HIV Risk Perception, Willingness to Use PrEP, and PrEP Uptake Among Young Men who have Sex with Men in Washington, DC

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Abstract

Low HIV risk perception is a barrier to PrEP uptake, but few studies have examined risk perception and PrEP uptake among young men who have sex with men (YMSM). We performed a secondary analysis of data collected in 2016 from YMSM ages 16–25 in the Washington, DC metropolitan area who participated in a cross-sectional online survey that aimed to identify strategies for engaging YMSM in PrEP services. Of 188 participants, 115 (61%) were considered eligible for PrEP. Among PrEP-eligible participants who had never used PrEP, 53%, 71%, and 100% with low, moderate, and high risk perception, respectively, were willing to use PrEP (Fisher's exact test $p = 0.01$). Odds of PrEP willingness were greater among those with moderate/ high versus low risk perception (adjusted odds ratio [OR] = 5.62, 95% CI = 1.73–18.34). HIV risk perception was not significantly associated with self-reported PrEP use. These findings suggest the importance of risk perception as a correlate of willingness to use PrEP, which is a key step in existing frameworks of PrEP uptake.

Keywords

HIV/AIDS; PrEP uptake; YMSM; HIV risk perception

Introduction

In 2018, 92% of new HIV diagnoses among young men ages 13 to 24 in the United States were attributable to male-to-male sexual contact [1]. Although the HIV epidemic disproportionately impacts young men who have sex with men (YMSM), HIV pre-exposure prophylaxis (PrEP) use remains low in this population [2]. PrEP was first approved for adults by the U.S. Food and Drug Administration (FDA) in 2012, and it was approved for adolescents in 2018. Although PrEP use has increased overall, individuals under the age of 25 have lower rates of PrEP use than their older counterparts [3]. For example, 16- to 24-year-olds have the lowest PrEP coverage nationally [4], and in a national sample of YMSM aged 13–18, only 3% of those who were identified as PrEP candidates had a current PrEP prescription. [2] A study conducted between 2015 and 2017 among YMSM in Chicago found that PrEP use was low but increasing over time, and that participants who had recently used PrEP were significantly older compared to participants who had not recently used PrEP [5].

The PrEP care continuum, a framework that describes the multiple steps needed to achieve protection with PrEP, includes self-perceived HIV risk as a key part of the PrEP awareness stage preceding PrEP uptake, adherence, and retention [6]. Low HIV risk perception among individuals at risk for HIV is a barrier to PrEP uptake across populations [7]. Previous research demonstrates gaps between objective risk assessment and perception of risk [8-10], and suggests that underestimation of HIV risk can be an individual-level barrier to PrEP uptake among men who have sex with men (MSM) [11-13]. For example, low risk perception has been found to be negatively associated with willingness to use PrEP, which according to the PrEP care continuum is a necessary first step for PrEP uptake [14]. In their survey of MSM receiving anonymous community-based HIV testing, Wilton et al. (2016) found that only 32% of participants who met objective risk behavior criteria reported moderate to high HIV risk perception [12]. Similarly, Kesler et al. (2016) found that only 27% of participants who were at risk for HIV based on objective risk assessment had high HIV risk perception. Moreover, almost half of those reporting HIV sexual risk behaviors were unwilling to use PrEP because their risk perception was low [13].

Few studies have examined associations between HIV risk perception, willingness to use PrEP, and PrEP uptake among YMSM. A study conducted among Black and Latinx adolescents ages 13–17 found that the odds of willingness to use PrEP were almost four times greater among participants who had higher HIV risk perception compared to those who had lower HIV risk perception [15]. This study was not specific to YMSM. In an online survey, Macapagal et al. (2020) found a significant positive association between HIV risk perception and concern about being able to afford PrEP among YMSM ages 15-17 [16]. In one study that did assess HIV risk perception and willingness to use PrEP among YMSM, Holloway et al. (2017) found that YMSM with medium and high concern about getting HIV were more willing to take PrEP compared to those with low concern, although this study did not include YMSM under the age of 18 [17].

Using data collected in 2016 from YMSM aged 16- to 25-years old living in the Washington, DC metropolitan area, this analysis examined associations between (1) HIV

risk perception and PrEP-eligibility based on objective risk assessment, (2) HIV risk perception and willingness to use PrEP among PrEP-eligible YMSM who had never used PrEP, and (3) HIV risk perception and self-reported PrEP use among PrEP-eligible YMSM. Although both PrEP awareness and use among MSM overall have increased since these data were collected, PrEP use remains low among YMSM [2, 4]. Given the incidence of HIV infection among YMSM, a greater understanding of risk perception and PrEP uptake in this population is needed to inform efforts to increase PrEP coverage.

Methods

Study Sample

We performed a secondary analysis of cross-sectional survey data collected in Washington, DC between February and July 2016 from a convenience sample of YMSM recruited primarily via geospatial networking applications (e.g., Jack'd, Grindr), as well as via venue-based recruitment, peer referral, and in-person recruitment at YMSM-specific events. Multiple recruitment strategies were used to obtain a sample most likely to be representative of the YMSM population in the DC area. The purpose of the original parent study was to identify strategies for engaging and retaining younger Black MSM in PrEP services. YMSM were eligible to participate if they were assigned male sex at birth, self-identified as male, were between the ages of 16–25 (inclusive), reported any lifetime history of consensual anal sex, oral sex, or mutual masturbation with at least one male-at-birth partner or self-reported as gay or bisexual, reported an HIV-negative or unknown HIV status, lived in the Washington, DC metropolitan area, and could complete an online survey in English. This analysis includes participants who reported ever having anal sex with a male partner, given our ultimate intent to examine the associations of interest in a PrEP-eligible sample. Self-reported data were collected using REDCap, an electronic data capture system [18]. Participants received a $25 incentive for taking the 10–15 minute survey via smartphone, tablet, or computer. All study procedures and instruments were approved by the George Washington University (GWU) Institutional Review Board (IRB). The GWU IRB granted a waiver of signed documentation of informed consent and a waiver of parental permission for minor participants.

Measures

HIV Risk Perception—HIV risk perception was measured using the Perceived Risk of HIV Scale (PRHS), an eight-item scale designed to elicit cognitive and intuitive risk self-assessments, as well as salience of HIV risk (see full scale in Supplementary Table 1) [19]. Participants responded to the PRHS items before they were asked to report their sexual behavior. The PRHS has previously demonstrated good reliability and criterion validity [19], and had good internal consistency in this sample ($\alpha = 0.82$). Consistent with previous studies examining associations between HIV risk perception and PrEP uptake, HIV risk perception was defined as a categorical variable (low, moderate, and high). In the absence of previously validated categories for the continuous PRHS, participants were categorized based on their mean item score, where low perceived risk was defined as a mean item score of 1–2, moderate perceived risk was defined as a mean item score of >2–3, and high perceived risk was defined as a mean item score of >3–4. The following item was

reverse-coded: "I am sure I will NOT get infected with HIV." Since not all items had the same number of item responses, the scale for each item was standardized before calculating the final score. Each item was standardized to range in value from 1 to 4 in order to contribute equal weight to the final score. The final score was more meaningful than a score based on tertiles, where the lowest (highest) tertile may not necessarily correspond to "low" ("high") perceived risk.

PrEP Eligibility—Participants self-reported both lifetime and past six-month sexual behavior. Past six-month sexual behavior was used to determine PrEP eligibility, which was defined in this analysis using the MSM Risk Index from the 2017 Updated Centers for Disease Control and Prevention (CDC) Clinical Providers' Supplement [20]. While such risk assessments have numerous limitations, this measure was used in order to broadly identify participants who met a baseline level of risk and would reasonably benefit from PrEP, as in previous studies that have assessed HIV risk perception as a barrier to PrEP uptake [11-13, 17]. Survey items used to calculate the Risk Index score were: (1) participant age, (2) number of male anal sex partners in the last six months, (3) any condomless receptive anal sex in the last six months, (4) number of HIV-positive partners with whom participants had condomless anal sex in the last six months, (5) any condomless insertive anal sex with an HIV-positive partner in the last six months, and (6) methamphetamine use in the last six months. Three of the MSM Risk Index items were adapted for this analysis because they were not directly measured in the online survey (i.e., number of condomless receptive anal sex events in the last six months, number of HIV-positive sex partners in the last six months, and number of condomless insertive anal sex events with an HIV-positive partner in the last six months). Participants were considered to be at objective risk for HIV and eligible for PrEP if their responses resulted in a total Risk Index score of 10 or greater [20]. PrEP eligibility was analyzed as a dichotomous variable (yes vs. no).

PrEP Uptake—As financial concerns are one of the most common barriers to PrEP use in the U.S. [7], we asked participants: "If given the option to take PrEP for free, would you take it to prevent HIV infection?" Response options were "yes," "maybe," and "no." Previous studies have used similar measures of willingness to use PrEP if it were offered for free [15, 21]. Self-reported PrEP use was assessed using the following question: "Have you ever taken PrEP?" with response options of "yes" or "no." At the time of data collection, only daily, oral PrEP had been approved by the FDA, and PrEP was not yet approved for adolescents under the age of 18.

Statistical Analysis

Descriptive statistics were calculated to summarize participant characteristics, including age, race/ethnicity, education, employment, health insurance status, and HIV testing history. Differences in PrEP eligibility by HIV risk perception categories were evaluated using chi-square and Fisher's exact tests. Among the PrEP-eligible subset of the sample, the association between HIV risk perception as an independent variable and willingness to use PrEP as a dependent variable was examined using a multivariable proportional odds logistic regression model, and the association between HIV risk perception and self-reported PrEP use was assessed using multivariable logistic regression. A manual stepwise selection

model included covariates that were significant at $p < 0.20$ in order to adjust for potential confounders. Covariates that were considered for inclusion in the multivariable models were age, race/ethnicity, education, employment status, health insurance status, student status, living with parents, ever receiving an HIV test, having a regular healthcare provider, ever having a sexually transmitted infection (STI), and use of marijuana or poppers in the last six months. A manual stepwise selection model was used to estimate a parsimonious model because the small sample size precluded inclusion of all potential covariates. A fully adjusted model was also tested in a sensitivity analysis. Moderate and high risk perception categories were collapsed for regression analyses due to small cell sizes when cross-classifying by willingness to use PrEP. Analyses involving willingness to use PrEP were restricted to participants who reported that they had never used PrEP. All analyses were conducted in SAS software version 9.4 (SAS Institute Inc., Cary, NC, USA).

Results

239 YMSM participated in the online survey. Seventeen participants who reported never having anal sex with a male partner were excluded from this analysis. A Risk Index score could not be calculated for an additional 34 participants due to missing data (number of male anal sex partners was missing two observations, condomless receptive anal sex was missing 18 observations, number of HIV-positive partners with whom the participant had condomless anal sex was missing 24 observations, condomless insertive anal sex with an HIV-positive partner was missing 23 observations, and methamphetamine use was missing one observation). Participants who were missing Risk Index scores did not differ from those included in the final analytic sample, with the following exceptions: a greater proportion of participants with missing data were non-Hispanic Black ($\chi^2(3) = 13.71$, $p = 0.004$) and fewer reported using poppers in the last six months ($\chi^2(1) = 6.14$, $p = 0.01$).

The final analytic sample size was 188. As shown in Table 1, 129 participants (69%) were ages 21–25, 84 (45%) were non-Hispanic Black, and 156 (83%) identified as gay. 112 participants (60%) were students and 140 (75%) were employed. 155 participants (83%) reported that they were tested for HIV within the past year, although 16 (9%) had never had an HIV test. 162 participants (86%) had previously heard of PrEP. Participants first heard about PrEP through a variety of sources, including from a friend (27%), news article (18%), advertisement (15%), and a sexual partner (12%). Only 9% first heard about PrEP from a healthcare provider.

HIV Risk Perception and PrEP Eligibility

Of 188 YMSM, 39 (21%) had low HIV risk perception, 124 (66%) had moderate HIV risk perception, and 25 (13%) had high HIV risk perception (Table 2). 115 participants (61%) met the MSM Risk Index criteria for PrEP eligibility. Compared to participants who were not PrEP-eligible, PrEP-eligible participants were more likely to be currently employed (80% vs. 66%, $\chi^2(1) = 4.77$, $p = 0.03$), to ever have had an STI (37% vs. 22%, $\chi^2(1) = 4.46$, $p = 0.03$), to report using poppers in the last six months (38% vs. 16%, $\chi^2(1) = 10.17$, $p = 0.001$), and to have used alcohol within two hours before or during condomless anal sex in the last six months (48% vs. 16%, $\chi^2(1) = 17.42$, $p < 0.0001$) (Table 1). PrEP-eligible

participants were significantly more likely to have moderate or high versus low HIV risk perception than participants who were not PrEP-eligible (Table 2). Among PrEP-eligible participants, 16 (14%) had high risk perception, 83 (72%) had moderate risk perception, and 16 (14%) had low risk perception.

Willingness to Use PrEP

Among the 169 participants who had never used PrEP, 121 (72%) reported that they would be willing to take PrEP if it were provided for free, 29 (17%) reported that they might be willing, and 19 (11%) reported that they would not be willing. Of the 169 participants who had never used PrEP, 101 participants (60%) were identified as PrEP-eligible, and 73 (72%) of these participants reported that they would be willing to use PrEP. Among the 101 PrEP-eligible participants who had never used PrEP, 13 of the 13 participants (100%) with high HIV risk perception reported that they would be willing to use PrEP if it were provided for free, compared to 52 of the 73 participants (71%) with moderate HIV risk perception and 8 of the 15 participants (53%) with low HIV risk perception (Fisher's exact test $p = 0.01$) (Table 3). The proportional odds assumption for the stepwise selection regression model of HIV risk perception and willingness to use PrEP (yes vs. maybe and no) was met ($\chi^2(4)$ = 4.28, $p = 0.37$), and the overall model was significant ($\chi^2(4) = 18.62$, $p = 0.0009$). In the stepwise selection model, the odds of being willing to use PrEP were greater among PrEP-eligible participants with moderate or high HIV risk perception compared to those with low HIV risk perception (adjusted odds ratio [OR] = 5.62, 95% CI = 1.73–18.34). In a sensitivity analysis, results from a fully adjusted model were consistent with the more parsimonious stepwise selection model (Table 3).

PrEP Use

Only 14 of 115 PrEP-eligible participants (12%) had ever used PrEP and 11 (10%) were currently using PrEP. Among PrEP-eligible YMSM, a Fisher's exact test indicated that HIV risk perception was not significantly associated with PrEP use ($p = 0.53$). Among 115 PrEP-eligible YMSM, 3 of 16 participants (19%) with high risk perception had ever used PrEP, compared to 10 of 83 participants (12%) with moderate perceived risk and 1 of 16 participants (6%) with low perceived risk (Table 3). Results are only presented for the stepwise selection logistic regression model as the fully adjusted model did not converge, likely due to the small cell sizes. The overall model was significant ($\chi^2(5) = 35.20$, $p < 0.0001$), however the point estimate for HIV risk perception was not significant (adjusted OR = 1.72, 95% CI = 0.12–24.05).

Discussion

In this diverse sample of YMSM in the Washington, DC metropolitan area, HIV risk perception was significantly associated with PrEP eligibility based on objective HIV risk assessment. Participants with higher HIV risk perception were more likely to be considered at risk for HIV based on an objective assessment. Furthermore, we observed a significant positive association between HIV risk perception and willingness to use PrEP among PrEP-eligible YMSM who had never used PrEP. While only approximately half of PrEP-eligible YMSM with low perceived risk were willing to use PrEP, all PrEP-eligible YMSM with

high perceived risk were willing to use PrEP. The adjusted odds of being willing to use PrEP were over five times greater for PrEP-eligible participants with moderate or high perceived risk compared to those with low perceived risk. These findings are consistent with previous studies showing associations between perceived risk and eligibility for PrEP [8], and between perceived risk and willingness to use PrEP [12], providing further evidence that underestimation of HIV risk is a barrier to PrEP uptake [11]. These findings contribute to the literature by showing that, among PrEP-eligible YMSM in Washington DC, greater HIV risk perception is significantly associated with willingness to use PrEP.

HIV risk perception was not significantly associated with self-reported PrEP use in this analysis, though we did observe a non-statistically significant trend towards a dose-response relationship between HIV risk perception and PrEP use, which is consistent with previous research [22]. The non-significant association between risk perception and PrEP use may be due to a lack of statistical power related to the small number of participants who reported PrEP use, the cross-sectional nature of the data such that we were not able to distinguish between risk perception as a consequent or antecedent of behavior, or the inclusion of both YMSM who previously used PrEP and those who were currently taking PrEP in the outcome measure. We were not able to isolate current PrEP use from past PrEP use in our analysis because very few participants reported current PrEP use. Participants who had previously discontinued PrEP may have done so due to decreased risk perception, which would result in a negative association with risk perception that could potentially suppress a positive association between risk perception and PrEP use among those who are current users. Future longitudinal studies should be conducted to determine whether risk perception predicts PrEP uptake among YMSM.

Given that PrEP guidelines and messaging at the time of data collection emphasized the use of PrEP for individuals at substantial risk of HIV infection, it is not surprising that higher HIV risk perception was associated with willingness to use PrEP in this study. Our finding that PrEP-eligible YMSM were less likely to be willing to use PrEP if they perceived their risk to be low suggests that PrEP education programs should aim to strengthen HIV risk perception among YMSM who meet objective HIV risk behavior criteria. Longitudinal studies are needed to further evaluate this conclusion.

It should be noted that linking PrEP to "high risk behavior" may have unintended consequences. As Golub (2018) argues, the label of "high risk" is stigmatizing, which may distort risk perception and deter potential users from initiating PrEP [23]. Indeed, 53% of PrEP-eligible participants in our study who had low perceived risk of HIV were still willing to use PrEP, suggesting that YMSM may have other motivations for PrEP use. Ranjit et al. (2019) proposed a dual motivational model of intention to use PrEP among MSM and found that intention to use PrEP was predicted not only by perceived HIV risk (the "protection motivation pathway"), but also by expectations of better sexual experiences (the "expectancy motivation pathway") [24]. In order to increase PrEP coverage among YMSM who have low HIV risk perception, further research is needed to determine the relative benefits of messaging that focuses on HIV risk and messaging that focuses on sexual health promotion.

Over 60% of YMSM in our sample were eligible for PrEP based on an objective risk assessment. This estimate aligns with data from an analysis of a national panel of HIV-negative gay and bisexual men in the U.S. indicating that 65% of participants met CDC criteria for PrEP eligibility [25], and is similar to an estimate from a nationally representative study of adolescent MSM in which 54% of the sample met criteria for being a PrEP candidate [2]. Some of our findings contrast with previous studies. For example, in a study conducted in California in 2015 using similar recruitment methods, 41% of a diverse sample of YMSM had low perceived risk of HIV [17], compared to 21% in our study. Relatedly, we found lower levels of discordance between perceived HIV risk and objective risk assessment compared to other studies. Kesler et al. (2016) found that 73% of MSM determined to be eligible for PrEP perceived their risk of HIV to be low, compared to 14% in this study. These differences in HIV risk perception may be related to the differences in how HIV risk perception was measured in our study compared to previous studies. While most studies use a single item that typically measures cognitive risk perception only, we used a multi-item scale with a broader construct definition, which may be a more valid measure of HIV risk perception.

Both awareness of and willingness to use PrEP were high in this study. Over 85% of participants had previously heard of PrEP, which is consistent with findings from an analysis of data from the CDC National HIV Behavioral Surveillance system showing that over 70% of MSM in Washington, DC had heard of PrEP in 2014 [26]. This is also consistent with data from other studies conducted among YMSM [27-29]. Despite high awareness of and willingness to use PrEP, few participants in our overall sample (10%) reported ever actually using PrEP, and even fewer (7%) reported currently using PrEP. PrEP use among participants who were assessed as eligible for PrEP was slightly higher, though still low (12% had ever used PrEP and 10% were currently using PrEP). This low level of PrEP use generally corresponds to data from previous studies of YMSM [5, 30], including a study conducted after PrEP was approved for adolescents [2], as well as data from a national cohort of adult MSM [25].

Despite our findings suggesting the importance of accurate HIV risk perception for PrEP uptake, increased risk perception alone may be insufficient to change behavior. Uncertainty about how to obtain PrEP was found to be the most frequently cited barrier to PrEP uptake in a national sample of YMSM [30]. Additionally, provider-level barriers and social and structural factors beyond the individual-level may limit PrEP uptake among YMSM [7, 31]. Social and sexual network factors have been found to be associated with PrEP use among YMSM [28, 32]. YMSM, and adolescent MSM in particular, may experience unique challenges in accessing PrEP, such as their dependence on parents/caregivers for access to healthcare [33]. Additional social and structural factors should be considered in studies of PrEP uptake among YMSM in order to support successful linkage to PrEP services. Future studies should also examine low risk perception among YMSM as a barrier to uptake of long-acting injectable PrEP, which was approved by the FDA in December 2021.

Our study has several limitations. This convenience sample of YMSM recruited from a single metropolitan area may not be representative of YMSM in the U.S. Data collection occurred prior to the FDA approval of PrEP for adolescents, which limited our ability

to examine the association between risk perception and PrEP use, but should not have significantly impacted our estimates of risk perception and willingness to use PrEP. The data used in this analysis were self-reported, increasing the potential for misclassification. However, our use of the multi-item PRHS improves upon previous studies that only used a single indicator to measure HIV risk perception.

Because this was a cross-sectional study, we could not determine temporality, nor could we assess how the association between HIV risk perception and sexual behavior changes over time. Furthermore, willingness to use PrEP is an imperfect predictor of PrEP uptake. Rendina et al. (2017) argued that there is a distinction between willingness to use PrEP and intention to use PrEP, and suggested that this may explain why PrEP uptake is low despite high PrEP acceptability [34]. Longitudinal studies are needed to examine the relationship between willingness to use PrEP and PrEP initiation.

Additionally, there are several limitations related to the use of the CDC's MSM Risk Index as a measure of PrEP eligibility. First, this measure did not account for condomless anal sex with unknown HIV-status partners, viral suppression among HIV-positive partners, or PrEP use among HIV-negative partners. Second, we adapted three of the MSM Risk Index items because they were not directly measured in the online survey. Instead of the number of condomless receptive anal sex events, our survey asked about the number of condomless receptive anal sex partners. This did not affect the scoring of this item, as the MSM Risk Index assigns an item score of "10" to a response of one or more events, and we assigned an item score of "10" to a response of one or more partners. Instead of the number of HIV-positive male sex partners, our survey asked about the number of HIV-positive male sex partners with whom the participant had condomless anal sex. Our measure was therefore a more precise estimate of objective risk. Instead of the number of condomless insertive anal sex events with an HIV-positive partner, our survey asked about the number of HIV-positive partners with whom the participant had condomless insertive anal sex. The MSM Risk Index assigns an item score of "6" to a response of five or more events, while we assigned an item score of "6" to a response of one or more partners. Given the small number of participants in our sample who reported condomless sex with an HIV-positive partner, we expect that this had a minimal impact on the item score. Third, HIV risk assessments similar to the one used in this study were found to perform poorly in identifying seroconverters in a sample of Black MSM ages 16-29 [35]. Clinical practice guidelines now recommend informing all sexually active adults and adolescents about PrEP and offering it to anyone who asks for it even if they do not report HIV risk behavior [36]. However, our use of the CDC MSM Risk Index tool is consistent with several other similar analyses and increases the comparability of our findings, and is also consistent with clinical practice guidelines at the time of data collection.

Conclusion

Few studies have examined associations between HIV risk perception, willingness to use PrEP, and PrEP uptake among YMSM. In a sample of YMSM aged 16–25 in Washington, DC, we found that higher HIV risk perception was associated with increased willingness to use PrEP among PrEP-eligible individuals. Our study shows that underestimation of HIV risk is a barrier to willingness to use PrEP among YMSM. Further, since the majority of

study participants expressed willingness to use PrEP, these findings support the engagement of YMSM in PrEP services. Interventions to increase willingness to use PrEP would benefit from risk-related messaging tailored specifically to the YMSM population.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Table 1

Characteristics of Study Participants, Stratified by PrEP Eligibility (N=188)

	n (%)[a]	PrEP eligibility		Test statistic
		No (n = 73) n (%)	Yes (n = 115) n (%)	
Median age (IQR)[b]	22 (20–24)	22 (20–24)	22 (20–24)	0.29
Age				1.74
16–20	59 (31.4)	27 (37.0)	32 (27.8)	
21–25	129 (68.6)	46 (63.0)	83 (72.2)	
Gender identity[c]				–
Cisgender man	186 (98.9)	73 (100)	113 (98.3)	
Other gender identity[d]	2 (1.1)	0	2 (1.7)	
Sexual orientation				0.13
Gay/homosexual	156 (83.0)	60 (82.2)	96 (83.5)	
Bisexual	30 (16.0)	12 (16.4)	18 (15.7)	
Straight/heterosexual	2 (1.1)	1 (1.4)	1 (0.9)	
Race/ethnicity				7.55
Black, non-Hispanic	84 (44.9)	37 (50.7)	47 (41.2)	
White, non-Hispanic	55 (29.4)	25 (34.3)	30 (26.3)	
Hispanic	31 (16.6)	6 (8.2)	25 (21.9)	
Other	17 (9.1)	5 (6.9)	12 (10.5)	
Education				0.03
High school or less	38 (20.2)	15 (20.6)	23 (20.0)	
Some college	84 (44.7)	32 (43.8)	52 (45.2)	
College graduate or above	66 (35.1)	26 (35.6)	40 (34.8)	
Current student	112 (59.6)	43 (58.9)	69 (60.0)	0.02
Does not live with parents	119 (63.3)	41 (56.2)	78 (67.8)	2.61
Currently employed	140 (74.5)	48 (65.8)	92 (80.0)	4.77*
Has health insurance	175 (93.1)	68 (93.2)	107 (93.0)	0.00
Has primary care provider	134 (71.3)	50 (68.5)	84 (73.0)	0.45
Last HIV test				4.29

	n (%)[a]	PrEP eligibility		Test statistic
		No (n = 73) n (%)	Yes (n = 115) n (%)	
Within 1 year	155 (82.5)	56 (76.7)	99 (86.1)	
Over 1 year	17 (9.0)	7 (9.6)	10 (8.7)	
Never	16 (8.5)	10 (13.7)	6 (5.2)	
Heard of PrEP	162 (86.2)	60 (82.2)	102 (88.7)	1.59
Ever used PrEP	19 (10.1)	5 (6.9)	14 (12.2)	1.39
Currently using PrEP	13 (6.9)	2 (2.7)	11 (9.6)	3.23
Ever had an STI	58 (30.9)	16 (21.9)	42 (36.5)	4.46 [*]
Drug use (last 6 months)				
Poppers	56 (29.8)	12 (16.4)	44 (38.3)	10.17 [**]
Marijuana	118 (62.8)	43 (58.9)	75 (65.2)	0.76
Cocaine	17 (9.0)	6 (8.2)	11 (9.6)	0.10
Non-prescription drugs	15 (8.0)	3 (4.2)	12 (10.4)	2.36
Injection drug use[c]	3 (1.6)	1 (1.4)	2 (1.7)	–
Alcohol use 2 hours before or during condomless anal sex (last 6 months)				17.42 [***]
Yes	61 (35.9)	10 (15.8)	51 (47.7)	
No	109 (64.1)	53 (84.1)	56 (52.3)	
Depressive symptoms	114 (60.6)	41 (56.2)	73 (63.5)	1.00
Low social support	24 (12.8)	9 (12.3)	15 (13.0)	0.02

IQR (interquartile range); PrEP (pre-exposure prophylaxis); STI (sexually transmitted infection). Test-statistics are chi-square tests, unless otherwise indicated.

[*]
$p < 0.05$

[**]
$p < 0.01$

[***]
$p < 0.0001$.

[a]Total may not equal 188 due to missing data.

[b]Wilcoxon rank sum test.

[c]Fisher's exact test. Test statistic is not available.

[d]1 participant identified their gender as both male and female and 1 participant identified their gender as both male and genderqueer.

Table 2

Differences in PrEP Eligibility Criteria by Perceived Risk of HIV Infection (N=188)

		Perceived risk of HIV[a]			
	N (%)[b]	Low (n = 39)	Moderate (n = 124)	High (n = 25)	Test statistic
MSM Risk Index criteria[c]					
Age[d]					8.64[*]
<18	6 (3.2)	4 (10.3)	1 (0.8)	1 (4.0)	
18	182 (96.8)	35 (89.7)	123 (99.2)	24 (96.0)	
Number of male sex partners in the last 6 months[d]					—
>10	19 (10.1)	4 (10.3)	11 (8.9)	4 (16.0)	
6–10	38 (20.2)	4 (10.3)	31 (25.0)	3 (12.0)	
0–5	131 (69.7)	31 (79.5)	82 (62.6)	18 (72.0)	
Condomless receptive anal sex in the last 6 months					6.02[*]
Yes	85 (46.5)	11 (29.0)	61 (50.4)	13 (54.2)	
No	98 (53.6)	27 (71.1)	60 (49.6)	11 (45.8)	
Number of HIV-positive male condomless sex partners in last 6 months[d]					—
>1	1 (0.6)	0	1 (0.8)	0	
1	8 (4.6)	2 (5.6)	6 (4.2)	1 (4.8)	
0	167 (94.9)	34 (94.4)	133 (95.0)	20 (95.2)	
Condomless insertive anal sex with HIV-positive partner in last 6 months[d]					—
Yes	4 (2.3)	1 (2.7)	3 (2.6)	0	
No	171 (97.7)	36 (97.3)	135 (97.4)	22 (100.0)	
Methamphetamine use in last 6 months[d]					—
Yes	3 (1.6)	1 (2.6)	1 (0.8)	1 (4.0)	
No	185 (98.4)	38 (97.4)	123 (99.2)	24 (96.0)	
PrEP eligibility					8.49[*]
Yes (score 10)	115 (61.2)	16 (41.0)	83 (66.9)	16 (64.0)	
No (score < 10)	73 (38.8)	23 (59.0)	41 (33.1)	9 (36.0)	

MSM (men who have sex with men); PrEP (pre-exposure prophylaxis). Test statistics are chi-square tests, unless otherwise indicated.

*
$p < 0.05$.

[a] Low perceived risk is defined as an average score of 1-2, moderate is >2-3, and high is >3-4 on the Perceived Risk of HIV Scale.

[b] Totals may not equal 188 due to missing data.

[c] Item scoring per CDC MSM Risk Index: <18 = score 0, 18 = score 0, 18 = score 7, 6–10 male partners = score 4, 0–5 male partners = score 7, 6–10 male partners = score 8; >10 male partners = score 10, no condomless receptive anal sex = score 0; condomless receptive anal sex = score 10, no condomless receptive anal sex = score 0; condomless anal sex with > 1 HIV-positive partner = score 8, condomless anal sex with 1 HIV-positive partner = score 4, no condomless anal sex with HIV-positive partner = score 0; condomless insertive anal sex with HIV-positive partner = score 6, no condomless insertive anal sex with HIV-positive partner = score 0; methamphetamine use = score 6; no HIV-positive partners = score 0; condomless insertive anal sex with HIV-positive partner = score 6, no condomless insertive anal sex with HIV-positive partner = score 0; methamphetamine use = score 0.

[d] Fisher's exact test. Test statistic is not available. No p-values were statistically significant.

Table 3

Unadjusted and Adjusted Odds of Willingness to use PrEP and Self-Reported PrEP Use among YMSM Determined to be Eligible for PrEP based on an Objective Risk Assessment[a]

	Willingness to use PrEP[b]						PrEP use[c]				
	Yes n (%)	Maybe n (%)	No n (%)	p-value[d]	OR (95% CI)	aOR[e] (95% CI)	aOR[f] (95% CI)	Ever n (%)	Never n (%)	p-value[d]	OR (95% CI)	aOR[g] (95% CI)
Perceived HIV risk											
High	13 (100.0)	0	0	0.01	3.50 (1.20–10.26)	6.05 (1.65–22.17)	5.62 (1.73–18.34)	3 (18.8)	13 (81.3)	0.53	2.27 (0.28–18.64)	1.72 (0.12–24.05)
Moderate	52 (71.2)	15 (20.6)	6 (8.2)					10 (12.1)	73 (88.0)			
Low	8 (53.3)	2 (13.3)	5 (33.3)		1.00 (ref)	1.00 (ref)	1.00 (ref)	1 (6.3)	15 (93.8)		1.00 (ref)	1.00 (ref)

aOR (adjusted odds ratio); OR (odds ratio); PrEP (pre-exposure prophylaxis); YMSM (young men who have sex with men).

[a]Logistic regression models combine perceived risk categories due to small cell sizes.

[b]N = 101 PrEP-eligible participants who had never used PrEP.

[c]N = 115 PrEP-eligible participants.

[d]Only p-value is presented because test statistics are not available for Fisher's exact test.

[e]Fully adjusted model including age, race/ethnicity, education, employment status, insurance status, student status, living with parents, ever receiving an HIV test, having a regular healthcare provider, ever having a sexually transmitted infection, and use of marijuana or poppers; (n = 100; 1 observation excluded due to missing data).

[f]Stepwise selection model adjusted for age, employment status, and ever having a sexually transmitted infection.

[g]Stepwise selection model adjusted for age, education, and use of poppers.