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Understanding HIV Care Provider Attitudes Regarding Intentions to Prescribe PrEP

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Abstract

Introduction—Pre-exposure prophylaxis (PrEP) is a promising approach to reducing HIV incidence. Thus garnering the support of HIV providers, who are most familiar with antiretrovirals and likely to encounter patients in HIV serodiscordant relationships, to scale-up PrEP implementation is essential. We sought to determine whether certain subgroups of HIV providers were more likely to intend to prescribe PrEP.

Methods—Surveys were administered to HIV providers in Miami, Florida and Washington, DC. Composite scores were developed to measure PrEP knowledge, experience, and likelihood of prescribing. Latent class analysis (LCA) was used to stratify provider attitudes toward PrEP.

Results—Among 142 HIV providers, 73.2% had cared for more than 20 HIV-infected patients in the prior 3 months; 17% had ever prescribed PrEP. LCA identified two classes of providers (entropy 0.904); Class 1 (n=95) found PrEP less effective and perceived barriers to prescribing it; Class 2 (n=47) perceived PrEP as moderately effective and perceived fewer barriers to prescribing it. Compared to Class 2, Class 1 had significantly less experience with PrEP delivery ($t(22.7)=2.88$, $p=0.009$) and was significantly less likely to intend to prescribe to patients with

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multiple sex partners (20% vs. 43%, $p=0.04$) and those with a drug use history (7% vs. 24%, $p=0.001$).

Conclusions—While most HIV providers found PrEP to be effective, those considering it less effective had limited knowledge and experience with PrEP and had lesser intentions to prescribe. Provider training regarding whom should receive PrEP and addressing potential barriers to PrEP provision are needed if this HIV prevention method is to be optimized.

Keywords

pre-exposure prophylaxis; providers; attitudes; prescribing; HIV; prevention

Introduction

Given high rates of HIV infection worldwide, biomedical prevention interventions have recently become a cornerstone of HIV prevention efforts. Pre-exposure prophylaxis (PrEP), a biomedical intervention, has proven effective among key high-risk populations, including men who have sex with men, high-risk heterosexuals and injection drug users.^{1–4} In clinical trials, daily oral PrEP using emtricitabine + tenofovir disoproxil fumarate (Truvada®) has been between 74% and 92% effective in reducing one's HIV risk, depending on the population studied and measures of detectable drug levels.⁵

PrEP is a promising approach to reducing HIV incidence. Its real-world use which has been limited⁶ may be due to several factors. First, potential PrEP users must know about it, understand its risks and benefits, and be willing to take it.⁷ Studies have shown that certain high-risk populations have limited knowledge of PrEP but want to learn more about it.⁸ Furthermore, appropriate PrEP administration is available by prescription only and requires specialized counseling, regular HIV testing, close clinical monitoring for side effects, and follow-up beyond routine clinical care.⁵ These tasks require a significant commitment from both patients and providers and may make both groups apprehensive about using PrEP. Using PrEP without consistent clinical monitoring or patient adherence may increase the risk of side effects such as renal toxicity and future drug resistance.⁵

HIV providers will be essential in the scale-up and delivery of PrEP as they are most familiar with antiretrovirals (ARVs) and may therefore be frontline providers of PrEP. Previous studies in the US and abroad have assessed HIV providers' knowledge and perceptions of PrEP and perceived barriers to PrEP uptake.^{9–17} Commonly cited issues have included: (1) comfort with prescribing ARVs for prevention and debate over whether this role is better suited for HIV specialists or primary care providers¹⁶; (2) ability and willingness to identify potential PrEP users by evaluating patients' HIV risk¹⁸; (3) levels of real-world PrEP effectiveness and adherence balanced with the potential for risk compensation and drug resistance^{10,13,16}; (4) costs related to medications and the availability of insurance coverage^{8,10,13,14}; and (5) ethical allocation of ARVs.^{8,13}

Findings from studies of providers highlight the complexities of scaling-up and delivering PrEP in real-world settings.^{8,9,19} While general knowledge about and support for PrEP have increased since the FDA approved Truvada® and the Centers for Disease Control and

Prevention (CDC) released the prescribing guidelines, knowledge of PrEP among providers has increased only slightly¹³, and actual prescribing rates remain relatively low.⁶ Understanding providers' perceptions of PrEP and gauging their willingness to provide it will help to inform the implementation process and to make PrEP a more useful tool against HIV.

In Miami, Florida and Washington, DC, two US cities with high HIV prevalence rates²⁰, PrEP availability may help to significantly reduce HIV incidence. The CDC funded both cities through the Enhanced Comprehensive HIV Prevention Planning Initiative (ECHPP) to maximize uptake of high-impact HIV prevention methods.²¹ The ECHPP initiative predated the release of many of the sentinel PrEP studies, and therefore did not include an initiative on PrEP, but did include "*provision of Post-Exposure Prophylaxis [PEP] to populations at greatest risk.*" The DC and Miami-Dade Departments of Health collaborated with District of Columbia and University of Miami Center for AIDS Research (CFARs) to assist with implementation of this initiative. While assessing the potential scale-up of PEP²², the DC and Miami CFAR ECHPP teams also conducted a provider assessment evaluating the potential for PrEP uptake. Our objective was to use latent class analysis (LCA) techniques to identify subgroups of providers, based on their attitudes towards prescribing PrEP, to characterize which types of providers perceive fewer barriers to PrEP implementation and may therefore be more likely to intend to prescribe PrEP.

Methods

Survey Administration

Surveys were administered between March 2012 and March 2013 to HIV providers in Washington, DC and Miami-Dade County, FL, assessing provider knowledge, attitudes, and beliefs regarding PrEP and who should receive it, as well as perceived barriers and facilitators to PrEP provision. Survey methods varied slightly between cities, but identical survey items were administered in both cities.²² The target study population included infectious disease providers and HIV providers who had treated at least one HIV-positive patient in the previous year. Listings of HIV providers from physician societies, training centers, and health departments in both cities were used to identify potential participants.²² A brief, internet-based, anonymous survey was administered to 124 providers in DC and 107 HIV providers in Miami-Dade County using Research Electronic Data Capture (REDCap) and Survey Monkey, respectively, or a mailed hard copy survey. In both cities, providers received periodic mail, telephone, and email reminders to encourage participation. Online or written informed consent was obtained and providers completing the survey received a \$20 incentive. IRB approval was obtained from the George Washington University, the DC Department of Health, the University of Miami, and Columbia University.

Survey Domains and Analytic Methods

Survey requests were sent to 231 providers; 142 providers (DC n=63, Miami n=79) responded (overall response rate 61%). Data from the two cities were subsequently merged and aggregated for analysis purposes.

PrEP knowledge/experience—There were five questions regarding knowledge of and experience with PrEP (familiarity with iPrEX results¹ CDC guidelines,²³ practice having written PrEP protocols in place, frequency of PrEP requests, and ever having prescribed PrEP). These questions were combined into a single, “lack of PrEP knowledge/experience” scale with higher values indicating less knowledge/experience. This scale had an implied composite reliability of 0.83.²⁴

Patient factors associated with intended PrEP prescription—The survey assessed how several factors might influence providers’ decisions to prescribe PrEP, on a scale from 1 (“least likely to prescribe”) to 5 (“most likely to prescribe”). Variables included whether patients had: multiple sex partners; history of failing to use condoms; partners with known HIV; history of STDs; history of non-injection drug use; history of injection drug use; history of not returning for medical visits; and history of medication non-adherence. While this survey question did not specifically ask about PrEP prescribing among men who have sex with men, it was presumed that this population would be captured through the other patient populations included in the survey question. These factors were combined into a “likelihood of prescribing PrEP” scale, with higher values reflecting higher likelihood of prescribing PrEP. This scale’s composite reliability was .94.

Provider perceptions, and intentions regarding PrEP—LCA was used to classify providers based on their attitudes towards prescribing PrEP. Nine survey items were used to identify the latent categories. Each variable was coded so that lower scores represented the “lowest likelihood to prescribe PrEP.” Latent class indicators included 2 items asking providers to rate on a 1–5 scale the effectiveness of oral PrEP and vaginal microbicides, gels and creams in preventing HIV transmission. Another 7 items measured providers’ level of agreement using a Likert scale ranging from 1-strongly agree to 5-strongly disagree with the following statements: (1) it is feasible to provide PrEP in practice; (2) there is adequate time to provide PrEP in practice; (3) PrEP will promote HIV resistance; (4) PrEP will promote risky behavior; (5) I will provide PrEP to HIV discordant couples; (6) the availability of PrEP may empower women who are unable to negotiate consistent condom use with their partners; and (7) the cost of PrEP will still be a significant barrier for those who may benefit, even if PrEP is safe, efficacious, and made available.

Covariates—The following covariates were examined to identify the provider characteristics of each of the latent classes: age; sex; race/ethnicity; years of practice; field of practice; number of patients seen in the clinician’s practice in the prior month; number of HIV patients seen in the clinician’s practice in the prior 3 months; number of HIV patients seen by the clinicians in the prior 3 months; and the “lack of PrEP knowledge/experience” and “likelihood of prescribing PrEP” scales.

Rationale and Methods for the Latent Class Analysis—Latent class analysis aims to identify subgroups of individuals who respond differently on a series of categorical or ordered categorical variables. We used this method to see whether there were distinct subgroups of providers with different response patterns. The LCA was conducted using Mplus version 7.²⁵ First, we determined the number of classes to include by comparing the

fit of models including different numbers of classes. We used Bayesian information criteria (BIC)²⁶, Aikiake's information criteria (AIC)²⁷, the sample-size adjusted Bayesian information criteria (ABIC)²⁸, and entropy statistic as the criteria to compare model fitting with different numbers of classes assigned. To avoid having local maxima, each model was originally estimated with 500 starting values, with the 50 runs with the highest likelihood after 20 iterations continued to full maximization. If the maximum likelihood solution was not repeated numerous times in the set of 50, this was raised to 1500 initial starts and 500 to completion, and then 3000 and 1000, thereby ensuring that a substantial proportion converged to the same maximum. Due to missing data, the LCA was completed with multiple imputation with 30 sets of imputed data and results combined within Mplus.²⁵

Survey participants' demographics and practice characteristics were described using univariate analysis. The latent class solution is described by the unconditional probability of each class and the conditional probability of endorsing a 4 or 5 on each of the 9 input items for each class. We used a classify-analyze strategy to compare the other variables by latent class membership, which is most appropriate with high entropy models. Entropy with values approaching 1 indicates clear delineation of classes.²⁹ For categorical variables, chi-square tests were combined across imputations using the method described by Li, et al.,³⁰ which results in an F-statistic and associated p-value. The equality of our two scales across classes was tested using Proc MIanalyze in SAS 9.3, which results in a t-test statistic. In tables, we present the observed data means and frequencies, however, all overall statistical tests reported are based on the combined, multiply-imputed data. We report the significance of the individual items composing the scales based on the observed data using a chi-square statistic.

Results

Participant characteristics

There were slightly more respondents from Miami than from Washington (Table 1). There were slightly more male respondents (59%), with modal age category of 40–49. Most participants were non-Hispanic white (49%), followed by Hispanic (25%) and black (13%). Half of the respondents self-identified as infectious disease specialists, and over 25% as primary care physicians (18% internal medicine, 11% family medicine) who provided some HIV care. Nearly half (47%) of providers had been practicing for over 20 years, 82% had seen over 200 HIV-positive patients in their practices, and 73% had seen more than 20 HIV-positive patients in the prior three months. Over half of providers (53%) agreed that PrEP was effective or most effective and 24 (17%) had prescribed PrEP prior to completing the survey. Those providers who had previously prescribed PrEP were more likely to come from practices with a written PrEP protocol, had more patients ask for PrEP, and had lower scores on the “lack of PrEP knowledge scale” (data not shown).

Latent class analysis

The LCA identified two distinct classes of providers. The comparisons of LCA model fit (Table 2) show that no solution was favored by all three information criteria, but the 2 class solution was favored by two of the three criteria (AIC, ABIC) over the single class solution.

The three class solution had lower AIC and ABIC than did the two class solution. However, whereas the two class solution was replicated in 41 of 50 solutions of the random-start process, the three class solution was only replicated in 6 of 1000 random-starts. Further, when moving from 1000 to 1500 and then 3000 initial random starts, a new maximum was found each time. As this is indicative of local maxima, we focused on the two class solution. The entropy of the two class solution was good (.904); the average probability of being in Class 1 for those classified in Class 1 was .968 and that of being in Class 2 for those classified in Class 2 was .978. There were no differences in the proportions from each site across the two classes ($\chi^2(1) = .003$, $p = .958$).

Comparison of the two provider classes

Table 3 shows the probability and 95% confidence intervals of either agreeing or strongly agreeing with the statements by the two classes of respondents. This information is presented as a response profile in Figure 1. Class 1, the larger class (95 respondents), tended to agree less with statements that oral PrEP and microbicides can decrease the risk of HIV acquisition than did Class 2 (47 respondents). A significantly higher proportion of Class 2 versus Class 1 agreed that PrEP was feasible in their clinics and that they had adequate time to prescribe PrEP. A higher proportion of Class 2 versus Class 1 respondents also agreed that they would prescribe PrEP to serodiscordant couples and that it might empower women unable to negotiate condom use. With respect to perceived barriers, Class 2 also had a slightly higher probability of agreeing that cost might pose a significant barrier.

PrEP knowledge and experience scale

There were no differences across classes with respect to demographic characteristics, medical specialty, years of, or size of practice (Table 4). There was, however, a significant difference in the PrEP knowledge/experience scale. Class 2 showed the higher score, indicating less experience with PrEP ($t(22.7) = 2.88$, $p = 0.009$). Differences were explained by Class 2 being significantly more likely than Class 1 to be working in practices without written PrEP protocols (96% vs. 76%; $\chi^2(2) = 11.41$, $p = 0.003$); significantly less likely to have had PrEP requests in the previous 6 months (71% vs. 41%; $\chi^2(2) = 13.62$, $p = 0.004$); and significantly less likely to have ever prescribed PrEP (90% vs. 63%; $\chi^2(2) = 18.74$, $p < 0.001$).

Likelihood of prescribing PrEP to certain patients

There was a moderate but not statistically significant difference in the likelihood of prescribing PrEP to patients of differing characteristics scale ($t(21.5) = 1.95$, $p < .07$). More clinicians in Class 2 than Class 1 were likely to prescribe to individuals with multiple sex partners (43% vs. 20%; $\chi^2(4) = 10.13$, $p = 0.04$), and a history of non-injection drug abuse (24% vs. 7%; $\chi^2(2) = 18.08$, $p = 0.001$). Both classes, however, reported low likelihood of intending to prescribe to patients with a history of missing medical visits (4.0%–4.8%) or a history of medication non-adherence (2.4%–4.0%).

Discussion

Our survey of HIV providers' knowledge and attitudes about PrEP and willingness to provide it in two high HIV prevalence cities found that most (53%) agreed that PrEP is an effective HIV prevention approach. However, a small percentage of providers (17%) reported ever prescribing PrEP. In one national survey conducted in June 2013, several months after this survey and after the release of the updated CDC guidelines, 74% of infectious disease specialists supported PrEP as a prevention strategy, but only 9% reported actually prescribing PrEP.³¹ Though our study found twice this rate of prescribing (17%) even before this national study and the final CDC guidelines, this is still quite a low rate of prescribing.

We identified two distinct groups of providers: one found PrEP to be moderately effective, and perceived fewer barriers to prescribing PrEP than did the other group, in which participants considered PrEP to be less effective. Interestingly, no significant differences were found between the two classes of providers in terms of their demographic characteristics or field of, size of, or years in practice. However, there were significant differences between them regarding their knowledge about and familiarity with PrEP. For example, the providers finding PrEP to be moderately effective with fewer prescribing barriers were more likely to have received requests for PrEP or have ever prescribed it. Thus those with more experience with PrEP perceived fewer barriers.

Perceptions regarding practice-related barriers also set the two provider groups apart. Class 1, the group that found PrEP to be less effective and with barriers, was more likely to agree with statements regarding practice-related barriers. Previously conducted studies have documented that practice-related perceived barriers to PrEP provision are common among providers caring for HIV-infected or high risk persons. For example, providers in a California-based survey frequently expressed belief that their clinics' current care models were insufficient to adequately support PrEP provision.⁹ Other studies have also found that one of the most common perceived barriers to PrEP provision among infectious disease physicians was its time-consuming nature.³¹ In our study, nearly all providers in Class 2 expressed high levels of agreement with statements related to the feasibility of PrEP delivery and the time required for it as compared to only half of Class 1, but Class 1 participants generally had less experience with PrEP than those in Class 2, and were more likely to work for medical practices without written PrEP protocols. While Class 1 providers expressed sentiments that providing PrEP could be burdensome, there are no studies that we are aware of that have systematically assessed provider experiences during the provision of PrEP. These findings highlight the need for education about PrEP and assistance in implementing structural or procedural changes needed in clinics to facilitate efficient and effective PrEP delivery. Such interventions may prevent potential misconceptions of providers with little PrEP experience about the ability to provide this service.

Another important difference between the provider groups was that those who found PrEP moderately effective and perceived fewer barriers had comparatively more knowledge about and experience with PrEP, and were more likely to prescribe it to persons with multiple sex partners and non-injection drug users. As non-injection drug use is neither a direct risk

factor for HIV nor a current risk behavior meeting the criteria for PrEP use, future studies should examine whether providers are more likely to prescribe to non-IDU drug users whose partners are HIV-positive or who have multiple sex partners, for example. These findings suggest physicians may exhibit the same reluctance to prescribe PrEP to drug users as they did with prescription of ART to drug users early in the HIV epidemic.^{32,33} Despite the fact that the current CDC PrEP guidelines do not recommend prescribing solely based on non-injection drug use, there is sufficient evidence to suggest that this may be a factor for consideration in assessing one's high risk behaviors and the need for PrEP. Both groups, however, had clear concerns about prescribing PrEP to individuals with characteristics indicative of non-adherence¹⁵; less than 5% of providers were likely to prescribe PrEP to patients who miss medical appointments or who have been non-adherent with other medications. Ensuring high rates of adherence with PrEP use is essential to maximizing its efficacy⁵, and providers' responses may reflect this concern.

Both groups of providers also identified potential barriers to PrEP use related to the risk for drug resistance and risk compensation that were consistent with findings from other studies of potential physician providers of PrEP. A 2013 study of US infectious disease physicians found that, while a majority (74%) supported PrEP provision, 77% of those who expressed reluctance were worried about adherence and the potential for future drug resistance. Further, 53% were concerned about the cost of the drug and reimbursement procedures.³¹ Similarly, a 2013 survey of HIV healthcare providers in the US found that drug resistance, risk compensation, and adherence were respondents' top three concerns; drug cost was the fourth most common concern.¹⁵ Potential providers of PrEP ought to be familiar with the results of the sentinel PrEP efficacy studies and their follow-on open label studies. These studies have found very low rates of transmitted resistance and no increase in risky behavior among PrEP users.^{1,2,4,34,35} However, as real-world implementation and scale-up begin, continued monitoring of these issues will be essential.

This study has some potential limitations. This study used a convenience sample and we are unable to compare the characteristics of respondents to those who did not respond. However, based on the practice characteristics provided, the participants in this study represent experienced HIV providers in two major urban areas. It does not reflect the perspectives of providers not treating HIV-positive patients and therefore may not be generalizable to the broader provider population who may turn out to be the primary PrEP prescribers.^{36–38} Furthermore, it only includes providers in areas of high HIV prevalence and thus may not represent the perceptions and intentions of providers in lower HIV prevalence areas. Primary care provider perspectives may vary with respect to familiarity, concerns, and experience with PrEP and HIV prevention. Given the limited number of HIV providers, primary care providers' participation in PrEP provision will be necessary in order to maximize scale up of PrEP. Therefore, future studies should elicit the perspectives and prescribing experiences of non-HIV primary care providers.

As PrEP becomes more widely available and its use potentially increases, providers will need to learn about PrEP and determine how best to deliver it in their practices. Notably, when our survey was administered efficacy results were only available from the iPrEX study¹, and soon thereafter the US Food and Drug Administration approved Truvada® for

the use of pre-exposure prophylaxis. Additionally, the surveys were administered prior to release of both the CDC interim^{23,39,40} and final guidelines⁵ on pre-exposure prophylaxis as well as the release of findings from key studies of PrEP efficacy among heterosexuals^{2,4} and injection drug users³. As the official guidelines are now available, provider familiarity with PrEP and overall uptake will likely increase and a follow-up survey of providers would be warranted given the evolution of our knowledge of PrEP since this survey was initially administered.^{12,13,17,18} Although provider knowledge of PrEP increased following the release of the iPrEx trial results¹³, as of 2013, as many as 25% of providers in some settings were still unaware of the FDA approval or CDC guidance.⁴¹ It is therefore important to monitor future changes in provider knowledge, attitudes, and practice.⁵ Providing technical support to facilitate implementation of clinical guidelines and resources for billing and insurance coverage will help providers make PrEP accessible.

PrEP should be considered a tool in the armament for HIV prevention. Providers must be comfortable with and have the tools to identify persons at high risk for HIV infection and be prepared to assist them with determining the most appropriate HIV prevention method for them while taking into consideration their lifestyle and risk profile. In anticipation of patient requests for PrEP, providers must have protocols to properly identify and monitor PrEP users. They must also be comfortable identifying persons who are not PrEP candidates but may benefit from other HIV prevention methods, including behavior modification and condom use.¹³ Finally, monitoring and evaluating PrEP implementation and provider attitudes over time is essential to addressing barriers to uptake, so that PrEP is accessible to patients who may benefit from it.

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Figure 1. Probability of Agreement with Statements by Latent Class Analysis Groups

This figure shows the probability and 95% confidence interval of either agreeing or strongly agreeing with each statement by the two classes of respondents. Class 1 consisted of 95 respondents and Class 2 of 47 respondents. Class 1 found PrEP less effective and perceived barriers to prescribing it whereas Class 2 perceived PrEP as moderately effective and perceived fewer barriers to prescribing it.

Table 1

Provider Demographics and Practice Characteristics

	Total (N=142)	
Recruitment city	N	%
Washington, DC	63	44.4
Miami, FL	79	55.6
Age		
20 to 29	1	0.7
30 to 39	25	17.6
40 to 49	42	29.6
50 to 59	39	27.5
60 or older	29	20.4
Missing	6	4.2
Race/Ethnicity		
White, non-Hispanic	70	49.3
Black, non-Hispanic	18	12.7
Hispanic	35	24.6
Asian/Pacific Islander	13	9.2
Multi-Race	3	2.1
Other, please specify	0	0.0
Missing	3	2.1
Sex		
Male	83	58.5
Female	58	40.8
Transgender	1	0.7
Field of practice		
Primary Care Physician, Internal Medicine	27	19.0
Primary Care Physician, Family Medicine	15	10.6
Infectious Disease Physician	73	51.4
Pediatrician	5	3.5
Physician's Assistant	10	7.0
Other ¹	12	8.4
Years of practice		
Less than 5	9	6.3
5 to 9	18	12.7
10 to 14	26	18.3
15 to 19	18	12.7
20 or more	67	47.2
Missing	4	2.8

	Total (N=142)	
Recruitment city	N	%
Patients seen at practice in prior 1 month		
0 to 50	19	13.4
51 to 100	22	15.5
101 to 150	13	9.2
151 to 200	14	9.9
200+	71	50.0
Missing	3	2.1
HIV patients seen at practice in prior 3 months		
Less than 5	12	8.5
5 to 9	4	2.8
10 to 14	7	4.9
15–19	1	0.7
20 or more	116	81.7
Missing	2	1.4
HIV patients seen by provider in prior 3 months		
Less than 5	13	9.2
5 to 9	5	3.5
10 to 14	13	9.2
15–19	5	3.5
20 or more	104	73.2
Missing	2	1.4
Ever prescribed PrEP	24	16.9
Oral PrEP is effective¹	75	52.8

¹ Other provider included nurse practitioners, physician assistants, and other medical specialists such as psychiatrists, and pharmacists.

² Number and percentage of providers agreeing with the statement.

Table 2

LCA Model Fit Statistics

Class	1	2	3
AIC	3542.4	3438.8	3427.7
BIC	3648.8	3654.6	3752.9
Sample Size Adjusted BIC	3534.9	3423.6	3404.8
Proportion of Starts Replicated	-	41/50	6/1000
Entropy		0.904	0.952
p-value		.3847	.7611

Table 3

Predicted Probabilities of Agreeing or Strongly Agreeing with LCA variables by class *

	Class 1- PrEP Less Effective and with Barriers (n=95)	Class 2- PrEP Moderately Effective with Few Barriers (n=47)
	Probability [95%CI]	Probability [95%CI]
Oral PrEP can decrease risk of HIV acquisition	0.47 [.35, .59]	0.68 [.49, .83]
Microbicides can decrease risk of HIV acquisition	0.38 [.27, .50]	0.45 [.30, .62]
It is feasible to provide PrEP in my practice	0.49 [.35, .64]	0.95 [.81, .99]
There is adequate time to provide PrEP in my practice	0.50 [.36, .64]	0.91 [.71, .98]
PrEP will promote HIV resistance	0.36 [.26, .49]	0.23 [.10, .45]
PrEP will promote risky behavior	0.47 [.35, .60]	0.24 [.09, .49]
I will provide PrEP to serodiscordant couples	0.67 [.53, .77]	0.96 [.69, .99]
PrEP may empower women who are unable to negotiate condom use	0.71 [.60, .80]	0.78 [.59, .89]
Even if PrEP is safe and efficacious and it is made available, the cost will be a significant barrier for those who may benefit	0.76 [.64, .85]	[.69, .94]

* Agreement was based on Likert scale responses ranging from 1–5 with 1 being strongly agree and 5 being strongly disagree.

Table 4

Demographic and Clinical Characteristics of the Latent Class Analysis Groups

Characteristic	Class 1 PrEP Less Effective and with Barriers (n=95)	Class 2 PrEP Moderately Effective with Few Barriers (n=47)	p-value
Gender (% Male)	54/94 (57.5%)	29 (61.7%)	.73
Race/Ethnicity			.34
White (non-Hispanic)	42 (44.2%)	28 (59.6%)	
Black (non-Hispanic)	15 (15.8%)	3 (6.4%)	
Hispanic	23 (24.2%)	12 (25.5%)	
Asian	10 (10.5%)	3 (6.4%)	
Multi-race	2 (2.1%)	1 (2.1%)	
Missing	3 (3.2%)	0 (0.0%)	
Age			.65
20–29	1 (1.1%)	0 (0.0%)	
30–39	15 (15.8%)	10 (21.3%)	
40–49	25 (26.3%)	17 (36.2%)	
50–59	29 (30.5%)	10 (21.3%)	
60	21 (22.1%)	8 (17.0%)	
Missing	4 (4.2%)	2 (4.3%)	
Years of Practice			.96
<5	5 (5.3%)	4 (8.5%)	
5–9	12 (12.6%)	6 (12.8%)	
10–14	16 (16.8%)	10 (21.3%)	
15–19	11 (11.6%)	7 (14.9%)	
20	48 (50.5%)	19 (40.4%)	
Missing	3 (3.2%)	1 (2.1%)	
Field of Practice			.93
Internal Medicine	19 (20.0%)	8 (17.0%)	
Family Medicine	9 (9.4%)	6 (12.8%)	
Infectious Disease	49 (51.6%)	24 (51.1%)	
Other ^I	18 (19.0%)	9 (19.1%)	
Number of patients seen at practice in prior 1 month			.52
50	13 (9.2%)	6 (12.8%)	
51–100	15 (15.8%)	7 (14.9%)	
101–150	11 (11.6%)	2 (4.3%)	
151–200	10 (10.5%)	4 (8.5%)	
201	43 (45.3%)	28 (59.6%)	
Missing	3 (3.2%)	0 (0.0%)	

Characteristic	Class 1 PrEP Less Effective and with Barriers (n=95)	Class 2 PrEP Moderately Effective with Few Barriers (n=47)	p-value
Number of HIV patients seen at practice in last 3 months			.92
0–4	9 (9.5%)	3 (6.4%)	
5–9	3 (3.2%)	1 (2.1%)	
10–14	4 (4.2%)	3 (6.4%)	
15–19	1 (1.0%)	0 (0.0%)	
20	76 (80.0%)	40 (85.1%)	
Missing	2 (2.1%)	0 (0.0%)	
Number of HIV patients provider has cared for in past 3 months			.28
0–4	8 (8.4%)	5 (10.6%)	
5–9	5 (5.3%)	0 (0.0%)	
10–14	10 (10.5%)	3 (6.4%)	
15–19	2 (2.1%)	3 (6.4%)	
20	68 (71.6%)	30 (34/6%)	
Missing	2 (2.1%)	6 (12.8%)	
Lack of Prep Knowledge/Experience²	10.73 (.21)	9.63 (.31)	.009
Not Familiar with iPrEX	13/89 (14.6%)	5/42 (11.9%)	.36
Not Aware of CDC guidelines	29/89 (32.6%)	11/42 (26.2%)	.63
Practice lacks a PrEP protocol	85/89 (95.5%)	32/42 (76.2%)	.003
No PrEP requests in last 6 months	63/89 (70.8%)	17/42 (40.5%)	.004
Never prescribed PrEP	81/90 (90.0%)	26/41 (63.4%)	<.001
Likelihood of Prescribing PrEP to patients with³	26.3 (.69)	28.6 (.92)	.07
Multiple sex partners	15/75 (20.0%)	18/42 (42.9%)	.04
History of failing to use condoms	12/75 (16.0%)	15/42 (35.7%)	.12
Partner with known HIV	47/74 (63.5%)	36/42 (85.7%)	.06
History of STDs	20/75 (26.7%)	19/42 (45.2%)	.33
History of non-injection drug use	5/75 (6.7%)	10/42 (23.8%)	.001
History of injection drug use	16/74 (21.6%)	18/42 (42.9%)	.18
History of missing medical visits	3/75 (4.0%)	2/42 (4.8%)	.43
History of not adhering to medications	3/42 (4.0%)	1/42 (2.4%)	.71

¹ Other providers included nurse practitioners, physician assistants, and other medical specialists such as psychiatrists.

² The following questions were combined into a single “lack of PrEP knowledge/experience” scale with higher values indicating less knowledge/experience. Aware of CDC guidance on PrEP (1=yes, 2=no, 3=unsure); Written PrEP protocol at practice (1=yes, 2=no, 3=unsure); Familiar with iPrEX study (1=very familiar, 2=somewhat familiar, 3=not familiar); Frequency of patients requesting PrEP in last 6 months (1=often, 2=occasionally, 3=rarely, 4=never); Ever Prescribed PrEP (1=yes, 2=no, 3=not sure; no and not sure combined). This scale had an implied composite reliability of 0.83. P-values for individual items are on observed data.

³ This scale assessed how several factors might influence providers’ decisions to prescribe PrEP on a likert scale from 1 (“least likely to prescribe”) to 5 (“most likely to prescribe”) with the overall scale being the sum of each likert response. Variables included whether patients had: multiple sex partners; history of failing to use condoms; partners with known HIV; history of STDs; history of non-injection drug use; history of injection drug

use; history of not returning for medical visits; and history of medication non-adherence. These factors were combined into a “likelihood of prescribing PrEP” scale, with higher values reflecting higher likelihood of prescribing PrEP. Each individual item entry is the proportion responding to the highest likert category: “More Likely to Prescribe”. This scale’s composite reliability was .94. P-values for individual items are on observed data.

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