



Predictors of PrEP Uptake Among Patients with Equivalent Access

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Abstract

Increasing PrEP adoption for eligible individuals is critical, but limited research has examined individual-level factors that might be amenable to educational or behavioral intervention. Using data from a PrEP demonstration project conducted at a community health center, we examined differences in behavioral and psychosocial factors between patients offered PrEP who chose to accept it and those who declined. In a multivariable model, the odds of accepting PrEP were higher among those with an HIV-positive main partner, greater risk behavior in the past 3 months, and higher HIV risk perception. PrEP adoption was positively associated with PrEP adherence self-efficacy and negatively associated with perceived sensitivity to medicines. These psychological variables were associated with measures of PrEP- and HIV-related stigma. In the multivariable model, there were no differences in PrEP adoption by demographic factors or socioeconomic status. Data suggest that patients' decisions about PrEP uptake may be impacted not only by objective and subjective HIV risk, but also by psychological variables such as stigma beliefs, medication beliefs, and self-efficacy.

Keywords Pre-exposure prophylaxis (PrEP) · HIV prevention · Implementation · Stigma · Self-efficacy

Introduction

In the United States, approximately 40,000 people are diagnosed with human immunodeficiency virus (HIV) each year, and over 1.1 million individuals are currently living with HIV infection [1]. In 2012, a combination of the antiretroviral drugs (tenofovir and emtricitabine) was approved by the U.S. Food and Drug Administration (FDA) as a once daily pill that effectively reduces the risk of HIV infection [2]. Called pre-exposure prophylaxis (PrEP), this biomedical HIV prevention strategy has revolutionized approaches to HIV prevention in the U.S. and internationally. The Centers for Disease Control and Prevention (CDC) estimates that almost half a million gay and bisexual men and other men

who have sex with men (GBM) in the U.S. would benefit from being on PrEP [3]; however, uptake of this new biomedical prevention strategy remains slow [4]. In order to ensure that the benefits of PrEP are fully realized, it is critical to develop specific strategies to promote PrEP utilization by highest priority populations.

To date, the majority of research on PrEP uptake has focused on describing rates of utilization among GBM; these data indicate that PrEP uptake is higher among individuals who meet CDC eligibility criteria (i.e., are engaging in high risk behavior), which is heartening [5, 6]. However, these studies also indicate high rates of HIV risk among individuals who are *not* on PrEP; in one recent analysis, 66% of GBM not on PrEP had a CDC HIV risk score greater than 10, indicating the need for intensive HIV prevention services [6]. Analyses by race/ethnicity indicate significant disparities in PrEP uptake [7], with studies citing lack of PrEP awareness and access in communities of color [8]. Findings from qualitative studies stress the importance of increasing the number of comfortable and competent PrEP providers [8], and training providers to overcome the historical (and persistent) racism and discrimination experienced by patients of color in medical settings [9]. Equally important are findings regarding financial barriers to PrEP; recent data indicate that concerns about cost or insurance status are the

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largest barriers to starting medication among individuals prescribed PrEP at a community-based clinic [10].

These data underscore the importance of increasing PrEP awareness, enhancing access to PrEP programs, lowering medication costs, and improving insurance access. To supplement these efforts, however, it is important to understand determinants of PrEP uptake *among individuals with access to it*. The last-but most important-step in PrEP uptake occurs within a clinical setting, in which a patient must decide whether or not to accept a PrEP prescription from a willing provider. Little, if any, of the current research on PrEP uptake has examined *intervenable* factors at the patient-level, i.e., specific psychological, attitudinal, or motivational factors that could be addressed to enhance the likelihood of PrEP uptake. This analysis was designed to address this gap in the literature by examining patients with access to PrEP through a demonstration project at a community-based health center. All individuals met criteria for PrEP eligibility, had access to LGBTQ-competent health care providers, and were offered PrEP medication free of charge and with no co-pay for visits or testing. With these awareness, access, provider, and financial barriers reduced, we examined demographic, behavioral, and psychological factors that distinguished between patients who accepted PrEP prescriptions and those who did not. The goal of our analysis was to identify specific factors that could be included into an intervention to enhance PrEP uptake among eligible patients in clinical settings.

Methods

Participants

Data are drawn from SPARK, a prospective, longitudinal open-label PrEP demonstration project, conducted in collaboration with Callen-Lorde Community Health Center, the largest LGBT-health center in New York City. Between February 2014 and August 2016, HIV-negative MSM and transgender women receiving services at the health center were referred to the study by clinic staff and screened for eligibility. Eligible participants were assigned male sex at birth (regardless of current gender identity), ≥ 18 years of age, reported sex with cisgender men or transgender women, HIV-negative (documented rapid HIV antibody test at screening and acute nucleic acid amplification test (NAAT) at enrollment), able to communicate in English (with bilingual support in Spanish, if needed), and met the clinic's criteria for increased risk of HIV acquisition, including one or more of the following: (a) condomless anal sex in the past 6 months; (b) HIV+ main partner or anal sex with a known HIV+ partner in the past 6 months; (c) diagnosed with gonorrhea, chlamydia or syphilis in the past 6 months;

or (d) self-reported concern about HIV-exposure in the next 3 months. Participants were excluded if they reported previously being prescribed PrEP.

Procedures

Eligible participants were offered participation in one of two study arms: a PrEP-arm, in which they would receive up to 12 months of TDF/FTC free of charge, and attend quarterly visits for HIV-testing, sexually transmitted disease (STI) testing, and medical monitoring; or a comparison arm, in which they would simply attend visits for HIV- and STI-testing at 3-months and 12-months. Patients who chose to enter the comparison arm had the opportunity to switch to the PrEP arm and initiate PrEP through the study at any time up to and including their 3-month follow-up visit, and were able to initiate PrEP through their care at the health center (i.e., outside the study) at any time.

Participants in both arms completed self-report surveys at baseline and prior to each study visit. Self-report survey data were collected through an online survey platform, and participants could choose to complete the survey at home or in a private room at the collaborating research center. Participants received \$40 (either in cash or in an online gift card) for completing the baseline survey. Participants in the PrEP arm (called PrEP Adopters) completed the baseline survey prior to their PrEP prescription visit. Participants in the comparison arm (called PrEP Decliners) were asked to complete their baseline survey within 28 days of study enrollment (median = 6 days). All study procedures were approved by the Institutional Review Board at the City University of New York.

Measures

Sociodemographics and PrEP Eligibility

Participants reported their gender identity, age, race/ethnicity, education level and income. PrEP eligibility questions were asked by study staff at screening.

Sexual and Substance Use Behavior

Participants were asked a series of questions about sexual behaviors in the past 3 months by partner type (main/casual), partner gender, and partner HIV serostatus. For this analysis, we calculated the total number of casual partners with whom the participant reported anal sex (receptive or insertive) and the percent of anal sex acts with casual partners that were condomless. Participants were also asked a series of questions about substance use in the past 3 months. For this analysis, we created a dichotomous variable for stimulant use, indicating that the participant reported methamphetamine,

cocaine/crack, or other stimulant use (without a prescription) in the past 3 months. Finally, participants completed the Alcohol Use Disorders Identification Test (AUDIT) [11], a screening tool designed to assess drinking problems. Consistent with test guidelines, we dichotomized scores at 8 or above, which is considered indicative of hazardous or harmful alcohol use.

Risk Perception

Participants were asked three questions about HIV risk perception. First, they were asked how likely they think they are to get HIV in the next year on a 100-point scale, ranging from 0 (not at all likely) to 100 (I will definitely get HIV in the next year). Second, participants were asked how much they worry about HIV on a five-point scale, ranging from 1 (never) to 5 (all the time). And third, participants were asked how often they think about HIV day-to-day, on a 7-point scale ranging from 1 (never) to 7 (all the time). These three measures are hypothesized to tap into different aspects of HIV risk perception [12, 13]. Participants' perceptions of susceptibility to and severity of STIs was assessed using an 8-item, 5-point Likert-scale adapted from Champion's Health Belief Model constructs [14]. The scale includes four items about susceptibility (e.g., my chances of getting an STI are great; I worry a lot about getting an STD), and four items about severity (e.g., if I got an STD, it would be serious; when I think about getting an STD, I feel nauseous), and demonstrated strong reliability in this sample ($\alpha = 0.75$).

Stigma

To measure PrEP-related stigma, participants responded to four questions ($\alpha = 0.79$) on a four-point Likert scale, e.g., "I would worry what other people thought of me if they knew I was on PrEP." In addition, participants completed the 16-item Anticipated HIV Stigma scale [15], a four-point Likert-scale ($\alpha = 0.93$) that asks participants to imagine how they would feel about themselves were they to become infected with HIV (e.g., "I would feel I let myself down if I ever got infected with HIV"; "If I had HIV I would feel the need to hide it").

PrEP-Specific Attitudes

Consistent with research on perceived efficacy of medical interventions [16], participants answered a "gist" question about PrEP effectiveness: "If taken every day, how effective is PrEP at preventing HIV infection." Participants responded on a 10-point scale from 1 (not at all effective) to 10 (extremely effective). Participants completed the five-item Perceived Sensitivity to Medicines scale [17],

designed to measure individuals' perceptions of how their body reacts to medications in general ($\alpha = 0.92$). Finally, participants responded to 9-items about PrEP adherence self-efficacy, adapted from the HIV treatment adherence self-efficacy scale [18]. In this scale, participants were asked to imagine—if they were to take PrEP—how confident they would be that they could maintain medication adherence in various situations, e.g., "continue taking PrEP even if it interferes with your daily activities". The scale demonstrated strong reliability in this sample ($\alpha = 0.95$).

Statistical Analysis

The purpose of this analysis is to examine demographic and psychosocial variables associated with PrEP adoption among individuals who: (a) meet PrEP eligibility criteria; and (b) have access to PrEP through a community health center. As noted above, the health center's PrEP eligibility criteria were slightly more inclusive than CDC guidelines. In order to increase the generalizability of the present analyses, we restricted our sample to only participants who met CDC criteria for PrEP, i.e., condomless sex in the past 6 months, diagnosis with an STI in the past 6 months, or in an ongoing sexual relationship with an HIV-positive male partner. This restriction limited the sample to 267 PrEP Adopters (89% of the total 300 enrolled) and 101 PrEP Decliners (77% of the total 131 enrolled). Other than these eligibility criteria, there were no demographic differences between individuals that were included in the present analysis and those who were excluded.

We began by examining the association between each predictor variable and PrEP adoption using logistic regression. Variables with a univariate p value of 0.05 or lower were included in the multivariable models. Collinearity analyses were conducted according to Tabachnick and Fidell and no variables met criteria for exclusion in the multivariable model based on multicollinearity [19]. We also examined bivariate correlations among all psychosocial variables in order to better understand observed patterns of association in the multivariable model.

Results

Demographics

Table 1 presents associations between each of our predictor variables and the odds of PrEP adoption in this sample. Overall, the proportion of transgender and gender non-binary individuals in our sample was quite low ($n = 14$, 4%); however, cisgender males had over three times the odds of being PrEP Adopters, compared to

Table 1 Univariable and multivariable associations between demographic, behavioral, and psychological factors and PrEP adoption among PrEP eligible individuals at a community-health center

Demographics	PrEP adopters (n = 267) N (%)	PrEP decliners (n = 101) N (%)	Univariable OR (95% CI)	Multivariable OR (95% CI)
Gender identity				
Transgender/non-binary	6 (2.2%)	8 (7.9%)	1 [Reference]	1 [Reference]
Cisgender male	261 (97.8%)	93 (92.1%)	3.74* [1.27–11.07]	0.43 [0.04–5.00]
Age				
18–24	25 (9.4%)	14 (13.9%)	1 [Reference]	
25–29	71 (26.6%)	23 (22.8%)	1.73 [0.77–3.87]	
30–49	152 (56.9%)	55 (54.5%)	1.55 [0.75–3.19]	
50+	19 (7.1%)	9 (8.9%)	1.18 [0.42–3.31]	
Race/ethnicity (n = 365)^a				
Non-Hispanic White	134 (50.2%)	43 (43.9%)	1 [Reference]	
Black	28 (10.5%)	13 (13.3%)	.69 [0.33–1.45]	
Hispanic/Hispanic White ^b	35 (13.1%)	9 (9.2%)	1.25 [0.56–2.80]	
Asian	12 (4.5%)	11 (11.2%)	0.35* [0.14–0.85]	0.84 [0.25–2.82]
Native Hawaiian/Pacific Islander	1 (0.4%)	1 (1.0%)	0.32 [0.02–5.24]	
Middle Eastern	4 (1.5%)	2 (2.0%)	0.64 [0.11–3.63]	
Multiracial	53 (19.9%)	19 (19.4%)	0.90 [0.48–1.68]	
Income (n = 362)^a				
\$0–\$20,000	70 (26.4%)	25 (25.8%)	1 [Reference]	
\$20,000–\$40,000	82 (30.9%)	27 (27.8%)	1.09 [0.57–2.04]	
\$40,000–\$75,000	70 (26.4%)	29 (29.9%)	0.86 [0.46–1.62]	
\$75,000+	43 (16.2%)	16 (16.5%)	0.96 [0.46–2.00]	
Education (n = 365)^a				
Less than a Bachelor's degree	93 (34.8%)	34 (34.7%)	1 [Reference]	
Bachelor's degree or higher	174 (65.2%)	64 (65.3%)	0.99 [0.61–1.62]	
PrEP eligibility criteria				
	PrEP adopters (n = 267) N (%)	PrEP decliners (n = 101) N (%)	Univariable OR (95% CI)	Multivariable OR (95% CI)
HIV+ main partner (n = 367) ^a	55 (20.6%)	9 (9.0%)	2.62* [1.24–5.53]	3.12* [1.05–9.31]
STI history	41 (15.4%)	10 (9.9%)	1.65 [0.79–3.44]	
Unprotected anal last 6 months (n = 366) ^a	254 (95.4%)	94 (94.0%)	1.35 [0.49–3.70]	
Sexual behavior and substance use				
	PrEP adopters (n = 267) M (SD)	PrEP decliners (n = 101) M (SD)	Univariable OR (95% CI)	Multivariable OR (95% CI)
Number of casual sex partners	10.69 (11.86)	6.63 (9.00)	1.04** [1.01–1.07]	1.05* [1.00–1.10]
% Condomless anal sex with casual partners ^c	0.42 (0.32)	0.33 (0.27)	3.21** [1.47–7.01]	7.26** [1.97–26.79]
AUDIT (≥ 8)	103 (38.6%)	42 (41.6%)	0.88 [0.55–1.41]	
Any stimulant use	95 (35.6%)	15 (14.9%)	3.17*** [1.73–5.79]	2.27 [0.92–5.56]
Psychological factors				
	PrEP adopters (n = 267) M (SD)	PrEP decliners (n = 101) M (SD)	Univariable OR (95% CI)	Multivariable OR (95% CI)
Risk perception				
Perceived HIV Risk (in the next year) (n = 367) ^a	20.85 (22.34)	12.26 (20.30)	1.02** [1.01–1.04]	1.04** [1.02–1.07]
HIV Worry	3.31 (.85)	2.99 (0.95)	1.52** [1.16–2.00]	1.55 [0.94–2.55]
Frequency HIV Cognitions	4.17 (1.62)	4.87 (1.54)	0.76*** [0.65–0.88]	0.82 [0.64–1.06]
Perceived STI Severity	24.37 (5.28)	24.68 (5.45)	0.99 [0.95–1.03]	

Table 1 (continued)

Psychological factors	PrEP adopters (n = 267)	PrEP decliners (n = 101)	Univariable OR (95% CI)	Multivariable OR (95% CI)
	M (SD)	M (SD)		
Stigma				
PrEP Stigma	1.63 (0.59)	2.07 (.64)	0.33*** [0.23–0.49]	0.61 [0.34–1.10]
Anticipated HIV Stigma	2.56 (0.63)	2.75 (0.60)	0.60** [0.41–0.87]	0.58 [0.30–1.10]
PrEP-specific attitudes				
PrEP effectiveness beliefs (n = 366) ^a	9.06 (1.41)	8.24 (1.97)	1.33*** [1.16–1.52]	1.16 [.91–1.47]
Perceived sensitivity to medicines (n = 367) ^a	9.91 (3.95)	12.64 (4.45)	0.86*** [.81–0.91]	0.86** [0.78–0.94]
Adherence self-efficacy	7.91 (1.15)	5.39 (2.14)	2.42*** [2.00–2.93]	2.48*** [1.89–3.25]

^aTotal n for variables with missing data displayed in characteristics column

^bIncludes individuals who indicated Hispanic ethnicity and White race, as well as individuals who refused to put a race other than “Hispanic/Latino” or who wrote in Hispanic/Latino as their race under “Other.”

^cParticipants who reported no sex with casual partners are coded as zero in multivariate modeling

*p < 0.05; **p < 0.01; ***p < 0.001

transgender or gender non-binary individuals (OR 3.74; 95% CI 1.27–11.07). The sample was relatively well distributed in terms of race/ethnicity, with over half of the sample (n = 188; 50.9%) identifying as persons of color. There were no differences in the odds of PrEP adoption among Black, Hispanic, or Multiracial patients, compared to whites. The only significant demographic predictor of PrEP adoption was Asian race, with Asian-identified individuals having significantly lower odds of PrEP adoption, compared to Whites (OR 0.37, 95% CI 0.16–0.87). PrEP adoption was not significantly associated with age, income, or education.

PrEP Eligibility Criteria and Sexual/Substance Use Behavior

Overall, 17% of the sample (n = 64) reported having an HIV-positive main partner. Having an HIV-positive main partner was associated with increased odds of PrEP adoption (OR 2.62; 95% CI 1.24–5.53). The other two CDC eligibility criteria (STI history and recent condomless anal sex) were not associated with significantly increased odds of PrEP adoption. Not surprisingly, having a greater number of sexual partners and having a higher percentage of condomless anal sex acts with casual partners in the past 3 months were both associated with increased odds of PrEP adoption, OR 1.04 (95% CI 1.01–1.07) and OR 3.21 (95% CI 1.47–7.01), respectively. Stimulant use was also associated with increased odds of PrEP adoption (OR 3.17, 95% CI 1.73–5.79), but hazardous drinking scores on the AUDIT were not.

Risk Perception

PrEP adoption was significantly positively associated with perceived risk of HIV infection in the next year (OR 1.02; 95% CI 1.01–1.04) and HIV worry (OR 1.52; 95% CI 1.16–2.00). Higher frequency of HIV-related cognitions (i.e., reporting thinking about HIV more often day-to-day) was associated with decreased odds of PrEP adoption (OR 0.76; 95% CI 0.65–0.88). Perceived severity of STI infection was not associated with PrEP adoption.

Stigma and PrEP-Specific Attitudes

PrEP adoption was significantly negatively associated with PrEP stigma (OR 0.33; 95% CI 0.23–0.49) and anticipated HIV stigma (OR 0.60; 95% CI 0.41–0.87). Higher PrEP effectiveness beliefs (i.e., rating PrEP as more effective on a 1–10 point scale) were associated with significantly higher odds of PrEP adoption (OR 1.33; 95% CI 1.16–1.52). PrEP adoption was also associated with lower perceived sensitivity to medicines (OR 0.86; 95% CI 0.81–0.91) and higher perceived adherence self-efficacy (OR 2.42; 95% CI 2.00–2.93).

Multivariable Predictors of PrEP Adoption

The last column of Table 1 presents the adjusted odds ratios for a multivariable model including all variables that were significantly associated with PrEP adoption in

Table 2 Correlations among psychosocial predictors of PrEP adoption

	1	2	3	4	5	6	7	8	9
1. Perceived risk HIV	–								
2. HIV worry	0.19**	–							
3. Frequency HIV cognitions	–0.03	–0.40**	–						
4. Perceptions STI severity	0.20**	0.41**	–0.15**	–					
5. PrEP stigma	0.00	–0.03	0.06	0.22**	–				
6. Anticipated HIV stigma	–0.01	0.24**	–0.01	0.43**	0.29**	–			
7. PrEP effectiveness beliefs	–0.07	0.17**	–0.17**	0.05	–0.12*	0.04	–		
8. Perceived sensitivity to medicines	0.03	0.09	–0.07	0.23**	0.23**	0.20**	0.03	–	
9. Adherence self-efficacy	0.00	0.06	–0.10*	–0.06	–0.40**	–0.10	–0.36**	–0.34**	–
Mean	18.51	3.22	4.36	24.45	1.74	2.61	8.83	10.67	7.22
Standard deviation	22.11	.89	1.63	5.32	0.64	0.62	1.62	4.26	1.86

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

bivariate testing. In this model, demographic variables (gender, Asian race), stimulant use, HIV worry, frequency of HIV-related cognitions, and PrEP effectiveness beliefs were no longer significantly associated with PrEP adoption. Further, stigma-related variables (anticipated HIV stigma and PrEP stigma), were no longer associated with PrEP adoption. Having an HIV-positive main partner (OR 3.12; 95% CI 1.05–9.31), number of sexual partners (OR 1.05; 95% CI 1.00–1.10), percentage of condomless anal sex acts with casual partners (OR 7.26; 95% CI 1.97–26.79), perceived risk of HIV infection (OR 1.04; 95% CI 1.02–1.07), perceived sensitivity to medicines (OR 0.86; 95% CI 0.78–0.94), and adherence self-efficacy (OR 2.48; 95% CI 1.89–3.25) were associated PrEP adoption in the multivariable model.

Because so many of the psychological variables were associated with PrEP uptake in the bivariate testing but were not retained in the final model, we were interested in the associations between the two variables that were retained—perceived sensitivity to medicine and adherence self-efficacy—and the other psychological variables. Table 2 presents a correlation table of the psychological variables measured in this study. Perceived sensitivity to medicines was positively associated with both PrEP stigma and anticipated HIV stigma. PrEP adherence self-efficacy was negatively associated with PrEP stigma and PrEP effectiveness beliefs. Due to the moderate negative correlation between adherence self-efficacy and PrEP stigma, we ran a mediation model to examine the indirect effect of PrEP stigma on uptake as mediated through adherence self-efficacy. A bootstrap analysis of direct and indirect effects indicated that a direct effect of PrEP stigma remained ($b = -0.505$, $SE = 0.24$, $p < 0.05$), but also supported an indirect effect of PrEP stigma on PrEP uptake through adherence self-efficacy ($b = -0.96$, $SE = 0.16$, $p < 0.001$) [20].

Discussion

The current study examined a sample of PrEP-eligible individuals who were offered PrEP prescription at a community health center, and compared those who choose to adopt PrEP (PrEP Adopters) to those who did not (PrEP Decliners). In terms of demographic factors, PrEP adopters were more likely to be cisgender and less likely to be Asian. Lower rates of PrEP adoption among transgender women have been widely noted, and have been attributed to a variety of factors, including past and present history of discrimination/mistreatment in medical settings and concern about interactions between PrEP and hormones [21]. Little has been written about PrEP uptake among Asian individuals; however, it is important to note that this population has been largely overlooked in prevention efforts, with HIV diagnoses increasing in recent years [22, 23]. The small number of transgender women and Asian individuals included in this sample prevents further analysis of potential mediators of PrEP uptake, but it is important to note that demographic differences were not retained in the multivariable model, suggesting that similar psychosocial factors predict PrEP uptake across groups. PrEP adoption did not differ by Black race or Latino ethnicity and did not differ by age, education or income, suggesting that reducing logistical and provider barriers to PrEP uptake is a critical strategy for reducing health disparities.

Consistent with current CDC guidelines, individuals with HIV-positive main partners had higher odds of PrEP uptake. As data indicating that individuals living with HIV who are virally suppressed cannot transmit HIV to their sexual partners (i.e., undetectable = untransmissible, or U = U) are being accepted and endorsed by national and international organizations [24], it will be important to examine changes to recommendations and/or uptake among serodiscordant partners. Odds of PrEP uptake also increased with increased

risk behavior, i.e., higher number of sexual partners and greater percentage of anal sex acts that were condomless. These data suggest that patients may be able to accurately assess their own level of risk, and that PrEP may be more attractive to those who need it most.

It is important to note that PrEP adoption was negatively associated with frequent HIV-related cognitions and anticipated HIV stigma. We would expect individuals who think more about HIV day-to-day and those who believe that they would experience internalized or enacted stigma were they to become HIV-positive to be *more* interested in a novel HIV prevention strategy, not less. However, this finding can be understood in the context of psychological avoidance, in which individuals choose to distance themselves from potential psychological or interpersonal threat. Our past work has found that anticipated HIV stigma is negatively associated with HIV testing [25], and others have demonstrated that concerns about being associated with a stigmatized condition reduces risk perception and prevention behavior [26, 27]. Although it is impossible to make causal claims from these correlational data, the pattern of correlations and indirect effects suggest that HIV and PrEP-related stigma may change individuals' perceptions of their own ability to engage with biomedical prevention.

The most important psychological factors related to PrEP uptake were adherence self-efficacy and perceived sensitivity to medications. Self-efficacy is a cornerstone of almost every health behavior theory [28, 29]; this paper is the first, to our knowledge, to adapt a self-efficacy scale specifically for PrEP use. More research is needed on the dynamics and determinants of PrEP self-efficacy, and on interventions that can enhance PrEP self-efficacy among potential and current users. Perceived sensitivity to medicines has been positively associated with symptom reporting and negatively associated with medication adherence among multiple patient groups, including people living with HIV [17, 30], but little research has been conducted examining its role in prophylactic medication. It is important to note the association between perceived sensitivity to medication and both PrEP stigma and anticipated HIV stigma; it is possible that internalization of stigma related to both PrEP and HIV infection might increase negative attitudes toward PrEP medications themselves.

Strengths and Limitations

A major strength of this study is its comparison of uptake among individuals with equivalent PrEP access, allowing for an investigation of factors associated with PrEP adoption when logistical and financial barriers are removed. However, this strength is also a limitation; in the real world,

logistic and financial barriers can be paramount, and these data should not be construed to underemphasize their importance. Future research and advocacy are urgently needed to address ongoing social and structural barriers to PrEP experienced by multiple high priority populations. Data were collected in a community-based health center, and included a relatively diverse sample of individuals. Although 50% of the sample were people of color, the relatively small sample size within each racial/ethnic group did not allow for us to examine implementation dynamics that may be specific to individuals within or across cultures. Future research should examine differences between and among groups that can be addressed to better serve highest priority populations. In this paper, we are reporting only on PrEP uptake; future analyses of PrEP retention and adherence over time will be critical for better understanding psychosocial dynamics that inform PrEP implementation.

Implications and Conclusions

Our results suggest that when patients are provided with access to PrEP without financial or logistical constraints, individuals with greater objective and subjective risk for HIV are more likely to take it. This work points to the importance of continued efforts to expand PrEP implementation in a manner that reduces the logistical, financial, and provider-based barriers that often hamper access to PrEP among individuals who might benefit from it most. Our findings also underscore the importance of attending to psychological determinants of PrEP uptake, specifically HIV- and PrEP-related stigma and self-efficacy. Developing interventions that reduce stigma in clinical settings and develop self-efficacy and agency among potential PrEP users will be critical to promoting equitable access.

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Compliance with Ethical Standards

Conflict of interest Sarit Golub received study drug for use in this research from Gilead Sciences. Rachel Fikslin declares she has no conflict of interest. Matthew Goldberg declares he has no conflict of interest. Stephanie Peña declares she has no conflict of interest. Asa Radix declares he has no conflict of interest.

Ethical Approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

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