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Use of Pre-exposure Prophylaxis (PrEP) in Young Men Who Have Sex with Men is Associated with Race, Sexual Risk Behavior and Peer Network Size

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Abstract

Pre-exposure prophylaxis (PrEP) is efficacious to prevent HIV infection, however, uptake among young men who have sex with men (YMSM) is relatively low. The purpose of this study was to describe PrEP use and related factors in a representative sample of YMSM in two cities, Chicago and Houston. YMSM, ages 16–29, were recruited via respondent-driven sampling (RDS) from 2014–2016. Correlates of PrEP uptake were assessed in weighted multivariable logistic regression models. A total of 12.2% of participants (of 394) reported ever taking PrEP; Black YMSM had the lowest rates of uptake (4.7%) and Whites the highest (29.5%). In a multivariable regression model, having an HIV positive sex partner, reporting recent group sex, peer network size, and city (Chicago) were significantly and positively associated with use of PrEP, while Black race was negatively associated with it. Given evidence of racial/ethnic disparities in PrEP uptake in this study, further research is needed to identify potential mechanisms of action and points of intervention.

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Informed Consent: Informed consent was obtained from all individual participants involved in this study.

Keywords

Pre-exposure prophylaxis; Young Men Who Have Sex with Men; Social Network; HIV Prevention

INTRODUCTION

Pre-Exposure Prophylaxis (PrEP), defined as the use of antiretroviral medications to prevent HIV infection, is an efficacious prevention strategy for high-risk populations, particularly men who have sex with men (MSM) (1, 2). Among young men who have sex with men (YMSM), a risk group for whom new cases of HIV infection have continued to increase in recent years (3), evidence indicates that PrEP is efficacious (4), however, there is limited evidence of widespread use outside of randomized controlled trials. Recent studies have estimated that <10% of YMSM have ever used PrEP (5–7). To date, various factors have been associated with PrEP awareness among YMSM, including greater education and income (7), healthcare access, and social network factors (6, 8); while PrEP uptake among YMSM has been associated with greater income (5) and indicators of sexual risk (5, 7). Among all adults, as well as adult men who have sex with men (MSM), some evidence suggests that uptake differs by race. For example, White adults disproportionately accessed PrEP at retail pharmacies between 2012 and 2015 in comparison to other races (9) and White MSM were more likely to report taking PrEP than Blacks in the 2014 National HIV Behavioral Surveillance System (NHBS) data (10). A recent white paper published by the California HIV/AIDS research program suggests that uptake of PrEP may be differential by race/ethnicity among YMSM as well (11). Results stem from an on-line survey conducted between July and August of 2015 among 602 male residents of California with male sex partners, ages 18–29, which found low PrEP uptake overall (9.6%), with White YMSM significantly more likely to use PrEP (13.9%) in comparison to Latinos (6.6%; but not Blacks at 9.8%). Given findings from these studies to date, the purpose of the study was to describe PrEP uptake in a diverse sample of YMSM in two cities, Chicago and Houston (with differing Medicaid Expansion status), as well as assess demographic, health access, sexual risk and social network correlates of PrEP use.

METHODS

Study Sample

Findings reported herein come from an analysis of baseline data collected in an on-going longitudinal network study of HIV risk in YMSM, ages 16–29, collected between 2014 and 2016 in two cities, Chicago and Houston (Young Men’s Affiliation Project or YMAP). The purpose of YMAP is to investigate the HIV risk and protective factors associated with multiplex and multilevel social and affiliation networks of YMSM (12). Eligible participants were within the target age-range at baseline, assigned male at birth and identified as male, reported oral or anal sex with another male in the prior year, resided in Chicago or Houston metro area and were available for follow-up over the subsequent year and were English-speaking. We restricted analysis in this study to the subgroup of participants who were 18 years and older and reported HIV-negative serostatus. Research participants were recruited using respondent-driven sampling (RDS)(13), in which index participants were instructed to

recruit up to four eligible members of their social network for study participation. Institutional Review Board approval was obtained for all participating institutions. We obtained assent/consent from all participants; parental permission was waived for minors under 18 years of age. Participants were compensated at \$50 for their time and travel with an additional \$20 for each peer network member recruited.

Data Collection and Measures

We collected data via computer-assisted personal interviewing which included questions about sociodemographic characteristics, HIV/STI risk and protective behaviors, and network characteristics. In terms of demographic indicators, the questionnaire included items regarding participant age, race/ethnicity, sexual orientation, highest level of education, student status and current employment status.

We included three variables to serve as proxy indicators of healthcare and/or PrEP access, including having health insurance (“Do you currently have health insurance of any kind, government or private?”), site (Chicago or Houston; Illinois is a Medicaid expansion state and Texas is not)(14), and year of enrollment (2014, 2015, 2016).

Two social affiliation and network variables were created, including the level of gay community affiliation (“How much do you feel a part of the gay community?”; response options included: very much, somewhat, not very much, not at all) and YMSM (peer) network size, per the standard approach to estimate peer network size in RDS-based studies (13) (“Of the guys that you know by name in [Chicago or Houston] that have sex with other guys, how many are young men between the ages of 16–29? Keep in mind these are people who you know and who know you, who you know how to contact directly, and who you have seen in person in the last six months.”)

In terms of indicators of sexual risk, we included any prior history of a sexually transmitted infection (“Have you ever been told by a doctor, nurse or other health care provider that you have: HPV-Human papillomavirus, syphilis, anal or genital warts?”), HIV testing history (“Have you ever been tested for HIV? When was the last time you were tested for HIV? What was the result of your most recent HIV test?”), recent history of group sex (“In the past 6 months, how often have you engaged in group sex?”). To measure serostatus of sexual partners and recent history of condomless anal sex, we asked participants to list up to 5 recent (last 6 months) sexual partners by name or initials and then asked about their perceived serostatus (“Is [NAME] HIV-positive, negative? Response options include: positive, negative, don’t know) and history of condom use for anal sex (“In the last 6 months, when you had sex with [NAME], how often did you use condoms? Response options included: Always, Usually, Sometimes, Rarely, Never). An indicator variable for any HIV-positive sexual partner was created (1=yes, 0=no) and any recent report of condomless anal sex (1=yes, 0=no).

Our primary outcome of interest was “ever” use of PrEP, herein referred to as “PrEP uptake,” which we measured with the question, “Have you ever taken HIV medication before sex because you thought it would lower your chances of getting HIV, also known as

PrEP?” (1=yes, 0=no). We also asked participants if they had taken PrEP in the last six months, and if so, if they were currently taking it.

Statistical Analysis

RDS weights were calculated in RDSAT (version 7.1) (15). Statistical analyses were completed using SAS software v9.4 (SAS Institute, Cary, NC). Bivariate associations between socio-demographics, network characteristics, and sexual behaviors and PrEP uptake were examined in weighted logistic regression models. Variables which were associated with PrEP uptake at a level of $p \leq 0.10$ in initial analyses were then entered into a multivariable regression model; those with $p > 0.05$ were removed one by one in an iterative process to arrive at a final parsimonious model. Only variables with $p < 0.05$ were maintained in the final model, with the exception of age and health insurance, which were retained in the model for theoretical reasons despite lack of statistical significance.

RESULTS

Between December of 2014 and January of 2016, we enrolled 553 participants into the YMAP study across both cities. Participants who reported being HIV-positive at baseline were removed from the analysis ($n=156$) as were those who reported an unknown status ($n=1$). An additional two participants were removed from the analysis due to being aged 16–17 and one was removed due to a missing age variable in the dataset. The final dataset for analysis was $N=394$ (Table 1). The median age in the analytic sample was 24 (Interquartile range=22–26), and in terms of race, the sample was primarily Black (49%), with smaller percentages White (24.1%) and Hispanic/Latino (19.5%). Most participants identified as “gay” (71.8%), with 21.8% and 6.4% identifying as “bisexual” and “straight/heterosexual” respectively. A large percentage of participants reported at least some college education (68.2%) and full or part-time employment (67.0%), with a smaller percentage reporting current student status (30.7%).

PrEP Uptake

A total of 48 (12.2%) participants reported having ever taken PrEP. Among those reporting ever having taken PrEP, the vast majority, 87.5%, had taken PrEP in the past six months and 77.1% ($n=37$) reported currently taking PrEP.

Correlates of PrEP

In initial analysis (Table 1), race/ethnicity, health insurance, network size, gay community affiliation, any STI history, recent condomless anal sex, any HIV-positive partner, and recent group sex were significantly associated with PrEP uptake ($p \leq 0.10$). Because of high intercorrelations between peer network size and gay community affiliation, peer network size was selected for inclusion in the multivariable model for both empirical and substantive reasons. For example, because this is a network-based study, we were most interested in the relationship of network factors to PrEP uptake over affiliation. Similarly, due to high intercorrelations in HIV risk variables (i.e., any STI history, recent condomless anal sex, having an HIV-positive sex partner and recent group sex), we selected the strongest associated factors: HIV-positive partner and group sex to include in the multivariable model.

In the final model (Table 2), city (Chicago), peer network size, reporting an HIV-positive partner, and group sex were significantly and positively associated with having ever used PrEP and Black race (vs. White) negatively associated with it. Given the strong association of Black race with PrEP use, we completed additional tests for interactions between Black race and socioeconomic factors, including health insurance as potential modifiers of the race-PrEP use relationship, however these were not statistically significant (data not shown). Additionally, noting the descriptive difference in PrEP use by year of enrollment, we also tested for a time trend in PrEP use over the enrollment period by year, month, and month/quarter of enrollment, which were also not statistically significant (data not shown).

DISCUSSION

Findings reported here support prior studies indicating that uptake of PrEP among YMSM is quite low, with only 12.2% of the study sample reporting ever having taken PrEP. In addition, there was no evidence that use of PrEP significantly increased over the period of enrollment from 2014–2016. Furthermore, these data indicate that use of PrEP may be differential by race, similar to findings among adult MSM, with Black YMSM at an 84% reduced odds of having ever used PrEP in comparison to their White counterparts, in the adjusted multivariable model. Prior studies suggest that Black YMSM may be less aware of PrEP and that awareness is associated with education, income, and employment status (7, 11). These factors echo the structural barriers to HIV prevention interventions experienced more generally by Black MSM (16). Given these findings, it will be important to reach racial/ethnic minorities as part of a concerted effort to promote PrEP among YMSM.

Despite low uptake overall, we also found that indicators of risk, including reporting an HIV-positive sex partner and recent group sex were associated with PrEP uptake, which suggest that those YMSM who are using PrEP tend to be those who have higher HIV risk on average. However, recent findings indicate that large percentages of YMSM report recent condomless anal sex (almost 50%) and sex with unknown status partners (17), thus, many more YMSM are likely indicated for PrEP than report prior use.

We also found that YMSM peer network size is related to PrEP uptake, suggesting that having a larger number of YMSM within one's social network is associated with PrEP use. This finding may be due to use of PrEP within one's peer network, being aware of PrEP or discussing it, but limitations in our data prevented us from testing these potential explanations. Prior studies have found that identifying as "gay" (in comparison to bisexual) and affiliation with the "Ball Community" is associated with awareness of PrEP among YMSM (6, 11) which also imply social network benefits in this regard. Because the social network implications for PrEP use have not been studied, this is a potentially important area of inquiry.

Finally, while having health insurance was not significantly associated with PrEP use in the multivariable model, participants in Chicago had over twice the odds of having ever taken PrEP than those in Houston. Limitations in the data did not allow us to explore this finding further (i.e., we did not collect data on how participants accessed PrEP, whether through insurance, PrEP access programs or other programs), but differences may be related to the

larger socioeconomic and public health context in each location. Future studies to determine the social and structural contexts conducive to PrEP uptake are advised.

Findings should be considered in the light of some limitations. For example, the collection of data is limited to two urban areas (Chicago and Houston), thus findings may not generalize to other locations. In addition, the report of sexual partner characteristics and sexual behavior is subject to recall error. We limited reporting to the prior 6 months only and used a timeline anchored to significant events over the prior 6 months to aid recall. Finally, for the exploratory statistical tests, such as the tests of interactions and the time trend analysis, relatively low statistical power limit conclusiveness of findings.

We conclude that the low uptake of PrEP overall among YMSM, and among Black YMSM in particular, in comparison to rates of infection, suggest underutilization of PrEP and the need for expansion of PrEP promotion efforts. Social, relational, and structural contexts conducive to PrEP uptake among YMSM are potentially important areas of future research.

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Table 1

Prevalence of PrEP Use by Participant Characteristics, N=394, YMAP HIV Negative Adult Cohort, Chicago and Houston 2014–2016

	Total, N=394 n (col %)	Ever used PrEP, N=48 n (row %)	Never used PrEP, N=346 n (row %)	p-value ^a
Age, Median (IQR)	24 (22–26)	24 (22–26)	24 (22–27)	0.665
Race/Ethnicity				
White	95 (24.1)	28 (29.5)	67 (70.5)	<0.001
Black	193 (49.0)	9 (4.7)	184 (95.3)	
Hispanic	77 (19.5)	9 (11.7)	68 (88.3)	
Other	29 (7.4)	2 (6.9)	27 (93.1)	
Sexual orientation				
Gay	283 (71.8)	36 (12.7)	247 (87.3)	0.194
Bisexual	86 (21.8)	5 (5.8)	81 (94.2)	
Heterosexual/Other	25 (6.4)	7 (28.0)	18 (72.0)	
Educational attainment				
< HS	34 (8.7)	2 (5.9)	32 (94.1)	0.272
HS or GED	91 (23.2)	9 (9.9)	82 (90.1)	
College	268 (68.2)	36 (13.4)	232 (86.6)	
Student (Full or part time)				
Yes	121 (30.7)	16 (13.2)	105 (86.8)	0.480
No	273 (69.3)	32 (11.7)	241 (88.3)	
Employed (Full or part time)				
Yes	264 (67.0)	36 (13.6)	228 (86.4)	0.402
No	130 (33.0)	12 (9.2)	118 (90.8)	
Health insurance				
Yes	287 (73.8)	45 (15.7)	242 (84.3)	0.048
No	102 (26.2)	3 (2.9)	99 (97.1)	
City				
Chicago	238 (60.4)	37 (15.6)	201 (84.4)	0.151
Houston	156 (39.6)	11 (7.1)	145 (92.9)	
Year of enrollment				
2014	21 (5.3)	3 (14.3)	18 (85.7)	0.564
2015	359 (91.1)	44 (12.3)	315 (87.7)	
2016	14 (3.6)	1 (7.1)	13 (92.9)	
Network size				
0–5	85 (21.6)	5 (5.9)	80 (94.1)	0.002
6–14	85 (21.6)	9 (10.6)	76 (89.4)	
15–39	125 (31.7)	18 (14.4)	107 (85.6)	
>=40	99 (25.1)	16 (16.2)	83 (83.8)	

	Total, N=394 n (col %)	Ever used PrEP, N=48 n (row %)	Never used PrEP, N=346 n (row %)	p-value ^a
Median (IQR)	15 (6–40)	21 (10.5–50)	15 (6–30)	
Gay community affiliation				
Very much a part of	152 (38.7)	26 (17.1)	126 (82.9)	0.020
Somewhat a part of	181 (46.1)	19 (10.5)	162 (89.5)	
Not very much a part of	47 (12.0)	2 (4.3)	45 (95.7)	
Not at all a part of	13 (3.3)	1 (7.7)	12 (92.3)	
Any STI history				
Yes	84 (21.3)	17 (20.2)	67 (79.8)	0.024
No	310 (78.7)	31 (10.0)	279 (90.0)	
Any condomless anal sex				
Yes	284 (72.1)	41 (14.4)	103 (93.6)	0.012
No	110 (27.9)	7 (6.4)	243 (85.6)	
Any HIV positive partner				
Yes	58 (14.7)	15 (25.9)	43 (74.1)	0.002
No	336 (85.3)	33 (9.8)	303 (90.2)	
Any group sex				
Yes	136 (34.5)	31 (22.8)	105 (77.2)	<0.001
No	258 (65.5)	17 (6.6)	241 (83.4)	
HIV test ever				
Yes	374 (94.9)	47 (12.6)	327 (87.4)	0.436
No	20 (5.1)	1 (5.0)	19 (95.0)	
HIV test past 2 years				
Yes	350 (90.0)	45 (12.9)	305 (87.1)	0.187
No	39 (10.0)	1 (2.6)	38 (97.4)	

^aP-value by logistic regression on ever use of PrEP adjusted for clustering by recruitment chain and RDS weights

Table 2

Multivariable Logistic Regression of PrEP Use on Participant Characteristics, N=394, YMAP HIV Negative Adult Cohort, Chicago and Houston 2014–2016

	Multivariable OR ^a (95% CI)	p-value
Age in years	0.93 (0.79–1.08)	0.321
Race/Ethnicity		
White	1.0 (ref)	—
Black	0.16 (0.06–0.43)	<0.001
Hispanic	0.56 (0.19–1.69)	0.294
Other	0.49 (0.08–3.17)	0.442
City		
Houston	1.0 (ref)	—
Chicago	2.41 (1.01–5.75)	0.048
Health insurance	4.55 (0.65–31.8)	0.122
Network size, median split (15 vs. <15)	2.29 (1.10–4.79)	0.029
Any HIV positive partner	4.71 (1.69–13.1)	0.004
Any group sex	3.37 (1.45–7.86)	0.006

^aOdds ratios generated from logistic regression on ever use of PrEP adjusted for clustering by recruitment chain and RDS weights. Odds ratios are adjusted for all variables for which estimates are presented. Age and health insurance status were retained in the model based on conceptual relevance despite lack of statistical significance.