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Availability of Pre-exposure Prophylaxis (PrEP) and Related Sexual Health Information on PrEP Provider Websites in the U.S.

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By

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B.S. Taylor University, 2010

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An abstract of
A thesis submitted to the Faculty of the
Rollins School of Public Health of Emory University
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Abstract

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Background: Pre-exposure prophylaxis (PrEP) is a once-daily pill shown to reduce the risk of human immunodeficiency virus (HIV) infection by up to 92%. Unfortunately, uptake, although increasing, remains low. Significant barriers to PrEP uptake include inadequate access to and knowledge about PrEP. Accurate and reliable knowledge about PrEP and HIV are key components in facilitating the behavior change necessary for PrEP uptake. PrEP provider websites are powerful, yet underutilized, tools in conveying required knowledge to catalyze PrEP uptake. This study describes the availability of information about PrEP and related sexual health topics on confirmed PrEP provider websites in the U.S.

Methods: Using PrEP Locator, a national sample of 510 confirmed PrEP provider websites was randomly selected and reviewed from November 2018 to February 2019. Data collected from each website were divided into three main categories: practice characteristics, practice demographics, and website content. Descriptive statistics were calculated, and bivariate analysis performed to assess associations between provider characteristics and website content. Chi-square tests were used to evaluate significance of associations.

Results: Approximately half (n=270; 52.9%) of PrEP provider websites reviewed mentioned PrEP on their websites, with only 9.6% mentioning it on their homepages. Thirty-eight percent included educational information about PrEP. Only 30% of the final sample included educational information for both PrEP and HIV. While mentioning HIV, Lesbian Gay Bisexual Transgender Queer/Questioning (LGBTQ), confidentiality, inclusivity, and post-exposure prophylaxis were all positively associated with mentioning PrEP, only 40.0%, 39.2 %, 35.1%, and 31.4% mentioned confidentiality, LGBTQ, inclusivity, and post-exposure prophylaxis, respectively. Including provider photographs or profiles was negatively associated with both mentioning PrEP and including PrEP educational information on provider websites.

Conclusions: Because the Internet is where most individuals start their searches for health care providers, ensuring that appropriate information about PrEP and related topics is available on PrEP providers' websites may be an important factor in an individual's decision to contact a clinic. Our findings suggest room for improvement on the part of PrEP providers to more effectively utilize their existing practice websites to both confirm provision of PrEP and provide accurate educational information about PrEP and related topics.

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Introduction

Pre-exposure prophylaxis (PrEP), brand name Truvada, is a once-daily pill for the prevention of human immunodeficiency virus (HIV) infection and is comprised of tenofovir and emtricitabine. If an HIV-negative individual on PrEP is exposed to HIV, PrEP reduces the risk of HIV acquisition by up to 92% (1). The effectiveness of PrEP in preventing HIV transmission has been well established, (2-8) and PrEP uptake among those at significant risk for HIV (e.g., HIV-negative men who have sex with men (MSM), serodiscordant couples, HIV-negative injection drug users) will have the greatest impact on reducing HIV incidence (9). It is estimated that if 40% of MSM adhere to CDC guidelines for PrEP, HIV incidence in the United States would decrease by 33% (4). Unfortunately uptake, although increasing, remains low. It is estimated that less than 10% of the 1.25 million PrEP candidates in the United States were using PrEP by the end of 2017 (8, 10).

Significant barriers to PrEP uptake include access to and knowledge about PrEP (11). To facilitate access, a single national web-based database of PrEP-providing medical practices was developed by researchers at Emory University and launched in September 2016 (12). Called PrEP Locator, this searchable, geolocated directory, now managed by the Center of Disease Control and Prevention (CDC), is the most comprehensive online repository of PrEP providers in the county. Although beneficial, knowledge of PrEP provider locations does not translate directly to uptake (13, 14). A small study of 54 individuals found that while the vast majority (83%) of visitors to PrEP Locator are considering PrEP, a minority (13%) succeed in scheduling or attending a PrEP initiation visit (14). Effective interventions will target this junction and the behavior changes needed to motivate a person who is considering PrEP to make plans to visit a doctor.

The Information-Motivation-Behavioral Skills (IMB) model, is a validated, comprehensive framework for understanding and promoting health behaviors (15). It is a model that has been used extensively in understanding patient adoption of health interventions across various populations and contexts (16-23). Since the FDA approval of PrEP, the IMB model is now being applied to PrEP uptake and adherence among multiple at risk populations (e.g. MSM and high risk drug users)(24-27).

In the context of PrEP uptake the IMB steps are as follows: 'Information' dictates individuals must be well-informed about PrEP; 'Motivation' results from one's perceived risk of contracting HIV and perceived impact HIV will have on quality of life; 'Behavior Skills' are those required to find a provider and engage in the regimen (24). Essentially, PrEP uptake will be driven by the extent to which individuals are well-informed about the drug, motivated to take it, and have the requisite skills to initiate and adhere to PrEP (24).

The Transtheoretical Model of Change is a second behavior model that has been applied to PrEP uptake (13, 28). Entitled the PrEP Motivational Cascade, this model conceptualizes behavior change as five successive stages in which the previous stage must be attained before an individual can move to the next (13). Simply put the stags are as follows: 1) precontemplation, those who are unwilling to pursue PrEP or do not see themselves as candidates 2) contemplation, those who identify as PrEP candidates but have no plans to initiate PrEP 3) PrEParation, those who are willing and have made plans, but have yet to be prescribed PrEP 4) action, individuals who have spoken to a provider and received a prescription 5) maintenance, individuals consistently adhering to PrEP (13).

Both these models require sufficient knowledge and motivation to be successful. As one of the most upstream sources of reputable information about PrEP, the websites of clinics offering PrEP are an ideal and existing platform though which to provide both educational and motivational content required for successful behavior change. With over 75% of young lesbian, gay, bisexual, transgender, and queer/questioning (LGBTQ) persons using online resources to seek sexual health information, (29,30) ensuring that PrEP providers take the greatest advantage of their own websites to educate about PrEP may make an important difference in whether or not an individual contacts them for care.

Websites like PrEP Locator have been developed to facilitate provider searches, but no study has examined whether providers listed on PrEP Locator clearly advertise provision of PrEP on their own practice websites. In an effort to understand the prevalence of mentioning PrEP on provider websites, this study estimates the availability of PrEP and related sexual health information on PrEP

provider websites in the U.S. and describes practice-level factors associated with providing PrEP-related information on practice websites.

Methods

We conducted a cross-sectional content analysis of PrEP provider websites using the PrEP Locator database to generate our sample. A comprehensive list was obtained from CDC of all providers listed on PrEP Locator as of March 15, 2018. Inclusion criteria for the Locator have been described previously (12); in summary, to be included in PrEP Locator, practices must confirm that 1) PrEP is prescribed at their clinic, 2) they have an active medical license, 3) they prescribe PrEP to the general public, 4) they are taking new-patient appointments, and 5) they have a verified clinic name, address, and active phone number. Because this project did not involve interaction with human subjects or collect any private information about individuals, this study was not reviewed by an institutional review board.

We set an a priori sample size of 500 PrEP provider websites and selected the number of websites per state according to each state's proportion of the total number of providers in the PrEP locator database as of March 15, 2018. For states anticipated to contribute one practice or less based on their relative contribution of active PrEP providers within PrEP Locator, we set a minimum selection of at least two practices per state or territory (Puerto Rico). After the number of websites per state and Puerto Rico were determined, we generated lists of random numbers for each state then matched the selected numbers to PrEP Locator websites via study identification numbers. State-specific random number lists initially exceeded the total number of websites needed per state so as to allow for substitute selections in situations where selected websites had been deactivated, were unidentifiable using Google search engine, or were already included in the sample. Since our primary interest was in obtaining a sample of unique provider websites, large unified networks of PrEP clinics that may have had multiple locations but all referred back to one parent website for provision of services or provider related content were only included once per state or territory. Practice website

links included in PrEP Locator were used to access each practice's website; if the website link provided by Locator did not work, the Google search engine was used to identify the practice website.

The content of selected PrEP-provider websites was reviewed from November 26, 2018 to February 5, 2019. Data collected from each website were divided into three main categories: practice characteristics, practice demographics, and website content. Practice characteristics included: practice location, practice type, medical specialty, and Medicare-Medicaid acceptance. Medical specialties were assigned based on how the clinic described their specialty on their website. Practice type was divided as clinic or doctor (network or non-network affiliated), hospital (network or non-network affiliated), Federally Qualified Health Center (FQHC), health department, and pharmacy-based clinic.

Practice-level demographic data collected were regionality and urbanicity. Regional assignments for each practice were made by state using the four U.S. Census regions (Northeast, Midwest, West, and South). Puerto Rico is not included in the U.S. Census regions, and therefore excluded from our regional analysis. Categorizations of urbanicity were assigned using the National Center for Health Statistics (NCHS) 2013 urban-rural classification scheme for United States counties (31). Practice zip codes were used to identify county locations. A dataset containing both 2013 NCHS urbanicity categorizations and county codes was merged with a dataset containing county-codes and zip-codes. This was then merged with our dataset by practice zip-code. For practice zip codes corresponding to multiple counties, urbanicity was assigned using the following convention: 1) if a majority of counties had one urbanicity categorization, that majority categorization was adopted, and 2) if all urbanicity categorizations were different (n= 48 websites), the first urbanicity value selected by the statistical software package (R Studio) was adopted. A subsequent sensitivity analysis was then performed to assess any impact this arbitrary urbanicity selection process had on the urbanicity distributions and measures of effect.

Website content on PrEP and other topics was assessed on two levels: any mention of the topic (defined as at least one mention anywhere on the website) and provision of educational information on the topic. Websites were screened for any mention of: PrEP, HIV, LGBTQ, other

sexually transmitted infections (STIs), post-exposure prophylaxis (PEP) for HIV, family planning, inclusivity, and confidentiality. Inclusivity was defined as specifically mentioning accepting and treating all persons, regardless of sexual orientation. 'Any mention of confidentiality' was defined as mentioning confidentiality in relation to treatment of the patient. Topics for which data were collected on educational information were: PrEP, HIV, STIs other than HIV, safe sex practices, and any non-sexual health topics (e.g., diabetes, vaccinations, nutrition). Only information provided on the practice website was considered; if educational content was provided through a link to an external webpage, it was not considered part of the practice website content.

Frequencies, bivariate associations, and p-values were calculated using SAS version 9.4 (Cary, NC). Prevalence ratios (PRs) and 95% confidence intervals (CI) were calculated to evaluate associations between practice characteristics, practice demographics, website content and 1) mentioning PrEP on the website and 2) providing educational content about PrEP on the website. Chi-square tests were used to determine the significance of the bivariate associations. McNemar's test was used to assess the significance of difference between correlated proportions. *P* values ≤ 0.05 were considered statistically significant.

Results

As of March 15, 2018, there were 2,164 active PrEP providers listed in the PrEP Locator database. Of those, 568 (26.2%) websites were reviewed as part of this study. Fifty-eight of the 568 websites were excluded; 34 were excluded for being non-unique websites (30 of which were pharmacy-based clinics) and 24 were either deactivated or not found using Google search engine. Five states and Puerto Rico met the minimum website contribution threshold, resulting in a final sample size of 510 websites, representing close to one-fourth of all practices listed on PrEP Locator.

Provider characteristics covered a range of practice types and medical specialties. Of the 510 websites included in the analysis, the most prevalent practice type was clinic or doctor without network affiliation (n=122, 43.5%), followed by network affiliated clinic or doctor (n=153, 30.0%), FQHC (n=62, 12.2%), and network affiliated hospital (n=38, 7.5%). The sample also included 18 (3.5%) health

departments and 13 (2.5%) pharmacies. The three most prevalent medical specialties were multi-specialty (n=138, 27.1%), sexual health (n=93, 18.2%), and primary care (n=80, 15.7%) comprising 61.0% of the total sample. Internal medicine and infectious disease (ID) providers followed with 77 websites (15.1%). While approximately 30% (n=157) of the final sample did not mention insurance on their websites, nearly half (49.0%) of the final sample mentioned accepting both Medicare and Medicaid.

Approximately one-quarter of practice websites were from the northeast (24.6%) and south (26.4%) with the Midwest contributing 17.1% of the sample. The West was most well represented at 31.9% of websites. Websites affiliated with practices from large metro areas (fringe and central; >1,000,000 population), comprised 67.3% of the 508 websites for which county data was available. Areas with a population <50,000 (micropolitan and noncore) only represented 8.1% of the websites analyzed.

Provider websites contained varying amounts of information on PrEP. Of the 510 websites reviewed, 270 (52.9%) included at least one mention of PrEP anywhere on their website, 49 (9.6%) of which mentioned PrEP on their homepage. One-hundred ninety-six (38.4%) provided educational information about PrEP.

Other sexual health topics were mentioned to varying degrees. Comparing the 270 websites that included at least one mention of PrEP anywhere on the website, 394 (77.2%; P<0.001), 327 (64.1%; P<0.001), 200 (39.2%; P<0.001), 160 (31.4%; P<0.001), and 156 (30.6%; P<0.001) mentioned HIV, PEP, LGBTQ, STIs, and family planning, respectively. Eighty-seven (17.1%) websites did not mention any of these sexual health related topics (including PrEP).

Regarding provision of PrEP-related educational content, PrEP educational information was found on 196 (38.4%) websites compared with 201 (39.4%; P=0.675), 168 (32.9%; P=0.007), 137 (26.9%; P<0.001), and 115 (22.5%, P<0.001) that included educational information on HIV, STIs, non-sexual health topics, and safe sex, respectively. Ninety-three (18.2%) websites provided

educational information on all sexual health topics reviewed (PrEP, HIV, STIs and safe sex practices), and 88 (17.5%) contained no health education information at all.

Overall, both provider profiles and photographs were found on only 88 (17.3%) of the websites reviewed. One hundred and fifty-three (30.0%) websites included educational information on both HIV and PrEP; of those, 117 websites (22.9% of the total sample) also mentioned LGBTQ and only 16 of those websites also included provider photographs and profiles. Additionally, among websites that provided PrEP and HIV educational information, 102 (20.0%) also mentioned confidentiality and inclusivity and only 14 of these websites also included provider photographs and profiles.

Compared to websites of non-network affiliated clinics or doctors, mentioning PrEP was 1.86 times more prevalent among pharmacies (95% CI 1.42-2.44) and approximately 1.5 times more prevalent among network affiliated clinics and doctors (PR = 1.45, 95% CI 1.21-1.74) and health departments (PR = 1.47, 95% CI 1.03-2.09). PrEP educational content was also significantly more prevalent on websites of these same practice types as compared to those of non-network affiliated clinics or doctors [Table2].

All (100%) clinics categorized as sexual health practices mentioned PrEP on their websites. Among the remaining 417 practices associated with other medical specialties, mentioning PrEP was significantly more prevalent among those specializing in HIV care (PR = 3.59, 95% CI 2.37-5.42), immediate care (PR = 2.81, 95% CI 1.80-4.37), primary care (PR = 1.77, 95% CI 1.12-2.82), and multispecialty/other (PR = 1.70, 95% CI 1.10-2.64) compared to internal medicine and infectious disease (ID) providers. To a slightly greater magnitude, PrEP educational content was significantly more prevalent among these same medical specialties when compared to internal medicine and ID providers [Table 2].

PrEP educational content was less prevalent among PrEP providers that mentioned accepting Medicare and Medicaid (PR = 0.76, 95% CI 0.58-1.00) or only Medicare (PR = 0.51, 95% CI 0.28-0.89) compared to those that had no mention of accepted insurance plans. The prevalence of

PrEP educational information among websites that did not include insurance information was 0.57 times (95% CI 0.41-0.79) that of providers that accepted neither Medicare nor Medicaid. No meaningful associations were seen between regionality nor urbanicity and mentioning PrEP or educating on PrEP [Table 2].

Mentioning PrEP and providing PrEP educational information were significantly more prevalent among websites that included any mention of HIV, LGBTQ, STIs, PEP, and family planning when compared to those that did include mention of these topics [Table 3]. A significant positive association was also observed for both mentioning PrEP and providing PrEP educational information and providing educational information on HIV, STIs, and safe sex [Table 3]. Conversely, websites that included provider photographs and/or profiles were significantly less likely to either mention PrEP (Photographs: PR = 0.58 95% CI 0.49-0.70; Profiles: PR = 0.54, 95% CI 0.45-0.65; both: PR = 0.62, 95% CI 0.51-0.74) or provide PrEP educational information (Photographs: PR = 0.39, 95% CI 0.31-0.51; Profiles: PR 0.35, 95% CI 0.27-0.46; both: PR 0.40, 95% CI 0.31-0.53) when compared to websites that did not include provider photographs, profiles, or provided neither, respectively.

Discussion

Since LGBTQ individuals routinely seek sexual health related information online (29, 30, 32). websites are ideal, arguably imperative, platforms from which to appropriately educate and motivate individuals if we desire to increase PrEP uptake in the United States. Yet, from a national sample of confirmed PrEP providers promoting themselves as such via PrEP Locator, only 52.9% mention PrEP anywhere on their website. Even less, 38.4%, provide educational information on PrEP. The lack of PrEP content on PrEP provider websites suggests room for improvement to an existing communications platform that, if enhanced even slightly, could result in encouraging more individuals curious about PrEP to contact possible providers.

The IMB model dictates that PrEP uptake will be driven by the extent to which individuals are well-informed about PrEP, their personal risk of contracting HIV, and HIV's impact on one's quality of life (24). Yet our finding indicate a minority of PrEP provider websites include relevant

educational information. HIV, STIs, and safe sex educational information was only provided on 39.4%, 32.9%, and 22.5%, respectively. As may be expected, posting HIV educational information was positively associated with providing PrEP educational information; still only 30.0% of the total sample analyzed included both PrEP and HIV education information on their websites. This indicates that at least 70% of PrEP providers are likely not providing sufficient information on their websites to effectively motivate individuals to initiate PrEP. Our findings suggest pharmacy-based clinics, network affiliated clinics and doctors, and health departments are all better at providing necessary information to PrEP seekers than non-network affiliated clinics and doctors even though the greatest proportion of our sample (43.5%) were websites of non-network affiliated clinics and doctors. Changes to non-network affiliated clinic and doctor websites may have the greatest potential to address this gap in information provision about PrEP.

In the process of preparing to contact a PrEP provider, being able to verify via the practice website that PrEP is indeed a service offered may be deciding factor between contacting the practice or not. According to an analysis of 995 HIV negative gay and bisexual men enrolled in the One Thousand Strong study, it was found that individuals interested in PrEP get lost in the earliest stages of a motivational PrEP behavior-change cascade including contemplation (those who identify as a PrEP candidate, are willing to take it but, as of yet, have no plans to do so) (13). For an individual to successfully navigate to subsequent stages of the cascade, an individual needs to be appropriately motivated to make plans and contact a provider (13). After identifying an attractive provider, an individual's ability to visit a provider is part of the behavioral skills required for PrEP uptake (24). Specific website content has the potential to facilitate both attractiveness and subsequent office visits; in a qualitative study among young LGBTQ individuals, two of the four primary themes for desired sexual health website content were "social connection" and LGBTQ specific information (29). Elements like provider profiles, photographs, and explicitly mentioning values of inclusivity and confidentiality may also facilitate this desired connection and serve as a deciding factor between contacting the practice or not. Encouragingly, mentioning LGBTQ, inclusivity and confidential

treatment were all significantly and positively associated with providing PrEP educational information. Unfortunately, this study found that only half of the websites had a photo (51.0%) or profile (50.0%), and less than half (43.9%) of PrEP providers included both photo and profile on their websites. With the finding that provision of provider photographs and profiles was negatively associated with providing PrEP information, PrEP providers may want to reconsider to what extent their websites either facilitate or impede a social connection with potential clients by way of provider photographs and profiles. If the provider's goal is to get at-risk individuals to initiate and PrEP, s/he should be intentional about using websites to enhance probability of achieving this goal by including content that not only informs, but motivates and encourages necessary behavior skills.

This study has some important limitations. First, all information included in this analysis was solely based on information publicly available on PrEP providers' websites. Practices included in this analysis were not otherwise contacted to verify information present or absent on their websites. Secondly, due to our desire to review a sample of approximately 500 unique PrEP provider websites from across the country, individual PrEP clinic websites that referred back to a single parent website for content about services provided were under-represented in our sample. This selection criterion affected pharmacy-based clinics the most, likely resulting in an underestimate of both the proportion of pharmacy-based clinics in our sample and dilution of the strength of association between pharmacies and provision of PrEP-related content relative to other practice types. Lastly, websites included in this study were all from providers who already actively promote themselves via PrEP Locator; PrEP-providing practices not listed on PrEP Locator were not considered for inclusion. Assuming that clinics affiliated with PrEP Locator are indeed the practices most interested in soliciting new HIV-negative clients, we hypothesize that our results are likely biased towards more engaged PrEP providers; the true prevalence of PrEP-related information available across the entire universe of PrEP providing clinics may actually be much lower.

As the first study to conduct a content analysis of practice websites affiliated with PrEP-providing clinics, we found a dearth of PrEP and related sexual health information on these websites.

In meeting at-risk individuals online where they are already seeking health-related information, provider websites can be powerful venues for conveying the information necessary to address the most upstream aspects of PrEP-related behavior change. With PrEP uptake being a driving force in reducing HIV incidence, ensuring PrEP providers realize the difference their own websites may be able to play in addressing this national epidemic is important and timely.

References

1. Prevention CfDCa. Pre-Exposure Prophylaxis (PrEP). (https://www.cdc.gov/hiv/risk/prep/index.html). (Accessed April 13 2019).
2. Grant RM, Anderson PL, McMahan V, et al. Uptake of pre-exposure prophylaxis, sexual practices, and HIV incidence in men and transgender women who have sex with men: a cohort study. *The Lancet Infectious diseases* 2014;14(9):820-9.
3. Hanscom B, Janes HE, Guarino PD, et al. Brief Report: Preventing HIV-1 Infection in Women Using Oral Preexposure Prophylaxis: A Meta-analysis of Current Evidence. *Journal of acquired immune deficiency syndromes (1999)* 2016;73(5):606-8.
4. Jenness SM, Goodreau SM, Rosenberg E, et al. Impact of the Centers for Disease Control's HIV Preexposure Prophylaxis Guidelines for Men Who Have Sex With Men in the United States. *The Journal of infectious diseases* 2016;214(12):1800-7.
5. Marcus JL, Hurley LB, Hare CB, et al. Preexposure Prophylaxis for HIV Prevention in a Large Integrated Health Care System: Adherence, Renal Safety, and Discontinuation. *Journal of acquired immune deficiency syndromes (1999)* 2016;73(5):540-6.
6. Martin M, Vanichseni S, Suntharasamai P, et al. The impact of adherence to preexposure prophylaxis on the risk of HIV infection among people who inject drugs. *AIDS (London, England)* 2015;29(7):819-24.
7. McCormack S, Dunn DT, Desai M, et al. Pre-exposure prophylaxis to prevent the acquisition of HIV-1 infection (PROUD): effectiveness results from the pilot phase of a pragmatic open-label randomised trial. *Lancet* 2016;387(10013):53-60.
8. Volk JE, Marcus JL, Phengrasamy T, et al. No New HIV Infections With Increasing Use of HIV Preexposure Prophylaxis in a Clinical Practice Setting. *Clinical infectious diseases : an official publication of the Infectious Diseases Society of America* 2015;61(10):1601-3.

9. Sullivan PS, Siegler AJ. Getting pre-exposure prophylaxis (PrEP) to the people: opportunities, challenges and emerging models of PrEP implementation. *Sexual health* 2018;15(6):522-7.

10. Siegler AJ, Mouhanna F, Giler RM, et al. The prevalence of pre-exposure prophylaxis use and the pre-exposure prophylaxis-to-need ratio in the fourth quarter of 2017, United States. *Annals of epidemiology* 2018;28(12):841-9.

11. Sales JM, Phillips AL, Tamler I, et al. Patient recommendations for PrEP information dissemination at family planning clinics in Atlanta, Georgia. *Contraception* 2019.

12. Siegler AJ, Wirtz S, Weber S, et al. Developing a Web-Based Geolocated Directory of HIV Pre-Exposure Prophylaxis-Providing Clinics: The PrEP Locator Protocol and Operating Procedures. *JMIR public health and surveillance* 2017;3(3):e58.

13. Parsons JT, Rendina HJ, Lassiter JM, et al. Uptake of HIV Pre-Exposure Prophylaxis (PrEP) in a National Cohort of Gay and Bisexual Men in the United States. *Journal of acquired immune deficiency syndromes (1999)* 2017;74(3):285-92.

14. Bratcher A, Schlueter Wirtz S, Siegler AJ. Users of a National Directory of PrEP Service Providers: Beliefs, Self-Efficacy, and Progress Toward Prescription. *Journal of acquired immune deficiency syndromes (1999)* 2018;78(4):e28-e30.

15. Fisher JDFaWA. The informtaion-motivation-behaviorial skills model. *Emerging theories in health promotion practice and research: strategies for improving public health* San Francisco, CA: Jossey-Bass A Wiley Company 2002:40-70.

16. Bian C, Xu S, Wang H, et al. A Study on the Application of the Information-Motivation-Behavioral Skills (IMB) Model on Rational Drug Use Behavior among Second-Level Hospital Outpatients in Anhui, China. *PloS one* 2015;10(8):e0135782.

17. Ezeabogu I, Copenhaver MM, Potrepka J. The influence of neurocognitive impairment on HIV treatment outcomes among drug-involved people living with HIV/AIDS. *AIDS care* 2012;24(3):386-93.

18. Fisher JD, Fisher WA, Bryan AD, et al. Information-motivation-behavioral skills model-based HIV risk behavior change intervention for inner-city high school youth. *Health psychology : official journal of the Division of Health Psychology, American Psychological Association* 2002;21(2):177-86.

19. Fisher JD, Fisher WA, Williams SS, et al. Empirical tests of an information-motivation-behavioral skills model of AIDS-preventive behavior with gay men and heterosexual university students. *Health psychology : official journal of the Division of Health Psychology, American Psychological Association* 1994;13(3):238-50.

20. Huedo-Medina TB, Shrestha R, Copenhaver M. Modeling a Theory-Based Approach to Examine the Influence of Neurocognitive Impairment on HIV Risk Reduction Behaviors Among Drug Users in Treatment. *AIDS and behavior* 2016;20(8):1646-57.

21. Macapagal K, Greene GJ, Andrews R, et al. Evaluating the Relationship-Oriented Information, Motivation, and Behavioral Skills Model of HIV Preventive Behaviors in Young Men Who Have Sex With Men. *AIDS education and prevention : official publication of the International Society for AIDS Education* 2016;28(2):165-79.

22. Mayberry LS, Osborn CY. Empirical validation of the information-motivation-behavioral skills model of diabetes medication adherence: a framework for intervention. *Diabetes care* 2014;37(5):1246-53.

23. Rongkavilit C, Naar-King S, Kaljee LM, et al. Applying the information-motivation-behavioral skills model in medication adherence among Thai youth living with HIV: a qualitative study. *AIDS patient care and STDs* 2010;24(12):787-94.

24. Dubov A, Altice FL, Fraenkel L. An Information-Motivation-Behavioral Skills Model of PrEP Uptake. *AIDS and behavior* 2018;22(11):3603-16.

25. Mutua G, Sanders E, Mugo P, et al. Safety and adherence to intermittent pre-exposure prophylaxis (PrEP) for HIV-1 in African men who have sex with men and female sex workers. *PloS one* 2012;7(4):e33103.

26. Qu D, Zhong X, Xiao G, et al. Adherence to pre-exposure prophylaxis among men who have sex with men: A prospective cohort study. *International journal of infectious diseases : IJID : official publication of the International Society for Infectious Diseases* 2018;75:52-9.

27. Shrestha R, Altice FL, Huedo-Medina TB, et al. Willingness to Use Pre-Exposure Prophylaxis (PrEP): An Empirical Test of the Information-Motivation-Behavioral Skills (IMB) Model among High-Risk Drug Users in Treatment. *AIDS and behavior* 2017;21(5):1299-308.

28. Prochaska JO, Velicer WF. The transtheoretical model of health behavior change. *American journal of health promotion : AJHP* 1997;12(1):38-48.

29. Magee JC, Bigelow L, Dehaan S, et al. Sexual health information seeking online: a mixed-methods study among lesbian, gay, bisexual, and transgender young people. *Health education & behavior : the official publication of the Society for Public Health Education* 2012;39(3):276-89.

30. Wilkerson JM, Smolenski DJ, Horvath KJ, et al. Online and offline sexual health-seeking patterns of HIV-negative men who have sex with men. *AIDS and behavior* 2010;14(6):1362-70.

31. Ingram DD, Franco SJ. 2013 NCHS Urban-Rural Classification Scheme for Counties. *Vital and health statistics Series 2, Data evaluation and methods research* 2014(166):1-73.

32. Rosenberger JG, Reece M, Novak DS, et al. The Internet as a valuable tool for promoting a new framework for sexual health among gay men and other men who have sex with men. *AIDS and behavior* 2011;15 Suppl 1:S88-90.

Table 1. Practice Characteristics and Content of Publically Available Information on PrEP Provider Websites

Characteristics	Total (N = 510)		PrEP Mentioned Anywhere on Website (N = 270)		PrEP Educational Information Provided on Website (N = 196)	
	n	%	n	%	n	%
Practice Type						
Non-Network Affiliated Clinic/ Doctor	222	(43.5)	101	(37.4)	59	(30.1)
Network Affiliated Clinic/Doctor	153	(30.0)	101	(37.4)	96	(49.0)
Federally Qualified Health Center	62	(12.2)	24	(8.9)	15	(7.7)
Network Affiliated Hospital	38	(7.5)	19	(7.0)	5	(2.6)
Health Department	18	(3.5)	12	(4.4)	9	(4.6)
Pharmacy-based	13	(2.5)	11	(4.1)	11	(5.6)
Non-Network Affiliated Hospital	4	(0.8)	2	(0.7)	1	(0.5)
Medical Specialty						
Sexual Health	93	(18.2)	93	(34.4)	89	(45.4)
Multi-specialty/ Other[a]	138	(27.1)	58	(21.5)	31	(15.8)
Primary Care	80	(15.7)	35	(13.0)	24	(12.2)
Immediate Care[b]	39	(7.6)	27	(10.0)	22	(11.2)
HIV Care	26	(5.1)	23	(8.5)	19	(9.7)
Internal Medicine/Infectious Disease	77	(15.1)	19	(7.0)	7	(3.6)
Family Practice	57	(11.2)	15	(5.6)	4	(2.0)
Medicare & Medicaid Acceptance						
No	63	(12.4)	39	(14.4)	34	(17.3)
Yes	250	(49.0)	139	(51.5)	103	(52.6)
Medicare, not Medicaid	40	(7.8)	16	(5.9)	11	(5.6)
Information not provided	157	(30.8)	76	(28.1)	48	(24.5)
Regionality[c]						
West	162	(31.9)	86	(32.0)	70	(35.7)
Northeast	125	(24.6)	79	(29.4)	49	(25.0)
South	134	(26.4)	63	(23.4)	44	(22.4)
Midwest	87	(17.1)	41	(15.2)	33	(16.8)
Urbanicity by County[c,d]						
Large central metro	240	(47.2)	129	(48.0)	92	(46.9)
Large fringe metro	102	(20.1)	57	(21.2)	40	(20.4)
Medium metro	89	(17.5)	45	(16.7)	34	(17.3)
Small metro	36	(7.1)	17	(6.3)	11	(5.6)
Micropolitan	28	(5.5)	12	(4.5)	11	(5.6)
Noncore	13	(2.6)	9	(3.3)	8	(4.1)

PrEP, pre-exposure prophylaxis; HIV, human immunodeficiency virus; LGBTQ, lesbian, gay, bisexual, transgender, queer/questioning

[a] 'Other' includes: 2 OB/GYN, 3 nursing, and 1 cosmetic practice

[b] Immediate Care includes 12 health departments, 16 urgent care and 11 pharmacy-based care

[c] Puerto Rico not included

[d] Large central metro: greater than 1,000,000 population, central. Large fringe metro: greater than 1,000,000 population fringe. Medium metro between 250,000 and 999,999 population. Small metro: between 250,00 and 50,000 population, Micropolitan: between 10,000 and 49,999 population. Noncore: less than 10,000 population

Table 2. Associations between Practice Characteristics and PrEP Content on PrEP Providers' Websites

Characteristics	Practices Including Any Mention of PrEP (N=510)					Practices Providing PrEP Educational Information (N=510)				
	n	%	PR	95% CI	*P*[a]	n	%	PR	95% CI	*P*[a]
Practice Type										
Non-Network Affiliated Clinic/ Doctor	101	(19.8)	*ref*			59	(11.6)	*ref*		
Network Affiliated Clinic/Doctor	101	(19.8)	1.45	1.21-1.74	<0.01	96	(18.8)	2.36	1.84-3.03	<0.01
Federally Qualified Health Center	24	(4.7)	0.85	0.60-1.20	0.36	15	(2.9)	0.91	0.56-1.49	0.71
Network Affiliated Hospital	19	(3.7)	1.10	0.78-1.56	0.60	5	(1.0)	0.50	0.21-1.15	0.10
Health Department	12	(2.4)	1.47	1.03-2.09	0.04	9	(1.8)	1.88	1.13-3.14	0.02
Pharmacy-based	11	(2.2)	1.86	1.42-2.44	<0.01	11	(2.2)	3.18	2.31-4.38	<0.01
Non-Network Affiliated Hospital	2	(0.4)	1.10	0.41-2.96	0.85	1	(0.2)	0.94	1.17-5.21	0.94
Medical Specialty[b]										
Internal Medicine/Infectious Disease	19	(4.6)	*ref*			7	(1.7)	*ref*		
Multi-specialty/ Other[c]	58	(13.9)	1.70	1.10-2.64	0.02	31	(7.4)	2.47	1.14-5.34	0.02
Primary Care	35	(8.4)	1.77	1.12-2.82	0.02	24	(5.8)	3.30	1.51-7.21	<0.01
Immediate Care[d]	27	(6.5)	2.81	1.80-4.37	<0.01	22	(5.3)	6.21	2.91-13.25	<0.01
HIV Care	23	(5.5)	3.59	2.37-5.42	<0.01	19	(4.6)	8.04	3.82-16.91	<0.01
Family Practice	15	(3.6)	1.07	0.59-1.91	0.83	4	(1.0)	0.77	0.24-2.51	0.67
Medicare & Medicaid Acceptance										
No	39	(7.6)	*ref*			34	(6.7)	*ref*		
Yes	139	(27.3)	0.90	0.72 - 1.12	0.35	103	(20.2)	0.76	0.58 - 1.00	0.05
Medicare, not Medicaid	16	(3.1)	0.65	0.42 - 0.99	0.04	11	(2.2)	0.51	0.29 - 0.89	0.02
Information not provided	76	(14.9)	0.78	0.61 - 1.01	0.06	48	(9.4)	0.57	0.41 - 0.79	<0.01

Regionality[e]										
West	86	(16.9)	*ref*			70	(13.7)	*ref*		
Northeast	79	(15.5)	1.19	0.98 - 1.45	0.08	49	(9.6)	0.91	0.69 - 1.20	0.50
South	63	(12.4)	0.89	0.70 - 1.12	0.30	44	(8.6)	0.76	0.56 - 1.03	0.07
Midwest	41	(8.0)	0.89	0.68 - 1.16	0.38	33	(6.5)	0.88	0.64 - 1.21	0.43
Urbanicity by County[e,f]										
Large central metro	129	(25.3)	*ref*			92	(18.0)	*ref*		
Large fringe metro	57	(11.2)	1.04	0.84 - 1.28	0.71	40	(7.8)	1.02	0.77 - 1.37	0.88
Medium metro	45	(8.8)	0.94	0.74 - 1.19	0.61	34	(6.7)	1.00	0.73 - 1.36	0.98
Small metro	17	(3.3)	0.88	0.61 - 1.27	0.49	11	(2.2)	0.80	0.47 - 1.34	0.39
micropolitan	12	(2.4)	0.80	0.51 - 1.24	0.32	11	(2.2)	1.02	0.63 - 1.67	0.92
noncore	9	(1.8)	1.29	0.88 - 1.89	0.19	8	(1.6)	1.61	1.01 - 2.54	0.04

PR, prevalence ratio; CI, confidence interval; ref, referent; PrEP, pre-exposure prophylaxis; HIV, human immunodeficiency virus

[a] chi-square test used to calculate p-value

[b] N=417; Sexual Health providers were removed from the sample when calculating PR due to the prevalence of PrEP on their websites

[c] 'Other' includes: 2 OB/GYN, 3 nursing, and 1 cosmetic practice

[d] Immediate Care includes 12 health departments, 16 urgent care and 11 pharmacy-based care

[e] Puerto Rico not included

[f] Large central metro: greater than 1,000,000 population, central. Large fringe metro: greater than 1,000,000 population fringe. Medium metro between 250,000 and 999,999 population. Small metro: between 250,00 and 50,000 population, Micropolitan: between 10,000 and 49,999 population. Noncore: less than 10,000 population

Table 3. Associations between other health topics and provision of PrEP content on PrEP Providers' Websites

	Total (N = 510)	Practices Including Any Mention of PrEP (N=270)				Practices Providing PrEP Educational Information (N=196)				
Topic	**n %**	**n %**	**PR**	**95% CI**	***P*[a]**	**n %**	**PR**	**95% CI**	***P*[a]**
Any Mention of and Homepage Prevalence										
HIV mentioned anywhere on the website										
No	116 (22.8)	2 (0.4)	*ref*			0 (0.0)	---	---	---
Yes	394 (77.2)	268 (52.5)	39.45	9.97 - 156.12	<0.01	196 (100.0)	---	---	---
HIV mentioned on the homepage										
No	425 (83.5)	201 (39.4)	*ref*			146 (28.6)	*ref*		
Yes	84 (16.5)	69 (13.5)	1.75	1.51 - 2.01	<0.01	50 (9.8)	1.74	1.40 - 2.17	<0.01
LGBTQ mentioned anywhere on the website										
No	310 (60.8)	98 (19.2)	*ref*			55 (10.8)	*ref*		
Yes	200 (39.2)	172 (33.7)	2.72	2.29 - 3.23	<0.01	141 (27.6)	3.97	3.08 - 5.13	<0.01
LGBTQ mentioned on the homepage										
No	463 (90.8)	230 (45.1)	*ref*			166 (32.5)	*ref*		
Yes	47 (9.2)	40 (7.8)	1.71	1.47 - 1.99	<0.01	30 (5.9)	1.78	1.39 - 2.28	<0.01
Mention of the following anywhere on the website										
Sexually Transmitted Infections, other than HIV										
No	183 (35.9)	30 (5.9)	*ref*			13 (2.5)	*ref*		
Yes	327 (64.1)	240 (47.1)	4.48	3.21 - 6.25	<0.01	183 (35.9)	7.88	4.62 - 13.42	<0.01
PEP										
No	350 (68.6)	115 (22.5)	*ref*			64 (12.5)	*ref*		
Yes	160 (31.4)	155 (30.4)	2.95	2.25 - 3.43	<0.01	132 (25.9)	4.51	3.58 - 5.69	<0.01
Family Planning										
No	354 (69.4)	157 (30.8)	*ref*			101 (19.8)	*ref*		
Yes	156 (30.6)	113 (22.2)	1.63	1.40 - 1.90	<0.01	196 (38.4)	2.13	1.73 - 2.62	<0.01
Inclusive Treatment[b]										
No	331 (64.9)	112 (22.0)	*ref*			36 (7.1)	*ref*		
Yes	179 (35.1)	158 (31.0)	2.61	2.22 - 3.06	<0.01	133 (26.1)	3.9	3.08 - 4.95	<001

Confidentiality[c]									
No	306 (60.0)	100 (19.6)	*ref*			47 (9.2)	*ref*		
Yes	204 (40.0)	170 (33.3)	2.55	2.15 - 3.03	<0.01	149 (29.2)	4.76	3.61 - 6.27	<0.01
Educational Information Provided on:									
HIV									
No	309 (60.6)	100 (19.6)	*ref*			43 (8.4)	*ref*		
Yes	201 (39.4)	170 (33.3)	2.61	2.20 - 3.10	<0.01	153 (30.0)	5.47	4.10 - 7.30	<0.01
Any STIs other than HIV									
No	342 (67.1)	124 (24.3)	*ref*			64 (12.6)	*ref*		
Yes	168 (32.9)	146 (28.6)	2.40	2.06 - 2.79	<0.01	132 (25.9)	4.20	3.32 - 5.31	<0.01
Safe Sex									
No	395 (77.5)	162 (31.8)	*ref*			97 (19.0)	*ref*		
Yes	115 (22.5)	108 (21.2)	2.29	2.02 - 2.60	<0.01	99 (19.4)	*3.51*	2.91 - 4.23	<0.01
Non-sexual health information									
No	373 (73.1)	186 (36.5)	*ref*			129 (25.3)	*ref*		
Yes	137 (26.9)	84 (16.5)	1.23	1.04 - 1.45	<0.01	70 (13.7)	1.41	1.13 - 1.76	<0.01
Provider Information									
Provider Photo on Website									
No	250 (49.0)	168 (32.9	*ref*			139 (27.3)	*ref*		
Yes	260 (51.0)	102 (20.0)	0.58	0.49 - 0.70	<0.01	57 (11.2)	0.39	0.31 - 0.51	<0.01
Provider Profile on Website									
No	255 (50.0)	175 (34.3)	*ref*			145 (28.4)	*ref*		
Yes	255 (50.0)	95 (18.6)	0.54	0.45 - 0.65	<0.01	51 (10.0)	0.35	0.27 - 0.46	<0.01
Both Photo and Profile on Website									
No	286 (56.1)	182 (35.7)	*ref*			149 (29.2)	*ref*		
Yes	224 (43.9)	88 (17.3)	0.62	0.51 - 0.74	<0.01	47 (9.2)	0.4	0.31 - 0.53	<0.01

PR, prevalence ratio; CI, confidence interval; ref, referent; PrEP, pre-exposure prophylaxis; HIV, human immunodeficiency virus; LGBTQ, lesbian, gay, bisexual, transgender, questioning/queer

[a] Chi-square test used to calculate p-value

[b] Defined as specific mention of accepting and treating all persons, regardless of sexual orientation

[c] Defined as specifically mentioning confidentiality in relation to treatment of the patient