2020). Our current review found only two studies with inconsistent results; one found that MSM living in the Southern U.S. were significantly more likely to show willingness to use PrEP compared to those living elsewhere, while the other study found the opposite (Mansergh et al., 2015; Rendina et al., 2017). Geographic location is an important factor to investigate because of the aforementioned disparity in HIV and PrEP use, and thus more studies that examine this variable are needed.

In addition, this review found that indicators for being at high risk for HIV infection (i.e., recent condomless anal sex, STI diagnosed in the past 12 months, six or more sex partners, or attending HIV behavioral interventions in the past 12 months) were associated with increased odds of being willing to use PrEP among MSM not on PrEP. According to the Center for Disease Control and Prevention's PrEP Clinical Practice Guideline, MSM who are engaging in recent condomless anal sex or diagnosed with a STI are good candidates for PrEP and thus, should be evaluated and offered PrEP as needed (CCDCd, 2018). A previous study found that many MSM who are PrEP candidates based on the CDC's PrEP indicators are not on PrEP (Kamitani et al., 2019). While there may be multiple reasons why MSM who are willing to take PrEP are not on PrEP, one potential explanation may be the structural barriers to access PrEP including medical mistrust, stigma, and lack of healthcare access in general faced by MSM who have risk factors for HIV. Effective interventions that help to reduce these and other barriers for PrEP initiation are needed.

Finally, MSM with fewer concerns about long-term side effects and who perceived more PrEP benefits had more than twice the odds of being willing to use PrEP as their respective counterparts. Men who perceived themselves to be at risk for HIV infection were also significantly more likely to show willingness to use PrEP compared to those with lower risk perceptions. However, self-perception of risk does not always accurately align with objective risk levels. Persons might be at objectively higher risk for acquiring HIV infection, but they do not perceive themselves to be vulnerable to HIV infection. Future interventions may need to focus on reducing concerns about PrEP's long-term side effects, increasing knowledge of the benefits of being on PrEP, and helping MSM accurately appraise their risk for HIV.

Echoing the national HIV strategic plan and the *Ending the HIV Epidemic Initiative*, our review findings provide clues on how to expand the effective interventions that help to prevent new HIV infections, including PrEP (U.S. Department of Health and Human Services, 2019, 2021). CDC's PRS Project has identified several effective interventions that promote PrEP use and persistence. For example, the *PrEP Counseling Center* has been identified as a best practice intervention to improve PrEP initiation among young Black MSM who engage in behaviors that increase the chance of HIV infection (Centers for Disease and Control Prevention (CDC) Prevention Research Synthesis (PRS) Project, 2020; Desrosiers et al., 2019). This culturally tailored individual-level counseling intervention includes personalized comprehensive PrEP counseling with a staff member who identifies as a Black MSM and has extensive HIV-related experience. Such interventions that are tailored to these MSM subpopulations may increase PrEP use.

Limitations

This review has several limitations. One is that we only included studies published in peer-reviewed journals. There may be other factors related to willingness to take PrEP that were reported in non-peer reviewed literature. A majority of included studies in this review had low risk of bias, but there may be other unidentified biases such as information bias and confounding. There were a limited number of studies for some outcomes, and this review was not able to control for patient characteristics or other covariates. Finally, the large amount of heterogeneity in the included studies is noteworthy; subgroup analyses reduced only some heterogeneity. One potential explanation for the heterogeneity is confounding factors related to willingness; however, we were unable to control for all identified associated factors due to the limited number of studies. None of these limitations are thought to greatly affect the study results.

Conclusion

This systematic review identified factors associated with willingness to use PrEP among MSM who are not on PrEP and suggests the subpopulations of MSM next in line for prioritization. Our findings may also guide to the design of interventions to increase access to and use of PrEP among MSM who are disproportionately affected by HIV.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgements:

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention. This work was entirely funded by the United States Government.

References

Adams JW, Shinefeld J, & Brady KA (2016). Acceptability of Oral Preexposure Prophylaxis Among Men Who Have Sex With Men in Philadelphia. Journal of Acquired Immune Deficiency Syndromes, 73(3), e62–e65. 10.1097/qai.0000000000001139 [PubMed: 27454249]

Arrington-Sanders R, Morgan A, Oidtman J, Qian I, Celentano D, & Beyrer C (2016). A Medical Care Missed Opportunity: Preexposure Prophylaxis and Young Black Men Who Have Sex With Men. Journal of Adolescent Health, 59(6), 725–728. 10.1016/j.jadohealth.2016.08.006

Blashill AJ, Brady JP, Rooney BM, Rodriguez-Diaz CE, Horvath KJ, Blumenthal J, Morris S, Moore DJ, & Safren SA (2020). Syndemics and the PrEP Cascade: Results from a Sample of Young Latino Men Who Have Sex with Men. Archives of Sex Behavior, 49(1), 125–135. 10.1007/s10508-019-01470-7

Brooks RA, Landovitz RJ, Regan R, Lee S-J, & Allen VC (2015). Perceptions of and intentions to adopt HIV pre-exposure prophylaxis among black men who have sex with men in Los Angeles. International Journal of STD and AIDS , 26(14), 1040–1048. 10.1177/0956462415570159 [PubMed: 25638214]

Centers for Disease and Control Prevention. (2018). Preexposure prophylaxis for the prevention of HIV infection in the United States -- 2017 Update: a clinical practice guideline. . Retrieved February 17th from https://www.cdc.gov/hiv/pdf/risk/prep/cdc-hiv-prep-guidelines-2017.pdf

Centers for Disease and Control Prevention. (2020a). Estimated HIV incidence and prevalence in the United States, 2015-2018. https://www.cdc.gov/hiv/pdf/library/reports/surveillance/cdc-hiv-surveillance-supplemental-report-vol-25-1.pdf

Centers for Disease and Control Prevention. (2020b). HIV Surveillance Report, 2018 (Updated), *Vol.* 31. Retrieved February 17th from http://www.cdc.gov/hiv/library/reports/hiv-surveillance.html.

Centers for Disease and Control Prevention (CDC) Prevention Research Synthesis (PRS) Project. (2020). PRS Infosheet: PrEP Counseling Center. Retrieved February 16th from https://www.cdc.gov/hiv/pdf/research/interventionresearch/compendium/prep/cdc-hiv-PrEP-Counseling-Center-EI-PrEP.pdf

Centers for Disease Control and Prevention. (2021, November 23, 2021). PrEP for HIV Prevention in the U.S. Retrieved July 13th, from https://www.cdc.gov/nchhstp/newsroom/fact-sheets/hiv/prep-for-hiv-prevention-in-the-us-factsheet.html

DeLuca JB, Mullins MM, Lyles CM, Crepaz N, Kay L, & Thadiparthi S (2008). Developing a Comprehensive Search Strategy for Evidence Based Systematic Reviews [Evidence-based public health; systematic searching; HIV/AIDS prevention; systematic reviews; database creation]. Evidence Based Library and Information Practice, 3(1), 30. 10.18438/b8kp66

Desrosiers A, Levy M, Dright A, Zumer M, Jallah N, Kuo I, Magnus M, & Siegel M (2019). A Randomized Controlled Pilot Study of a Culturally-Tailored Counseling Intervention to Increase Uptake of HIV Pre-exposure Prophylaxis Among Young Black Men Who Have Sex with Men in Washington, DC. AIDS and Behavior, 23(1), 105–115. 10.1007/s10461-018-2264-5

Eaton LA, Kalichman SC, Price D, Finneran S, Allen A, & Maksut J (2017). Stigma and Conspiracy Beliefs Related to Pre-exposure Prophylaxis (PrEP) and Interest in Using PrEP Among Black and White Men and Transgender Women Who Have Sex with Men. AIDS and Behavior, 21(5), 1236–1246. 10.1007/s10461-017-1690-0 [PubMed: 28108878]

Finlayson T, Cha S, Xia M, Trujillo L, Denson D, Prejean J, Kanny D, & Wejnert C (2019). Changes in HIV Preexposure Prophylaxis Awareness and Use Among Men Who Have Sex with Men - 20 Urban Areas, 2014 and 2017. Morbidity Mortality Weekly Report, 68(27), 597–603. 10.15585/mmwr.mm6827a1 [PubMed: 31298662]

Gilead. (2022). Gilead's Advancing Access® Program Is Here to Help You. Retrieved January 25 from https://www.gileadadvancingaccess.com/

Golub SA, Kowalczyk W, Weinberger CL, & Parsons JT (2010). Preexposure prophylaxis and predicted condom use among high-risk men who have sex with men. Journal of acquired immune deficiency syndromes (1999), 54(5), 548–555. 10.1097/QAI.0b013e3181e19a54 [PubMed: 20512046]

Grov C, Rendina HJ, Jimenez R, & Parsons JT (2016). Using Online Settings to Identify Gay and Bisexual Men Willing to Take or With Experience Taking PrEP: Implications for Researchers and Providers. AIDS Education and Prevention, 28(5), 378–392. 10.1521/aeap.2016.28.5.378 [PubMed: 27710085]

Grov C, Rendina HJ, Whitfield THF, Ventuneac A, & Parsons JT (2016). Changes in Familiarity with and Willingness to Take Preexposure Prophylaxis in a Longitudinal Study of Highly Sexually Active Gay and Bisexual Men. LGBT health, 3(4), 252–257. 10.1089/lgbt.2015.0123 [PubMed: 27183232]

Grov C, Whitfield TH, Rendina HJ, Ventuneac A, & Parsons JT (2015). Willingness to Take PrEP and Potential for Risk Compensation Among Highly Sexually Active Gay and Bisexual Men. AIDS and Behavior, 19(12), 2234–2244. 10.1007/s10461-015-1030-1 [PubMed: 25735243]

Holloway IW, Tan D, Gildner JL, Beougher SC, Pulsipher C, Montoya JA, Plant A, & Leibowitz A (2017). Facilitators and Barriers to Pre-Exposure Prophylaxis Willingness Among Young Men Who Have Sex with Men Who Use Geosocial Networking Applications in California. AIDS Patient Care and STDs, 31(12), 517–527. 10.1089/apc.2017.0082 [PubMed: 29211513]

Hoots BE, Finlayson T, Nerlander L, Paz-Bailey G, for the National HIV Behavioral Surveillance Study Group, Wortley P, Todd J, Sato K, Flynn C, German D, Fukuda D, Doherty R, Wittke C, Prachand N, Benbow N, Jimenez AD, Poe J, Sheu S, Novoa A, … for the National HIV Behavioral Surveillance Study Group. (2016). Willingness to Take, Use of, and Indications for Pre-exposure Prophylaxis Among Men Who Have Sex With Men—20 US Cities, 2014.

Clinical Infectious Diseases, 63(5), 672–677. 10.1093/cid/ciw367 %J Clinical Infectious Diseases [PubMed: 27282710]

Huang YA, Zhu W, Smith DK, Harris N, & Hoover KW (2018). HIV Preexposure Prophylaxis, by Race and Ethnicity - United States, 2014-2016. Morbidity Mortality Weekly Report, 67(41), 1147–1150. 10.15585/mmwr.mm6741a3 [PubMed: 30335734]

Kamitani E, Johnson WD, Wichser ME, Adegbite AH, Mullins MM, & Sipe TA (2020). Growth in Proportion and Disparities of HIV PrEP Use Among Key Populations Identified in the United States National Goals: Systematic Review and Meta-analysis of Published Surveys. Journal of Acquired Immune Deficiency Syndromes, 84(4), 379–386. 10.1097/qai.0000000000002345 [PubMed: 32205721]

Kamitani E, Mizuno Y, Wichser ME, Adgbite AH, DeLuca JB, & Higa D (2019). Systematic review of correlational studies in predictors for HIV pre-exposure prophylaxis uptake in men who have sex with men. PROSPERO CRD42019112390. https://www.crd.york.ac.uk/prospero/display_record.php?ID=CRD42019112390

Kanny D, Jeffries W. L. t., Chapin-Bardales J, Denning P, Cha S, Finlayson T, & Wejnert C (2019). Racial/Ethnic Disparities in HIV Preexposure Prophylaxis Among Men Who Have Sex with Men - 23 Urban Areas, 2017. Morbidity Mortality Weekly Report, 68(37), 801–806. 10.15585/mmwr.mm6837a2

Katz DA, Dombrowski JC, Barry M, Spellman D, Bell TR, & Golden MR (2019). STD Partner Services to Monitor and Promote HIV Pre-exposure Prophylaxis Use Among Men Who Have Sex With Men. Journal of Acquired Immune Deficiency Syndromes, 80(5), 533–541. 10.1097/qai.0000000000001952 [PubMed: 30649032]

Li J, Berg CJ, Kramer MR, Haardörfer R, Zlotorzynska M, & Sanchez TH (2019). An Integrated Examination of County- and Individual-Level Factors in Relation to HIV Pre-exposure Prophylaxis Awareness, Willingness to Use, and Uptake Among Men Who Have Sex with Men in the US. AIDS and Behavior, 23(7), 1721–1736. 10.1007/s10461-018-2334-8 [PubMed: 30430340]

Mansergh G, Herbst JH, Mimiaga MJ, & Holman J (2015). Preference for Condoms, Antiretroviral Preexposure Prophylaxis, or Both Methods to Reduce Risk for HIV Acquisition Among Uninfected US Black and Latino MSM. Journal of Acquired Immune Deficiency Syndromes, 70(4), e153–e155. 10.1097/qai.0000000000000810 [PubMed: 26302430]

Mata DA, Ramos MA, Bansal N, Khan R, Guille C, Di Angelantonio E, & Sen S (2015). Prevalence of Depression and Depressive Symptoms Among Resident Physicians: A Systematic Review and Meta-analysis. Journal of the American Medical Associaiton, 314(22), 2373–2383. 10.1001/jama.2015.15845 %J JAMA

Moctezuma G, & Guan S (2019). Socioeconomic disparities associated with awareness, access, and usage of Pre-Exposure Prophylaxis among Latino MSM ages 21-30 in San Antonio, TX. Journal of HIV/AIDS & Social Services, 18(2), 206–211. 10.1080/15381501.2019.1607795

Office of Infectious Disease and HIV/AIDS Policy, & U.S. Department of Health and Human Services. (2020, March 27, 2020). HHS Collaborates with National Pharmacies to Expand PrEP Access. Retrieved January 25 from https://www.hiv.gov/blog/hhs-collaborates-national-pharmacies-expand-prep-access#:~:text=Ready%2C%20Set%2C%20PrEP%20is%20a%20nationwide%20program%20led,ending%20the%20HIV%20epidemic%20in%20the%20United%20States.

Patrick R, Forrest D, Cardenas G, Opoku J, Magnus M, Phillips GI, Greenberg A, Metsch L, Kharfen M, LaLota M, & Kuo I (2017). Awareness, Willingness, and Use of Pre-exposure Prophylaxis Among Men Who Have Sex With Men in Washington, DC and Miami-Dade County, FL: National HIV Behavioral Surveillance, 2011 and 2014. Journal of Acquired Immune Deficiency Syndromes, 75, S375–S382. 10.1097/qai.0000000000001414 [PubMed: 28604442]

Rendina HJ, Whitfield THF, Grov C, Starks TJ, & Parsons JT (2017). Distinguishing hypothetical willingness from behavioral intentions to initiate HIV pre-exposure prophylaxis (PrEP): Findings from a large cohort of gay and bisexual men in the U.S. Social Science & Medicine, 172, 115–123. https://doi.org/10.1016/j.socscimed.2016.10.030 [PubMed: 27866750]

Rolle C-P, Rosenberg ES, Luisi N, Grey J, Sanchez T, del Rio C, Peterson JL, Frew PM, Sullivan PS, & Kelley CF (2017). Willingness to use pre-exposure prophylaxis among Black and White

men who have sex with men in Atlanta, Georgia. International Journal of STD & AIDS, 28(9), 849–857. 10.1177/0956462416675095 [PubMed: 28632468]

Rothstein HR, Sutton AJ, & Borenstein M (2006). Publication bias in meta-analysis: Prevention, assessment and adjustments. John Wiley & Sons.

Siegler AJ, Mouhanna F, Giler RM, Weiss K, Pembleton E, Guest J, Jones J, Castel A, Yeung H, Kramer M, McCallister S, & Sullivan PS (2018). The prevalence of pre-exposure prophylaxis use and the pre-exposure prophylaxis-to-need ratio in the fourth quarter of 2017, United States. Annals of Epidemiology, 28(12), 841–849. 10.1016/j.annepidem.2018.06.005 [PubMed: 29983236]

Stang A (2010). Critical evaluation of the Newcastle-Ottawa scale for the assessment of the quality of nonrandomized studies in meta-analyses. European Journal of Epidemiology, 25(9), 603–605. 10.1007/s10654-010-9491-z [PubMed: 20652370]

U.S. Department of Health and Human Services. (2019). Ending the HIV Epidemic: A Plan for America. Retrieved February 18th from https://www.hiv.gov/federal-response/ending-the-hiv-epidemic/overview

U.S. Department of Health and Human Services. (2021). HIV National Strategic Plan for the United States: A Roadmap to End the Epidemic 2021-2025. Retrieved February 17th from https://files.hiv.gov/s3fs-public/HIV-National-Strategic-Plan-2021-2025.pdf

U.S. Preventive Services Task Force. (2019, June 11, 2019). Prevention of Human Immunodeficiency Virus (HIV) Infection: Preexposure Prophylaxis. Retrieved January 25 from https://www.uspreventiveservicestaskforce.org/uspstf/recommendation/prevention-of-human-immunodeficiency-virus-hiv-infection-pre-exposure-prophylaxis

Weiss KM, Prasad P, Ramaraju R, Zlotorzynska M, & Jenness SM (2020). Estimated Number of Men Who Have Sex With Men With Indications for HIV Pre-exposure Prophylaxis in a National Sexual Network Study. Journal of Acquired Immune Deficiency Syndrome, 84(1), 10–17. 10.1097/qai.0000000000002300

Young I, & McDaid L (2014). How acceptable are antiretrovirals for the prevention of sexually transmitted HIV?: A review of research on the acceptability of oral pre-exposure prophylaxis and treatment as prevention. AIDS and Behavior, 18(2), 195–216. 10.1007/s10461-013-0560-7 [PubMed: 23897125]

Key Considerations

- MSM with racial/ethnic minority status, low-socioeconomic status, younger age, and engagement in HIV risky behaviors are willing to take PrEP but may lack access.
- Willingness to start PrEP is not associated with employment or insurance status.
- Indicators for being at high risk for HIV infection are associated with increased odds of being willing to use PrEP among MSM not on PrEP.
- MSM with fewer concerns about long-term side effects and who perceived more PrEP benefits have more than twice the odds of being willing to use PrEP as their respective counterparts.

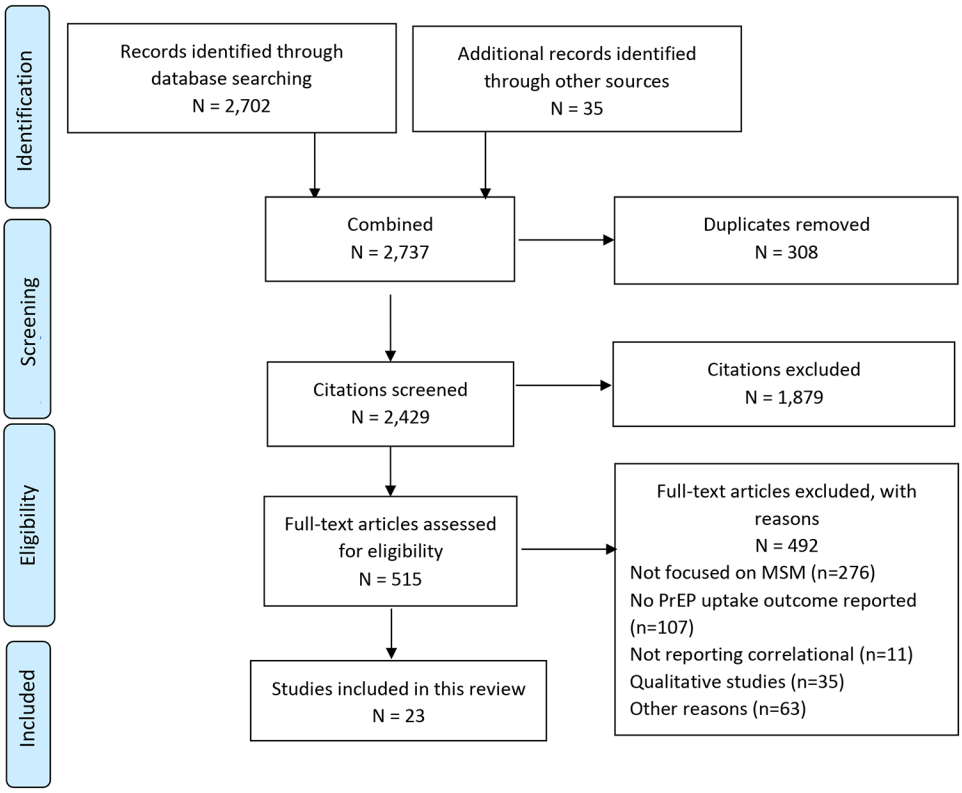
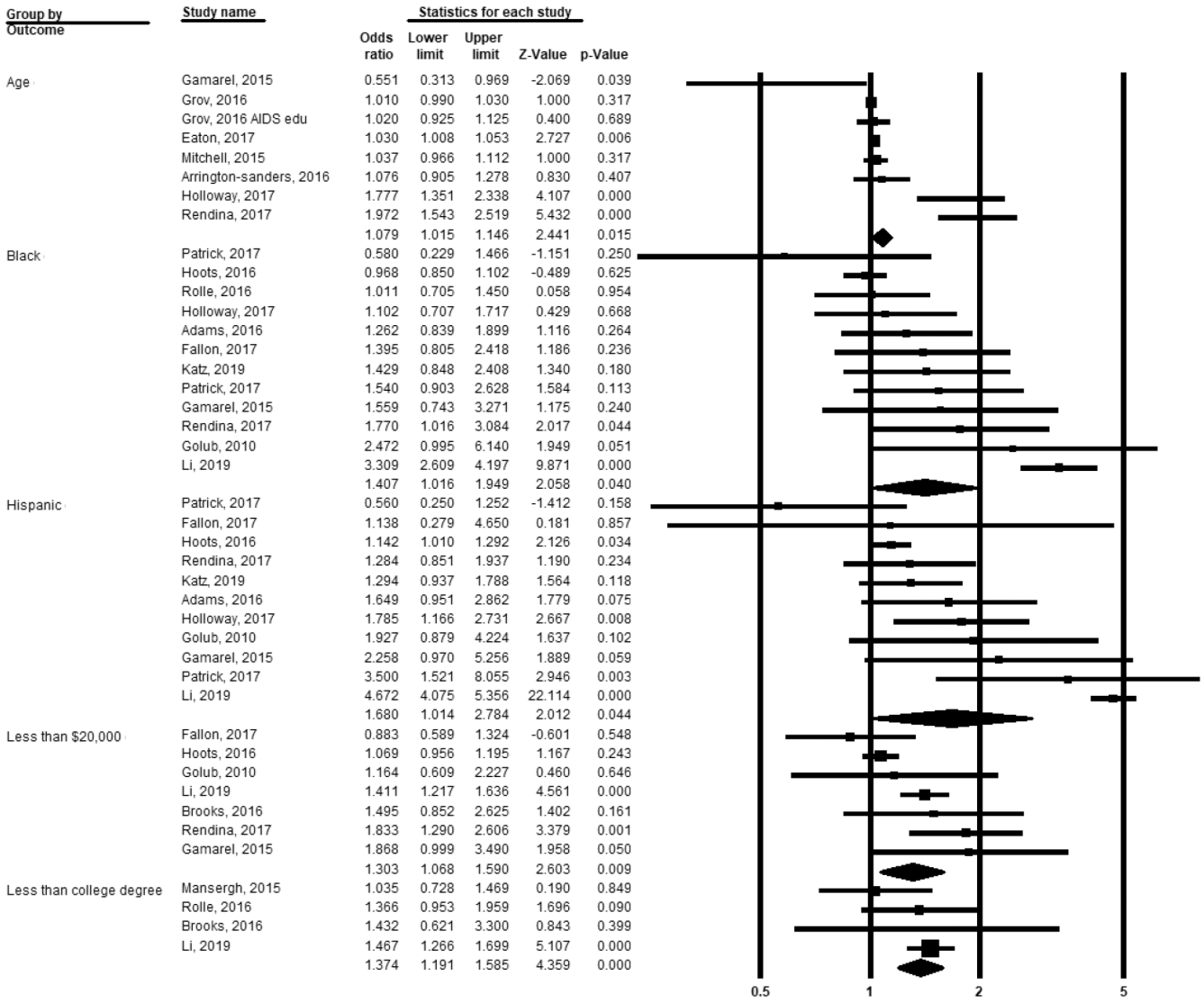


Figure 1:
Flow diagram of included studies



Group by Outcome	Study name	Odds ratio	Lower limit	Upper limit	Z-Value	p-Value
Age	Gamarel, 2015	0.551	0.313	0.969	-2.069	0.039
	Grov, 2016	1.010	0.990	1.030	1.000	0.317
	Grov, 2016 AIDS edu	1.020	0.925	1.125	0.400	0.689
	Eaton, 2017	1.030	1.008	1.053	2.727	0.006
	Mitchell, 2015	1.037	0.966	1.112	1.000	0.317
	Arrington-sanders, 2016	1.076	0.905	1.278	0.830	0.407
	Holloway, 2017	1.777	1.351	2.338	4.107	0.000
	Rendina, 2017	1.972	1.543	2.519	5.432	0.000
		1.079	1.015	1.146	2.441	0.015
Black	Patrick, 2017	0.580	0.229	1.466	-1.151	0.250
	Hoots, 2016	0.968	0.850	1.102	-0.489	0.625
	Rolle, 2016	1.011	0.705	1.450	0.058	0.954
	Holloway, 2017	1.102	0.707	1.717	0.429	0.668
	Adams, 2016	1.262	0.839	1.899	1.116	0.264
	Fallon, 2017	1.395	0.805	2.418	1.186	0.236
	Katz, 2019	1.429	0.848	2.408	1.340	0.180
	Patrick, 2017	1.540	0.903	2.628	1.584	0.113
	Gamarel, 2015	1.559	0.743	3.271	1.175	0.240
	Rendina, 2017	1.770	1.016	3.084	2.017	0.044
	Golub, 2010	2.472	0.995	6.140	1.949	0.051
	Li, 2019	3.309	2.609	4.197	9.871	0.000
		1.407	1.016	1.949	2.058	0.040
Hispanic	Patrick, 2017	0.560	0.250	1.252	-1.412	0.158
	Fallon, 2017	1.138	0.279	4.650	0.181	0.857
	Hoots, 2016	1.142	1.010	1.292	2.126	0.034
	Rendina, 2017	1.284	0.851	1.937	1.190	0.234
	Katz, 2019	1.294	0.937	1.788	1.564	0.118
	Adams, 2016	1.649	0.951	2.862	1.779	0.075
	Holloway, 2017	1.785	1.166	2.731	2.667	0.008
	Golub, 2010	1.927	0.879	4.224	1.637	0.102
	Gamarel, 2015	2.258	0.970	5.256	1.889	0.059
	Patrick, 2017	3.500	1.521	8.055	2.946	0.003
	Li, 2019	4.672	4.075	5.356	22.114	0.000
		1.680	1.014	2.784	2.012	0.044
Less than $20,000	Fallon, 2017	0.883	0.589	1.324	-0.601	0.548
	Hoots, 2016	1.069	0.956	1.195	1.167	0.243
	Golub, 2010	1.164	0.609	2.227	0.460	0.646
	Li, 2019	1.411	1.217	1.636	4.561	0.000
	Brooks, 2016	1.495	0.852	2.625	1.402	0.161
	Rendina, 2017	1.833	1.290	2.606	3.379	0.001
	Gamarel, 2015	1.868	0.999	3.490	1.958	0.050
		1.303	1.068	1.590	2.603	0.009
Less than college degree	Mansergh, 2015	1.035	0.728	1.469	0.190	0.849
	Rolle, 2016	1.366	0.953	1.959	1.696	0.090
	Brooks, 2016	1.432	0.621	3.300	0.843	0.399
	Li, 2019	1.467	1.266	1.699	5.107	0.000
		1.374	1.191	1.585	4.359	0.000

Figure 2:

Forest plot of pooled odd ratios – Sociodemographic factors associated with willingness to use PrEP

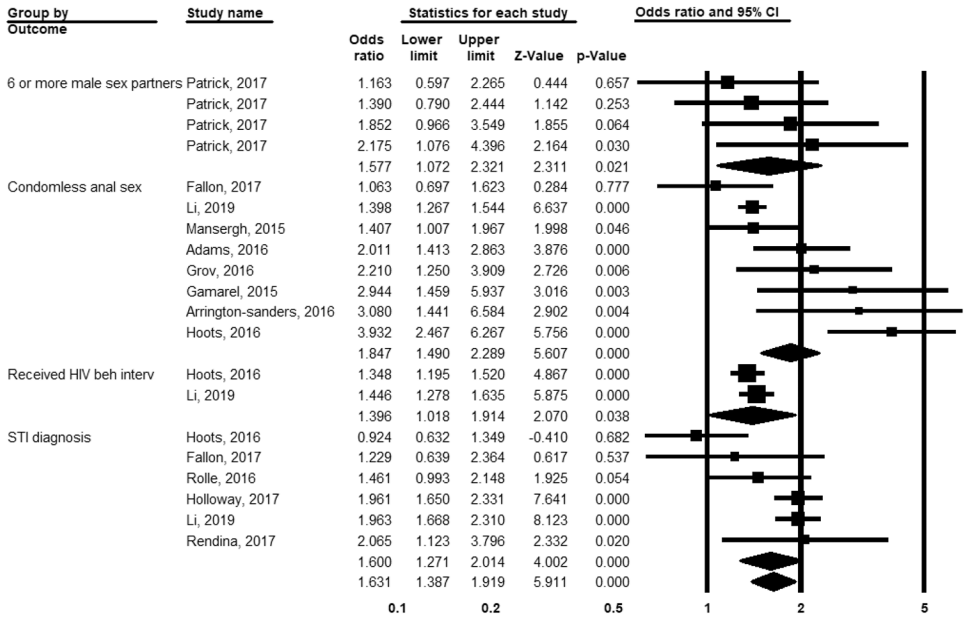


Figure 3:

Forest plot of pooled odd ratios – Behavioral factors associated with willingness to use PrEP

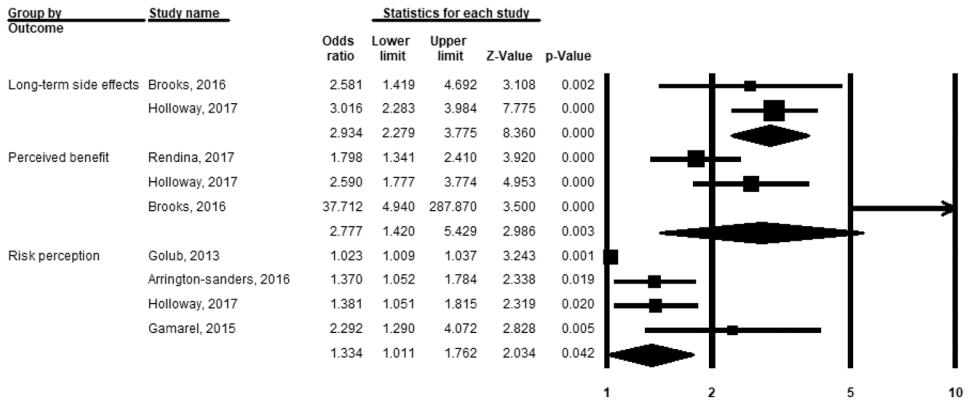


Figure 4:

Forest plot of pooled odd ratios – PrEP/HIV perception factors associated with willingness to use PrEP

Table 1:

Characteristics of included studies, proportions of MSM who are willing to take PrEP, and quality scores (N=23)

First author, publication year	Outcome	Year of data collection	Study location	Intended population	Sample size	Number of people who are willing to take PrEP	Proportion (%)	Risk of Bias[a]
Adams, 2016 [b]	Willingness	2014	Philadelphia	MSM	537	324	60.3	2
Blashill, 2020	Willingness	2017	San Diego	Latino MSM	151	NR	46[c]	3
Brooks, 2015	Likelyhood of using PrEP	2012-2013	Los Angeles	Black MSM	224	134	59.8	3
Eaton, 2017	Interesting	2015	Southeastern U.S.	Black and White MSM	264	115	43.5	3
Fallon, 2017	Willingness	2011	Baltimore	MSM	399	191	47.9	4
Gamarel, 2015	Likelyhood of using PrEP	2012-2013	New York City	MSM	164	93	56.7	3
Golub, 2010	Likelyhood of using PrEP	2007-2009	New York City	High risk MSM	180	124	68.9	3
Golub, 2013	Likelyhood of using PrEP	2012	New York City	MSM and Transgender Women	184	102	55.4	3
Grov, 2016	Willingness	2011-2014	New York City	Highly Sexually Active MSM	158	74	46.8	2
Grov, 2016	Willingness	2014-2015	New York City	MSM	2903	NR	\	3
Holloway, 2017	Willingness	2015	California	Young MSM	687	380	55.3	3
Hoots, 2016	Willingness	2014	20 U. S. Cities	MSM	6483	3940	60.8	2
Kalichman, 2017	Interesting	2015	Atlanta	MSM	272	138	50.7	3
Katz, 2019	Accepted PrEP referral	2014-2017	Washington	MSM	1908	501	26.3	3
Li, 2019	Willingness	2014-2015	US	MSM	8338	4372	52.4	2
Mansergh, 2015	Preference	2014	Chicago, Fort Lauderdale, Kansas City	Black and Latino MSM	605	387	64.0	3
Mitchell, 2015	Willingness	2011	U.S. (online survey)	MSM being in a relationship, engaged, or married	631	NR	53[c]	4
Moctezuma, 2019	Willingness	NR	San Antonio	Young Latino MSM	154	NR	\	2
Patrick, 2017 [c]	Willingness	2011*	Washington, DC and Miami-Dade Country (Florida)	MSM	602	331	55.0	2
Rendina, 2017	Willing or Intending	2015	Across the U.S.	MSM	880	505	57.4	4
Rolle, 2017	Willingness	2015	Atlanta	Young black MSM	184	63	34.2	3

First author, publication year	Outcome	Year of data collection	Study location	Intended population	Sample size	Number of people who are willing to take PrEP	Proportion (%)	Risk of Bias[a]
Bivariate only								
Arrington-Sanders, 2016	Willingness	2014-2015	U. S.	Young black MSM	147	91	61.9	3
Barash, 2010	Interesting	2009	Washington	MSM	282	94	33.3	4

Note: MSM: men who have sex with men, NR: Not reported

[a]Risk of bias was assessed by using the Modified Newcastle-Ottawa scoring guide that was adapted for this review. The study quality tool has possible scores from 0 to 5 and classifies studies as having low risk of bias (≥3 points) or high risk of bias (<3 points). The questions include: 1) Were participants recruited from multiple locations? 2) Was the sample size equal or greater than 200 participants? 3) Did all participants answer the question on willingness to use PrEP? 4) Was the PrEP willingness measured with a validated instrument? 5) Does the study report descriptive statistics with proper measure of dispersion?

[b]Adams (2016) reported only Pennsylvania data while Hoots (2016) reported data for 20 states including Pennsylvania. Only unique data not reported in Hoots (2016) were included in this review.

[c]Proportions reported in primary studies.

[d]Only data for 2011 were used for this review. Data for 2014 were duplicates of another study (Hoots, 2016)