Human Immunodeficiency Virus Pre-Exposure Prophylaxis Knowledge, Attitudes, and Self-Efficacy Among Family Planning Providers in the Southern United States: Bridging the Gap in Provider Training

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Background. Pre-exposure prophylaxis (PrEP) is an effective human immunodeficiency virus (HIV) prevention intervention, but its access and use are suboptimal, especially for women. Healthcare providers provision of PrEP is a key component of the Ending the HIV Epidemic initiative. Although training gaps are an identified barrier, evidence is lacking regarding how to tailor trainings for successful implementation. Title X family planning clinics deliver safety net care for women and are potential PrEP delivery sites. To inform provider training, we assessed PrEP knowledge, attitudes, and self-efficacy in the steps of PrEP care among Title X providers in the Southern United States.

Methods. We used data from providers in clinics that did not currently provide PrEP from a web-based survey administered to Title X clinic staff in 18 Southern states from February to June 2018. We developed generalized linear mixed models to evaluate associations between provider-, clinic-, and county-level variables with provider knowledge, attitudes, and self-efficacy in PrEP care, guided by the Consolidated Framework for Implementation Research.

Results. Among 351 providers from 193 clinics, 194 (55%) were nonprescribing and 157 (45%) were prescribing providers. Provider ability to prescribe medications was significantly associated PrEP knowledge, attitudes, and self-efficacy. Self-efficacy was lowest in the PrEP initiation step of PrEP care and was positively associated with PrEP attitudes, PrEP knowledge, and contraception self-efficacy.

Conclusions. Our findings suggest that PrEP training gaps for family planning providers may be bridged by addressing unfavorable PrEP attitudes, integrating PrEP and contraception training, tailoring training by prescribing ability, and focusing on the initiation steps of PrEP care.

Keywords. HIV prevention; implementation science; PrEP; provider education; women’s health.

INTRODUCTION

The Southern United States has the highest burden of human immunodeficiency virus (HIV) compared to other US regions [1]. Women comprise 20% of the 40,000 annual new diagnoses, the majority of whom live in the South [1, 2]. Human immunodeficiency virus pre-exposure prophylaxis (PrEP) is a safe, effective, individual-controlled, and scalable HIV prevention strategy that is a key initiative in the Department of Health and Human Services (DHHS) “Ending the HIV Epidemic: A Plan for America” [3, 4]. Despite national efforts for widespread PrEP dissemination, uptake remains disproportionately low in the South [1] and among women, only 10% of whom who could benefit from PrEP were prescribed in 2019 [5–7].

The Ending the HIV Epidemic initiative emphasizes optimizing the HIV workforce through partnerships with diverse organizations and healthcare provider training [4], which is a necessary preimplementation step. However, few US PrEP implementation studies have focused on provider training needs [8] or considered women’s health providers [9], who face key challenges to scaling PrEP. Structural barriers include low risk-perception and awareness of PrEP among women [10–13] and scarcity of PrEP-providing clinics and insurance support for PrEP, particularly in the South [5, 14, 15]. Provider-level barriers include variable knowledge and attitudes towards PrEP.
among primary care providers, HIV clinicians, and family planning (FP) providers [16–19]. Knowledge about PrEP and likelihood of PrEP prescribing have also been found to be lower among providers in the South compared to providers in other regions [8, 16, 17, 20].

The Consolidated Framework for Implementation Research (CFIR) [21] can be applied to assess factors that may influence provider PrEP training and implementation. Within the CFIR domain, “Characteristics of Individuals,” 3 key constructs relevant to PrEP training include the following: knowledge about PrEP, attitudes towards PrEP, and self-efficacy in PrEP care (i.e., confidence in conducting the steps of PrEP care). The Title X Family Planning Program provides funding to support a diverse network of clinics that serve as a safety net source of healthcare for women, particularly in areas without Medicaid expansion [14], and are potential PrEP delivery sites. The diversity of Title X-funded clinics may lead to variable models of PrEP care [22], thus tailoring trainings based on assessment of these CFIR constructs may be particularly relevant for PrEP scale-up in this setting. However, effective strategies to improve provider provision of PrEP in women’s health settings are unknown.

We recently conducted a CFIR-guided survey of providers and administrators from Title X clinics in the South to systematically study facilitators and barriers to implementation of PrEP in this setting [14]. In this secondary analysis of the parent survey, our objectives are to assess the associations between provider-, clinic-, and county-level covariates, and the CFIR constructs of provider knowledge, attitudes, and self-efficacy in PrEP care, with the overall goal of informing how to tailor PrEP training for FP providers in the Southern United States.

**METHODS**

**Study Design and Population**

The parent study’s protocol, recruitment strategies, data collection instruments, and statistical analysis methods have been previously described [23]. In brief, we conducted a web-based, geographically targeted survey of healthcare providers and clinic administrators from Title X clinics in 18 Southern states between February and June 2018 (DHHS regions III [Mid-Atlantic: Washington DC, Delaware, Maryland, Pennsylvania, Virginia, West Virginia], IV [Southeast: Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, Tennessee], and VI [Southwest: Arkansas, Louisiana, New Mexico, Oklahoma, Texas]). Participants were recruited online through the National Clinical Training Center for Family Planning (NCTCFP), in-person at the NCTCFP meeting, and through engagement with state Title X grantees. Surveys completed by respondents outside of the designated Title X DHHS regions were excluded (13 of 755), and only surveys in which the participant responded to the question of PrEP use in the clinic were included (n = 519). As part of evaluating clinic readiness to implement PrEP [14], the parent survey addressed various CFIR domains including Characteristics of Individuals, which comprised the constructs of provider knowledge, attitudes, and self-efficacy in PrEP care. The parent survey was created so that only respondents from non-PrEP providing clinics completed certain survey items; therefore, only non-PrEP providing clinic providers (defined as any clinical staff who could screen, counsel, or prescribe PrEP) were included in this analysis. This methodology was aligned with our overarching goal of understanding best practices for provider training to facilitate PrEP delivery. Approval was obtained from the Emory University and University of North Carolina Institutional Review Boards.

**Survey Measures**

Measures were selected from the 93-item parent survey [14, 23]. Survey items were adapted from existing measures of CFIR constructs (i.e., implementation climate, leadership engagement, PrEP knowledge, and PrEP attitudes) [17, 23–27] or developed by the study team using CFIR-specific tools to assess CFIR constructs relevant to PrEP implementation (i.e., for self-efficacy) [21] (Supplemental Figure 1).

The primary outcomes of this analysis were the CFIR-guided constructs of PrEP knowledge, PrEP attitudes, and self-efficacy in PrEP care. Outcome measures were derived as semicontinuous composite scores based on collections of related survey items. Survey items had high internal consistency based on Cronbach’s Alpha [14]. Survey questions assessing knowledge were based on a previously published survey of PrEP knowledge and attitudes among FP providers [17], and this consisted of 5 multiple choice questions addressing PrEP medication identification, efficacy in clinical trials, HIV testing, frequency of monitoring patients taking PrEP, and frequency of monitoring side-effects and laboratories for patients taking PrEP. The summary score for PrEP knowledge was derived as the mean sum of correct responses (range, 0–5). Other CFIR-related survey items were evaluated on a 5-point Likert scale (1 = strongly disagree to 5 = strongly agree). Survey items addressing attitudes towards PrEP were divided topically into the following subcategories: (1) “Acceptability of PrEP Integration in FP Settings” and (2) “Clinical and Socio-behavioral Attitudes towards PrEP”. The summary score for PrEP attitudes was calculated as the average of survey items (range, 0–5). Higher Likert-scale scores for positively worded questions indicated more favorable attitudes towards PrEP, and for negatively worded questions they indicated more unfavorable attitudes towards PrEP. Certain survey items were recoded for the same directionality when deriving the overall score. Self-efficacy was evaluated through survey questions on confidence in addressing each step of PrEP care: “PrEP Screening”
Statistical Analyses

Statistical analyses were performed using SAS version 9.4 (SAS Software, Cary, NC). Variables were summarized with descriptive statistics (means [standard deviation [SD]] or counts [%] for all providers and/or clinics where appropriate). We applied \( \chi^2 \) and \( t \) tests, where appropriate, to compare PrEP knowledge, attitudes, and self-efficacy scores between prescribing and non-prescribing providers. Paired \( t \) tests were applied to compare mean scores between the self-efficacy steps of PrEP care.

We first used simple linear regression to evaluate associations between each provider-, clinic-, and county-level covariate and each CFIR outcome. All covariates with \( P < .2 \) were included in the multivariable models. Next, generalized linear mixed models that included a clinic-specific random effect were developed for each outcome. If covariates were collinear (\( r > 0.8 \)), then only 1 relevant covariate was retained. Log transformation was applied to covariates that did not have a normal distribution. Backward selection was applied (threshold \( P < .2 \)) to develop reduced linear mixed models, which were compared with the full models to assess consistency. Given potential heterogeneity in provider experience based on prescribing, models for each outcome were then stratified by prescriber status. Missing data were uncommon and observations were dropped from the models if data were incomplete. Analyses were restricted to respondents who responded to at least 1 survey item pertaining to that outcome. Statistical tests were deemed significant for \( P < .05 \).

Patient Consent Statement

Participant written consent was obtained, and design of this work was approved by Emory University and University of North Carolina Institutional Review Boards.

RESULTS

Overall, 519 providers and administrators from 283 unique clinics completed the parent survey. After excluding responses from administrators and those from PrEP providing clinics, 351 providers from 193 unique non-PrEP clinics were included in this secondary analysis. The mean age was 45 (11.9%) years, 310 (88%) were female, and 228 (65%) were White (Table 1). Providers had worked in their respective clinics for a mean duration of 8.1 (SD = 8.33) years, and 157 (45%) could prescribe medications with or without supervision (prescribing providers). Nonprescribing providers consisted of 131 (63%) nurses and 65 (31%) other clinical staff (health educators, counselors, medical assistants, or patient navigators).

Regarding clinic-level characteristics, 346 (70%) survey respondents were from the Southeast DHHS region, 244 (70%) were from clinics located in metropolitan areas, and 279 (79%) were from clinics classified as health departments. One hundred twenty-three (35%) respondents noted that their clinics provided primary care services, 227 (65%) endorsed that their clinics had onsite insurance assistance, and 158 (45%) reported that their clinics had a pharmacy onsite. At the county level, 113 (32%) respondents were from clinics located in catchment areas of Medicaid expansion. County HIV prevalence rate was a median 290 per 100,000 population.

Knowledge About Pre-Exposure Prophylaxis

The mean sum of correct responses for knowledge survey items (of 5) was 2.6 (SD = 1.72) and higher for prescribing versus non-prescribing providers (\( P < .0001 \) (Supplemental Table 1). Unadjusted associations between provider-, clinic-, and county-level covariates and PrEP knowledge are shown in Supplemental Table 2. In the overall adjusted model, PrEP knowledge was positively associated with prescribing ability (0.851; 95% confidence interval [CI], 0.493–1.209) and negatively associated with years worked in clinic role (−0.031; 95% CI: −0.053 to −0.010) (Figure 1, Supplemental Table 3).
Table 1. Provider-, Clinic-, and County-Level Characteristics of Survey Respondents From Title X Family Planning Clinics in the Southern United States That Did Not Provide PrEP, by Ability to Prescribe Medications

| Variable                                      | All Providers (n = 351) | Prescribing Providers\(a\) (n = 157) | Nonprescribing Providers\(b\) (n = 194) |
|-----------------------------------------------|-------------------------|--------------------------------------|----------------------------------------|
| **Provider-Level Characteristics**            |                         |                                      |                                        |
| Age (in Years), Mean (SD)                     | 45.32 (11.93)           | 47.2 (12.78)                         | 43.71 (10.94)                         |
| Gender, n (%)                                 | 3 (1.0)                 | 0 (0)                                | 3 (1.8)                               |
| Female                                        | 310 (98.7)              | 142 (99.3)                           | 168 (98.2)                            |
| Genderqueer                                    | 1 (0.3)                 | 1 (0.7)                              | 0 (0)                                 |
| Nonbinary                                      | 0 (0)                   | 0 (0)                                | 0 (0)                                 |
| Ethnicity, n (%)                              | 12 (3.9)                | 3 (2.2)                              | 9 (5.3)                               |
| Latino/Latina/Latinx                          | 296 (86.1)              | 135 (87.8)                           | 162 (94.7)                            |
| Race, n (%)                                   |                         |                                      |                                        |
| Asian/Pacific Islander                        | 6 (2.0)                 | 4 (2.8)                              | 2 (1.2)                               |
| Black/African American                        | 57 (18.6)               | 19 (13.5)                            | 38 (22.5)                             |
| Native American/Alaskan Native                | 1 (0.3)                 | 4 (2.8)                              | 1 (0.6)                               |
| White                                         | 228 (74.5)              | 111 (78.7)                           | 117 (69.2)                            |
| Other                                         | 3 (1.0)                 | 0 (0)                                | 3 (1.8)                               |
| More than 1 Race                              | 11 (3.6)                | 3 (1.6)                              | 8 (4.7)                               |
| Primary role(s) at clinic\(c\) n (%)          |                         |                                      |                                        |
| Clinical Provider (NP, CNM, PA, MD, DO)       | 157 (44.7)              | 157 (100)                            | 0 (0)                                 |
| Nurse                                         | 157 (44.7)              | 26 (16.6)                            | 131 (67.5)                            |
| Health Educator, Counselor, Health Care       | 69 (19.7)               | 4 (2.5)                              | 65 (33.5)                             |
| Associate, Medical Assistant, or Patient Navigator |                     |                                      |                                        |
| Other Provider                                 | 7 (2.0)                 | 1 (0.6)                              | 6 (3.1)                               |
| Other Administrator                           | 13 (3.7)                | 8 (5.1)                              | 5 (2.6)                               |
| Years Worked in Clinic Role, Mean (SD)        | 8.12 (8.33)             | 8.46 (7.88)                          | 7.85 (8.70)                           |
| **Clinic-Level Characteristics**              |                         |                                      |                                        |
| Location, n (%)                               | 244 (69.5)              | 116 (73.9)                           | 128 (66.0)                            |
| Metropolitan                                   | 107 (30.5)              | 41 (26.1)                            | 66 (34.0)                             |
| Primary Care Services Provided at clinic, n (%)| 123 (35.0)              | 49 (31.2)                            | 89 (45.9)                             |
| Yes                                           | 228 (65.0)              | 74 (38.1)                            | 105 (54.1)                            |
| No                                            |                         |                                      |                                        |
| Staff to Assist Patients Enrolling in Medicaid and Insurance Programs, n (%) | | | |
| Yes                                           | 227 (64.7)              | 107 (68.2)                           | 120 (61.9)                            |
| No/Unknown                                     | 124 (35.3)              | 50 (31.9)                            | 74 (38.1)                             |
| Respondent’s Clinic has A Pharmacy on Site, n (%) |                     |                                      |                                        |
| Yes                                           | 158 (45.3)              | 69 (44.5)                            | 89 (45.9)                             |
| No/Unknown                                     | 191 (54.7)              | 86 (55.5)                            | 105 (54.1)                            |
| **Clinic Type, n (%)                           |                         |                                      |                                        |
| Family Planning                                | 8 (2.3)                 | 6 (3.8)                              | 2 (1.0)                               |
| Health Department                              | 279 (79.7)              | 114 (72.6)                           | 165 (85.5)                            |
| Hospital                                       | 20 (5.7)                | 15 (9.6)                             | 5 (2.6)                               |
| Planned Parenthood                            | 2 (0.6)                 | 2 (1.3)                              | 0 (0)                                 |
| Federally Qualified Health Center              | 27 (7.7)                | 12 (7.6)                             | 15 (7.8)                              |
| Community                                      | 7 (2.0)                 | 4 (2.5)                              | 3 (1.6)                               |
| School                                         | 5 (1.4)                 | 3 (1.9)                              | 2 (1.0)                               |
| Other                                          | 2 (0.6)                 | 1 (0.6)                              | 1 (0.5)                               |
| Clinic Title x Region, n (%)                   |                         |                                      |                                        |
| Region III (Mid-Atlantic)                     | 72 (20.5)               | 43 (27.4)                            | 29 (15.0)                             |
| Region IV (Southeast)                          | 246 (70.1)              | 97 (61.8)                            | 149 (76.8)                            |
| Region VI (Southwest)                          | 33 (9.4)                | 17 (10.8)                            | 16 (8.3)                              |
| **County-Level Characteristics**              |                         |                                      |                                        |
| Medicaid Expansion\(d\), n (%)                |                         |                                      |                                        |
| Yes                                           | 113 (32.2)              | 61 (38.9)                            | 52 (26.8)                             |
| No                                            | 238 (67.8)              | 96 (61.2)                            | 142 (73.2)                            |
Among nonprescribing providers, there was a significant negative association with years worked in a clinic role (−0.038; 95% CI, −0.078 to 0.010). Among prescribing providers, there were no significant covariate associations.

**Attitudes Towards Pre-Exposure Prophylaxis**

The mean attitudes score was 3.52 (SD = 0.55) and higher for prescribing versus nonprescribing providers (P < .0001) (Supplemental Table 4). However, scores on the attitudes subcategory of Acceptability of PrEP Integration in FP Settings did not differ by prescriber status. For the attitudes subcategory of Clinical and Socio-behavioral Attitudes towards PrEP, prescribing providers had more favorable attitudes than nonprescribing providers (P < .0001). Unadjusted associations between provider-, clinic-, and county-level covariates and PrEP attitudes are shown in Supplemental Table 5. In the overall adjusted model, PrEP attitudes were positively associated with prescribing ability (0.192; 95% CI, 0.071–0.313) (Figure 2, Supplemental Table 6). Among nonprescribing providers, there were significant positive associations with onsite insurance assistance (0.180; 95% CI, 0.021–0.340) and county HIV prevalence (0.095; 95% CI, 0.004–0.186). Among prescribing providers, there was a significant positive association with county percentage of high school education (0.022; 95% CI, 0.003–0.040).

**Self-Efficacy in Pre-Exposure Prophylaxis Care**

The overall mean self-efficacy score was 3.4 (SD = 0.78) and was higher for prescribing providers versus nonprescribing providers (P < .0001) (Table 2). When self-efficacy survey items were grouped by the steps of PrEP care, scores were higher among prescribing providers regarding each step (P < .0001).

Comparison of scores between steps indicated prescribing and nonprescribing providers were most confident in PrEP screening, less confident regarding PrEP follow up, and least confident regarding PrEP initiation (P < .0001). Unadjusted associations between provider-, clinic-, and county-level covariates and self-efficacy in PrEP care, suggesting potential avenues to tailor provider training or develop models of PrEP care to bridge these gaps.

**DISCUSSION**

We describe Title X provider knowledge, attitudes, and self-efficacy in PrEP care in the Southern United States and associations with provider-, clinic-, and county-level characteristics. Our findings reveal gaps in FP provider knowledge, attitudes, and confidence in certain steps of PrEP care, suggesting potential avenues to tailor provider training or develop models of PrEP care to bridge these gaps.
Figure 1. Linear mixed models results for knowledge about pre-exposure prophylaxis among (A) all providers, (B) prescribing providers, and (C) nonprescribing providers. Variables were selected for inclusion in the reduced model using a backward selection approach. Variables missing in the model results were not selected. The percentage and prevalence variables are the percentages/numbers (log transformed where appropriate) among the county population where the provider’s clinic is located and based on data from the US Census Bureau 2010 Census and AIDSVu. The points indicate linear mixed model estimates and whiskers indicate 95% confidence intervals. HIV, human immunodeficiency virus.

Figure 2. Linear mixed models results for attitudes towards pre-exposure prophylaxis among (A) all providers, (B) prescribing providers, and (C) nonprescribing providers. Variables were selected for inclusion in the reduced model using a backward selection approach. Variables missing in the model results were not selected. The percentage and prevalence variables are the percentages/numbers (log transformed where appropriate) among the county population where the provider’s clinic is located and based on data from the US Census Bureau 2010 Census and AIDSVu. The points indicate linear mixed model estimates and whiskers indicate 95% confidence intervals. HIV, human immunodeficiency virus.
In our analysis, PrEP knowledge scores were higher among prescribing providers (those with the ability to prescribe medication), as expected due to differences in training and experience. In addition, PrEP knowledge was negatively associated with years worked in a clinic role, indicating that providers further out from clinical training may benefit from continuing medical education about PrEP. Among prescribing providers, there were no additional covariates associated with PrEP knowledge, suggesting that tailoring the clinical content in PrEP trainings by ability to prescribe medication may be a useful approach.

Although overall attitudes toward PrEP were more favorable among prescribing providers, there was more nuance when PrEP attitudes were subcategorized. Although both prescribing and nonprescribing providers had favorable attitudes regarding integration of PrEP in FP settings, nonprescribing providers had significantly less favorable attitudes regarding the clinical and sociobehavioral aspects of PrEP, including concerns about PrEP efficacy, drug resistance, and risk compensation. These findings suggest that PrEP training for nonprescribing providers should provide content directed to overcome unfavorable perceptions of PrEP, particularly because more favorable attitudes regarding an intervention can strengthen self-efficacy [32].

Although, as expected, prescribing providers had higher self-efficacy scores compared to nonprescribing providers, both groups were least confident in PrEP initiation compared to the other steps of PrEP care. This finding aligns with previous literature describing low PrEP prescription rates despite a high-level of provider awareness and support for PrEP in the United States [8, 33, 34]. Furthermore, other studies have suggested that decreased knowledge about insurance navigation (a component of the PrEP initiation step) stymies providers’ ability to prescribe PrEP [33, 35]. Lack of onsite primary care services and lack of Medicaid expansion may exacerbate insurance navigation challenges and contribute to lower provider confidence in PrEP initiation [33, 35, 36].

Our findings inform how provider training can be optimized and tailored to improve provider knowledge, attitudes, and self-efficacy in PrEP care [8, 33]. Customized provider training has
been associated with effective implementation of other health-care interventions, such as improving negative attitudes towards buprenorphine prescription for opioid use disorder [32] and facilitating effective implementation of evidence-based tobacco use treatment in health centers [37]. Emerging PrEP literature also supports customized training; recent studies indicated the need for (1) tailoring training to provider needs [38] and (2) provider preferences regarding PrEP training content and format depending on clinical experience [8, 33]. Other studies have shown clinician mentoring programs to be successful training models to bolster the HIV workforce [39, 40]. Although various PrEP training formats exist, our findings support utilizing provider-, clinic-, and county-level characteristics and CFIR-guided assessments to shape trainings for specific audiences [33, 41]. Finally, customization through a “train-the-trainer” model could be applied to improve PrEP training. This model has succeeded in disseminating HPV vaccine education with subsequent increased delivery and uptake of the vaccine [42]. Our findings support use of this model because it has the potential to reach prescribing and nonprescribing providers. Training both clinicians and staff has been noted to improve PrEP initiation and delivery [35].

Results from our study demonstrate 3 potential paths to optimize provider PrEP training. The first path is that of “tailored provider training” through approaches such as addressing unfavorable provider attitudes toward PrEP, integrating PrEP and FP training, and focusing education on the PrEP initiation steps. Increased self-efficacy was associated with increased knowledge and favorable attitudes regarding PrEP in our analysis; trainings that address all 3 components may therefore improve provider confidence in PrEP care. In addition, because contraception and PrEP self-efficacy were associated, future trainings integrating clinical content about PrEP and contraception should be considered and may be beneficial in the context of long-acting PrEP and multipurpose prevention methods.

The second path for optimizing provider PrEP training is to “target PrEP education in clinics with less support”. Onsite insurance assistance and Medicaid expansion were associated with more favorable PrEP attitudes, although findings were not statistically significant in all models. Targeting clinics in areas without Medicaid expansion and with less pre-existing support for training clinic staff in PrEP insurance navigation and access programs may be beneficial.

Our results also inform a third path of developing “novel models of care” that can expand PrEP delivery. Given that providers were least confident in PrEP initiation, alternative PrEP delivery strategies, such as using telehealth or referral models for PrEP initiation with existing PrEP providers, may allow providers in clinical settings that are new to PrEP to transition more readily from “PrEP awareness” to “willingness to prescribe PrEP”, while maintaining longitudinal care of their patients. Such models of care may be used as a “bridge program” for clinics until providers gain the necessary resources and comfort to conduct PrEP initiation.

Figure 3. Linear mixed models results for self-efficacy in pre-exposure prophylaxis (PrEP) care among (A) all providers, (B) prescribing providers, and (C) nonprescribing providers. Variables were selected for inclusion in the reduced model using a backward selection approach. Variables missing in the model results were not selected. The percentage and prevalence variables are the percentages/numbers (log transformed where appropriate) among the county population where the provider’s clinic is located and based on data from the US Census Bureau 2010 Census and AIDSVu. The points indicate linear mixed model estimates and whiskers indicate 95% confidence intervals.
We acknowledge several limitations. First, this study was based on a convenience sample of providers, thus introducing potential selection bias. Responses to questions addressing attitudes and self-efficacy may also be subject to social desirability bias. Second, although collinear covariates were excluded from our models, because the number of measured covariates was finite, there is potential for unmeasured confounders. For example, the county-level covariate measuring percentage Hispanic/Latinx was a significant covariate in certain models; this finding may result from an unmeasured confounder. Third, this analysis focused on the provider-level outcomes within the CFIR domain. Characteristics of Individuals, and was conducted only in non-PrEP clinics. Previous work from our group and others have shown numerous CFIR constructs relevant to PrEP implementation [14, 43], including inner and outer setting factors that were not assessed in this analysis. Additional work is needed to examine provider-level and other successful pathways for PrEP implementation, including within clinics that already provide PrEP.

Systemic racism has contributed to disparities in sexual and reproductive health outcomes in the United States [44], including disparities in HIV prevention and care. Strategies to eliminate disparities are urgently needed. Specific to PrEP, key strategies that have been proposed to address racism and other structural determinants include the following: improving patient-provider communication, supporting a diverse healthcare workforce, and understanding how to best address structural determinants as part of PrEP care [45]. Although the majority of patients accessing Title X FP services in the South identify as Black or Hispanic/Latinx [46], most providers surveyed identified as non-Hispanic White. These findings reinforce the importance of bolstering a more diverse healthcare workforce and addressing racism and structural determinants as an integral component of provider PrEP training [45, 47]. Finally, although this analysis focused on provider perspectives, integrating patients’ voices must also be central to implementation efforts and research [45, 47, 48].

Guidelines and policies affecting PrEP and reproductive health care in the United States have shifted since completion of this survey in 2018. Updated Centers for Disease Control and Prevention’s PrEP clinical practice guideline’s recommendation of universal PrEP education is a key step in improving PrEP access for women [49]. In addition, the recent approval of injectable cabotegravir for HIV prevention has provided an additional option for women [49, 50]. However, the recent US Supreme Court’s decision removing the federal right to abortion has resulted in abortion restrictions and bans in many states, likely reducing availability of HIV and sexual health services [51]. Sexual and reproductive health clinics, providers, and patients face severely restricted policies in 10 of the 18 states surveyed in this study, thus presenting a bleak future for safety-net women’s healthcare and HIV prevention, particularly in the South [52].

CONCLUSIONS

In conclusion, optimizing provider knowledge, attitudes, and self-efficacy in PrEP is an important step to successful PrEP implementation in FP settings and in other clinical contexts in high HIV burden areas. Our results indicate that training focused on PrEP initiation for all providers in the clinical care team and alternative models of care to support PrEP initiation may be key strategies to transition providers from PrEP awareness to prescription. Our analysis also suggests that addressing provider lack of knowledge and concerns about PrEP may improve confidence in PrEP care. In addition to tackling system-level challenges, future implementation studies should focus on tailoring provider training and models of care to strengthen the ability of clinics to prescribe PrEP to improve PrEP delivery and uptake for women in the South.

Supplementary Data

Supplementary materials are available at Open Forum Infectious Diseases online. Consisting of data provided by the authors to benefit the reader, the posted materials are not copyedited and are the sole responsibility of the authors, so questions or comments should be addressed to the corresponding author.

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Bridging PrEP Provider Training Gaps • OFID • 9
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