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HIV-Related Training and Correlates of Knowledge, HIV Screening and Prescribing of nPEP and PrEP Among Primary Care Providers in Southeast United States, 2017

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Abstract

The Southeast accounted for most HIV diagnoses (52%) in the United States in 2015. Primary care providers (PCPs) play a vital role in HIV prevention for at-risk persons and treatment of persons living with HIV. We studied HIV-related training, knowledge, and clinical practices among PCPs in the Southeast to address knowledge gaps to inform HIV prevention strategies. Between April and August 2017, we conducted an on-line survey of a representative sample of PCPs in six Southeast jurisdictions with high rates of HIV diagnoses (Atlanta; Baltimore; Baton Rouge; District of Columbia; Miami; New Orleans). We defined HIV-related training as self-reported completion of any certified HIV/STD course or continuing education in past 24 months (prior to survey completion). We assessed associations between training and HIV testing practices, familiarity with nonoccupational post-exposure prophylaxis (nPEP) and pre-exposure prophylaxis (PrEP), and ever prescribing nPEP or PrEP. There were 820 participants after fielding 4595 surveys (29.6% adjusted response rate). In weighted analyses, 36.3% reported HIV-related training. Using adjusted prevalence ratio (aPR) and confidence intervals (CI), we found that PCPs with HIV-related training (compared to those with no training) were more likely to be familiar with nPEP (aPR = 1.32, 95% CI 1.05, 1.67) and PrEP (aPR = 1.67, 95% CI 1.19, 2.38); and to have ever prescribed PrEP to patients (aPR = 1.75, 95% CI 1.10, 2.78). Increased HIV-related trainings among PCPs in high HIV prevalence Southeast jurisdictions may be warranted. Strengthening nPEP and PrEP familiarity among PCPs in Southeast may advance national HIV prevention goals.

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Keywords

HIV; Primary care providers; Training; South; PrEP; PEP

Introduction

Half of all new HIV infections [1] occur in the Southeast United States (U.S.). HIV surveillance data show that the majority of HIV diagnoses in this region are among African Americans [2]. Compared with whites, African Americans in the Southeast experience higher rates of undiagnosed HIV infection [3] and are more frequently diagnosed with Stage 3 (AIDS) infection [1]. Various factors including social and structural inequities contribute to these disparities [4, 5]. Furthermore, these circumstances also correlate with individual-level behaviors such as infrequent HIV testing [6] and lower uptake of biomedical prevention tools [7] that further exacerbate negative HIV prevention and care outcomes.

Primary care providers (PCPs), which include physicians, nurse practitioners and physician assistants, serve important public health roles in HIV prevention and care [8, 9]. These frontline providers are uniquely positioned to inform, educate, and deliver HIV-related prevention services to all persons. Optimal prevention services are particularly important for African Americans living in the Southeast, who are disproportionately affected by HIV [10]. As a resource, the Centers for Disease Control and Prevention (CDC) has published clinical guidelines for PCPs to provide HIV prevention services, including screening [11]. These services also include biomedical prevention tools, specifically pre-exposure prophylaxis (PrEP) and non-occupational post-exposure prophylaxis (nPEP), for sexual exposure [11, 12]. However, recent evidence indicates that primary care providers may not be comfortable or sufficiently skilled to provide such prevention services [13]. Furthermore, PCPs lacking appropriate HIV-related training may directly or indirectly deter patients from seeking biomedical prevention tools such as PrEP [13–15]. Efforts to increase provider knowledge have been linked to higher prescription rates of PrEP [16, 17] and nPEP [18] among PCPs. However, few studies have examined the overall readiness of PCPs to provide these services and the impact of HIV-related training on their ability to do so. Assessing the preparedness of PCPs to provide prevention services is particularly salient for reducing HIV incidence and disparities in high HIV-burden locations of the Southeast.

To address this gap, we examined the provider characteristics and practices associated with HIV-related training experience among a representative sample of PCPs practicing in six metropolitan statistical areas (MSAs) with high HIV burden among African Americans located in the Southeast. Our specific objectives included (1) assessing the levels of prior HIV-related training and (2) investigating whether and how self-reported HIV-related training correlates with provider characteristics, HIV screening practices, knowledge about HIV biomedical interventions, and prescribing of biomedical interventions.

Methods

K-BAP Study

Data for this analysis were obtained from the baseline assessment of the Knowledge, Behaviors, Attitudes, and Practices of HIV-Related Care among Providers in the Southeast (K-BAP) study. All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. This study was reviewed and approved by the Chesapeake Institutional Review Board on June 23, 2016. The United States Government, Office of Management and Budget (OMB # 0920–1160) approved the data collection authorization on February 1, 2017.

In-depth details of the K-BAP study design are described elsewhere [19]. Briefly, we conducted an online survey of PCPs practicing in six high HIV-burden MSAs in the Southeast. The MSA selection criteria included (1) being located in Southeast U.S., (2) having a large African American population (> 20% of adults age 18–54 years), (3) and having high HIV burden (HIV incidence > 25 per 100,000 and prevalence > 300 per 100,000 persons) according to 2011 surveillance data [20]. The six selected MSAs included for the study were Atlanta, GA; Baltimore, MD; Baton Rouge, LA; Miami, FL; New Orleans, LA; and Washington, DC. Eligible PCPs consisted of physicians, nurse practitioners, and physician assistants who practiced in specialty areas that provide direct primary care to clients (Online Appendix 1). For analytical purposes, Baton Rouge and New Orleans, as well as Baltimore and Washington, DC were merged together because of their geographical proximity. This yielded four (4) geographic regions for analysis.

Sampling and Study Population

The sampling frame of study was derived from the IQVIA® provider database, which contains a census of all currently active health care providers in the U.S. [21]. The database includes extensive background information about providers including age, gender, practice location, and contact information. Using this database, we acquired a sampling frame consisting of 36,489 providers in January 2017; we used this population to obtain a representative sample of 7330 providers in the six selected Southeast jurisdictions, stratified by region and provider type (physician, nurse practitioner, and physician assistant). For strata with low cell counts, we oversampled to ensure adequate statistical power.

We calculated the survey response rates based on the standards published by the American Association for Public Opinion Research (AAPOR) [22]. Of the original sample, 820 eligible providers returned surveys (AAPOR Response Category 1), 23 declined to participate (AAPOR Response Category 2), 4675 did not respond (AAPOR Response Category 3), and 1198 were ineligible because they were not practicing or had moved out of the target MSAs (AAPOR Response Category 4). An additional 614 providers were removed from the sample because administrative data indicated they were not primary care providers. This yielded a raw response rate (AAPOR RR 2) of 14.9% and an adjusted response rate (AAPOR RR 4) of 29.6%. The AAPOR response rates by Provider Type and MSA are shown in Online Appendixes 2 and 3.

Participant Recruitment

We used a multi-mode invitation system to recruit survey respondents to complete the web survey. Providers received a postal mail notification with survey web link and unique password, followed by a post card reminder approximately two weeks later. An email invitation was sent to arrive concurrently with the mail invitation, followed by three additional email reminders sent approximately one week apart. Providers who did not respond to the mail or email invitations received up to two reminder phone calls. Respondents who followed the survey link were shown an informed consent notice, followed by the 56-item baseline survey. The survey instrument included measures of knowledge, attitude, screening, and clinical practices related to HIV prevention and care. The following topics were covered: (a) reviewing and discussing sexual health and risk reduction, (b) screening for HIV and other sexually transmitted infections (STIs), (c) recognizing HIV and offering antiretroviral treatment; (d) discussing prevention benefit of treatment, and (e) identifying nPEP and PrEP. Participants who completed baseline assessment received $20 cash incentive via postal mail. We received 995 provider responses, of which 820 were from eligible providers. These 820 cases were retained for analysis.

Statistical Analyses

This analysis reports on correlates of self-reported HIV-related training among PCPs. We operationalized HIV-related training as completing any certified HIV/STD course or continuing education in the 24 months prior to completing the survey. Using Rao–Scott χ^2 tests, we assessed bivariate associations between HIV-related training and the following: selected provider characteristics, HIV screening practices, condom accessibility, familiarity with nPEP and PrEP, and ever prescribing nPEP or PrEP. In a multivariable logistic regression model, we examined factors that were statistically associated ($p \leq 0.05$) with the outcome of PCPs being exposed to HIV-related training. All estimates incorporated the adjusted survey weights. We present unadjusted and adjusted prevalence ratios (PR) with 95% confidence intervals (CI). We used SAS (Version 9.3) and SUDAAN (Version 11) procedures, which are appropriate to analyze complex survey data. We considered estimates with a coefficient of variation greater than 0.3 unreliable [23].

Results

Baseline survey fielding Efforts yielded a sample of 820 participants enrolled into study. Based on weighted frequency distribution, provider characteristics included the following: 49.7% ≥ 50 years of age, 59.4% female, and 60.2% white. In addition, our weighted sample comprised 75.6% physicians, 20.7% nurse practitioners and 3.6% physician assistants. Almost half (47.6%) of the sample practiced in the Washington, DC and Baltimore, Maryland MSAs. In addition, 36.3% of PCPs self-reported HIV-related training (Table 1).

In bivariate analyses, we found that PCPs with HIV-related training were more likely to practice in Miami (PR = 1.85, 95% CI 1.52, 2.25) versus Atlanta, offer HIV screening annually or more often (PR = 1.54, 95% CI 1.25, 1.92), and provide condoms to patients at their practice facility (PR = 1.79, 95% CI 1.20, 2.63). The bivariate model also indicated that PCPs with HIV-related training were more likely to be more familiar with nPEP (PR = 2.08,

95% CI 1.67, 2.56), ever have a patient request nPEP (PR = 1.52, 95% CI 1.20, 1.92), and more likely to ever prescribe nPEP to at least one person (see Table 2). In addition, the bivariate model indicated that PCPs with HIV-related training were more likely to be familiar with PrEP (PR = 2.63, 95% CI 2.13, 3.23), ever have a patient request PrEP (PR = 1.49, 95% CI 1.22, 1.82), and ever prescribe PrEP (PR = 2.00, 95% CI 1.59, 2.56).

In the multivariable analysis [adjusted prevalence ratio (aPR), $p \leq 0.05$] (Table 2), we found that PCPs who reported HIV-related training were more likely to practice in Miami versus Atlanta (aPR = 1.53, 95% CI 1.31, 1.78), provide condoms to patients at their practice facility (aPR = 1.52, 95% CI 1.03, 2.27), and be familiar with nPEP (aPR = 1.32, 95% CI 1.05, 1.67). In addition, PCPs with HIV-related training were more likely to be familiar with PrEP (aPR = 1.67, 95% CI 1.19, 2.38), ever prescribe PrEP to patients (aPR = 1.75, 95% CI 1.10, 2.78) and have patients requesting PrEP (aPR = 1.47 (95% CI, 1.12, 1.89).

Discussion

We found that only one-third of PCPs in the selected Southeast locations reported any HIV-related training; the region is clearly in need of a better-prepared HIV workforce. Our results are consistent with other scientific reports showing insufficient provider competency to address the community's HIV-related service needs [24, 25]. Although not examined in our study, PCPs' lack of familiarity with HIV prevention tools could potentially serve as a barrier for client uptake of screening and prevention interventions [16, 26, 27]. Work-force shortages projected for available PCPs with HIV training [28] highlight the urgency of the issue.

Overall, we found that PCPs with HIV-related training were more likely to provide HIV prevention tools to their patients. Not surprisingly, increased HIV knowledge obtained via HIV-related training was associated with providing condoms and prescribing PrEP to patients. Other studies also found similar results: PCPs with increased PrEP knowledge were more likely to prescribe or offer patient referrals for PrEP [13, 29]. Other supporting evidence in the literature indicates that lack of knowledge may serve as a barrier to prescribing PrEP [17]. The positive correlation between provider training and delivery of prevention services reported in our study and others is encouraging.

Our analyses also revealed that PCPs with HIV-related training were more likely to report patients requesting PrEP; this finding aligns with reports from similar research studies [30, 31]. For instance, adequately trained providers may help create less stigmatizing clinical environments and enhance patients' comfort with requesting PrEP [32]. In another study, African American women were less likely to seek HIV care if they perceived stigmatizing behavior from their health care provider [33]. Also, higher quality of HIV care was associated with obtaining care from PCPs with higher cultural competence [34]. Therefore, our study findings are consistent with previous studies that support the importance of HIV-related training to improve critical skills (i.e., cultural competency) among PCPs to increase uptake of prevention tools such as PrEP. Furthermore, uptake of such trainings can improve racial disparities in HIV prevention and care particularly in high HIV burden areas [35].

In our study, fewer than half of PCPs reported a “good” understanding of nPEP; these results were unexpected. Unlike PrEP, PEP use for HIV prevention has existed since 1996 for occupational exposure [36]; guidelines for nPEP have been available since 2005 [37]. Frontline healthcare workers have been a key target audience for PEP use to ensure occupational safety and transmission prevention [31, 38]. Given the longstanding availability of PEP (for occupational exposure), we expected greater familiarity with nPEP (for sexual exposure), particularly among PCPs in the Southeast. One possible explanation is that much of nPEP use involves medical emergencies related to sexual assault [18]. A recent CDC publication also elucidates that nPEP use should be reserved primarily for emergency situations [39]. Consequently, our findings may simply reflect these factors, which contribute to emergency department providers being more familiar with nPEP than PCPs. However, prevention strategies must include increasing nPEP familiarity among PCPs to improve public awareness and uptake of this HIV prevention tool.

Similar to our findings involving PrEP, HIV-related training among PCPs was associated with familiarity with nPEP. Other reports in the literature provide context for our findings. Institutional barriers to PCPs familiarity with nPEP include the lack of a written nPEP protocol [40] and the absence of appropriate staff training [18]. Unlike for the PrEP analyses, we did not find a correlation between HIV-related training and nPEP prescriptions. Of note, we found a trend toward an association between HIV-related training and PCPs reporting a high number of nPEP prescriptions (> 20 patients) in the multivariable model ($p = 0.062$), which appears in line with association between provider training and nPEP prescribing found in another study [31]. In aggregate, results from our study and existing literature suggest that low levels of familiarity and comfort with nPEP among PCPs in the Southeast are potential barriers to nPEP uptake among at-risk patients; further research is needed to explore these barriers.

We also found no statistically significant association between HIV-related training and HIV screening behaviors, in contrast to some prior studies that revealed these associations [41–43]. These results might be explained by unique facility characteristics and other unmeasured factors in our study, such as: lack of facility resources [44], lack of clinic protocols [45], and provider discomfort with discussing sexual history [45, 46]. While we did not collect data on these factors, they have been identified as correlates of low HIV screening. HIV-related training may influence screening behaviors, but perhaps also be mediated through jurisdiction- and facility-level factors rather than only provider-level factors. Further investigation is warranted.

Limitations and Strengths

There are some limitations to note. First, the 29.6% adjusted response rate may be viewed as low compared to other studies in the field of HIV and beyond [47–49]. However, our study’s response rate is well in the realm of response rates from similar surveys with samples of providers who had not been engaged in previous studies or projects with the study investigators [50–53]. Future surveys should consider options that may increase provider responses, including pre-payment of incentives. Second, our measures of HIV-related training were based on PCPs’ self-reports. Under-reporting may have occurred due to poor

recall. Conversely, PCPs self-reports may have led to overreporting of previous HIV-related training due to social desirability bias. Third, we had significantly fewer participants and lower response rates from the Miami MSA compared to the other MSAs. Therefore, MSA comparison data should be interpreted with caution. Because Miami has ranked in the top 1–2 jurisdictions for number of HIV diagnoses in recent years [1], increasing engagement of Miami providers may be vital for future HIV prevention research and program strategies.

Our study represents one of the first Efforts to examine HIV-related training among a representative sample of PCPs in selected Southeast jurisdictions. Our methodological approach included a stratified random selection approach that yielded a sample of 820 participants. This sample size yielded an overall confidence interval of ± 7.0 points (margin of error = ± 3.5%). Even when accounting for the oversampling of small strata (e.g., physician assistants in Baton Rouge), our sampling approach provided an accurate estimate of the population of providers within the selected MSAs. Based on the study sample's representativeness, our results can inform workforce-training policies and practices that affect HIV prevention and care in the Southeast. To our knowledge, this study also provides the most comprehensive recent assessment of HIV readiness levels for deploying biomedical interventions among primary care providers in the Southeast.

Conclusion

Our study highlights the gaps in current HIV-related training needs and preparedness for frontline primary care providers. We found that capacity and training needs are most needed for improving general understanding and provision of PrEP and nPEP. Future research (e.g., qualitative studies) and program implementation science should examine facilitators and barriers associated with HIV-related training uptake. These investigations should also explore the learning modalities (e.g., online continuing education courses, academic detailing) that are acceptable, accessible, and beneficial to PCPs in the Southeast and could best enhance providers' readiness to provide HIV care and prevention services in primary care settings. Lastly, future Efforts need to examine facility- and jurisdiction-level factors to design appropriate, culturally competent, and consistent trainings for PCPs to advance national HIV prevention and care goals for the Southeast.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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References

1. Centers for Disease Control and Prevention. HIV Surveillance Report: Diagnoses of HIV Infection in the United States and Dependent Areas, 2017. 2018 https://www.cdc.gov/hiv/pdf/library/reports/surveillance/cdc-hiv-surveillance-report-vol-29.pdf.
2. U.S. Department of Commerce: U.S. Census Bureau. Census Regions and Division of the United States. 2018 https://www2.census.gov/geo/pdfs/maps-data/maps/reference/us_regdiv.pdf. Accessed 8 May 2018.
3. Centers for Disease Control and Prevention. Monitoring selected national HIV prevention and care objectives by using HIV surveillance data—United States and 6 dependent areas, 2015. HIV Surv Suppl Rep. 2017;22(2):24.
4. Arnold T, Brinkley-Rubinstein L, Chan PA, et al. Social, structural, behavioral and clinical factors influencing retention in Pre-Exposure Prophylaxis (PrEP) care in Mississippi. PLoS ONE. 2017;12(2):e0172354. [PubMed: 28222118]
5. Parker CM, Garcia J, Philbin MM, Wilson PA, Parker RG, Hirsch JS. Social risk, stigma and space: key concepts for understanding HIV vulnerability among black men who have sex with men in New York City. Cult Health Sex. 2017;19(3):323–37. [PubMed: 27550415]
6. Mannheimer S, Wang L, Wilton L, et al. Infrequent HIV testing and late HIV diagnosis are common among a cohort of black men who have sex with men in 6 US cities. J Acquir Immune Defic Syndr. 2014;67(4):438–45. [PubMed: 25197830]
7. Kuhns L, Hotton A, Schneider J, Garofalo R, Fujimoto K. Use of pre-exposure prophylaxis (PrEP) in young men who have sex with men is associated with race, sexual risk behavior and peer network size. AIDS Behav. 2017;21(5):1376–82. [PubMed: 28238119]
8. Korthuis PT, Berkenblit GV, Sullivan LE, et al. General internists' beliefs, behaviors, and perceived barriers to routine HIV screening in primary care. AIDS Educ Prev. 2011;23(Suppl 3):70–83. [PubMed: 21689038]
9. McNaghten AD, Valverde E, Blair J, Johnson C, Freedman M, Sullivan P. Routine HIV testing among providers of HIV care in the United States, 2009. PLoS ONE. 2013;8(1):e51231. [PubMed: 23341880]
10. Dorell C, Sutton M, Oster A, et al. Missed opportunities for HIV testing in health care settings among young African American men who have sex with men: implications for the HIV epidemic. AIDS Patient Care STDS. 2011;25(11):657–64. [PubMed: 21923415]
11. Branson B, Handsfield HH, Lampe M, et al. Revised recommendations for HIV testing of adults, adolescents, and pregnant women in health-care settings. MMWR. 2006;55(RR-14):1–17.
12. Centers for Disease Control and Prevention, Health Resources and Services Administration, National Institutes of Health, et al. Recommendations for HIV prevention with adults and adolescents with HIV in the United States, 2014: Summary for Clinical Providers. 2014 http://stacks.cdc.gov/view/cdc/26063.
13. Blackstock O, Moore B, Berkenblit G, et al. A cross-sectional online survey of HIV pre-exposure prophylaxis adoption among primary care physicians. J Gen Intern Med. 2017;32(1):62–70. [PubMed: 27778215]
14. Karris M, Beekmann S, Mehta S, Anderson C, Polgreen P. Are we prepped for preexposure prophylaxis (PrEP)? Provider opinions on the real-world use of PrEP in the United States and Canada. Clin Infect Dis. 2014;58(5):704–12. [PubMed: 24319083]
15. Tripathi A, Ogbuanu C, Monger M, Gibson J, Duffus W. Preexpo-sure prophylaxis for HIV infection: healthcare providers' knowledge, perception, and willingness to adopt future implementation in the southern US. South Med J. 2012;105(4):199–206. [PubMed: 22475669]
16. Blumenthal J, Jain S, Krakower D, et al. Knowledge is Power! Increased provider knowledge scores regarding pre-exposure prophylaxis (PrEP) are associated with higher rates of PrEP prescription and future intent to prescribe PrEP. AIDS Behav. 2015;19(5):802–10. [PubMed: 25616837]
17. Clement ME, Seidelman J, Wu J, et al. An educational initiative in response to identified PrEP prescribing needs among PCPs in the Southern US. AIDS Care. 2017;30(5):1–6. [PubMed: 28540763]

18. Du Mont J, MacDonald S, Myhr T, Loutfy M. Sustainability of an HIV PEP program for sexual assault survivors: “lessons learned” from health care providers. Open AIDS J. 2011;5:102–12. [PubMed: 22216082]
19. Sutton M, Duke C, Geter A, et al. HIV-related knowledge, beliefs, attitudes and practices of primary care providers in the southeastern United States: Survey-linked education to strengthen the HIV prevention workforce (unpublished) 2018.
20. Centers for Disease Control and Prevention. Estimated HIV incidence and prevalence in United States, 2010–2015. HIV AIDS Surveillance Project. 2018 http://www.cdc.gov/hiv/library/reports/hiv-surveillance.html. Accessed 21 Sept 2018.
21. IQVIA. IQVIA: Research and Development. 2018 https://www.iqvia.com/solutions/research-and-development.
22. The American Association for Public Opinion Research. Standard Definitions: Final Dispositions of Case Codes and Outcome Rates for Surveys, 9th edition. 2016 https://www.aapor.org/AAPOR_Main/media/publications/Standard-Definitions20169theditionfinal.pdf. Accessed 4 Sept 2018.
23. Chattopadhyay B, Kelley K. Estimation of the coefficient of variation with minimum risk: a sequential method for minimizing sampling error and study cost. Multivar Behav Res. 2016;51(5):627–48.
24. Farley J, Stewart J, Kub J, Cumpsty Fowler C, Lowensen K, Becker K. Development of The Johns Hopkins University School of Nursing adult/geriatric primary care nurse practitioner program in HIV prevention, treatment, and care. J Assoc Nurses AIDS Care. 2016;27(3):223–33. [PubMed: 26852319]
25. Portillo C, Stringari Murray S, Fox C, Monasterio E, Rose C. The HIV Primary Care Workforce of Tomorrow: the UCSF integrated HIV/AIDS primary care capacity nurse practitioner program. J Assoc Nurses AIDS Care. 2016;27(3):214–22. [PubMed: 27086186]
26. Auerbach J, Kinsky S, Brown G, Charles V. Knowledge, attitudes, and likelihood of pre-exposure prophylaxis (PrEP) use among US women at risk of acquiring HIV. AIDS Patient Care STDS. 2015;29(2):102–10. [PubMed: 25513954]
27. Shirreffs A, Lee D, Henry J, Golden M, Stekler J. Understanding barriers to routine HIV screening: knowledge, attitudes, and practices of healthcare providers in King County, Washington. PLoS ONE. 2012;7(9):e44417. [PubMed: 22970215]
28. Human Resources and Servicess Administration. The U.S. nursing workforce: Trends in supply and education. 2013 https://bhw.hrsa.gov/sites/default/files/bhw/nchwa/projections/nursingworkforcetrendsoct2013.pdf. Accessed 4 Sept 2018.
29. Castel A, Feaster D, Tang W, et al. Understanding HIV care provider attitudes regarding intentions to prescribe PrEP. J Acq Immun Defic Syndr. 2015;70(5):520–8.
30. Centers for Disease Control and Prevention. CDC Vital Signs: daily pill can prevent HIV. 2015 https://www.cdc.gov/vitalsigns/hivprep/index.html.Accessed 4 Sept 2018.
31. Cardo D, Culver D, Ciesielski C. A case-control study of HIV seroconversion in health care workers after percutaneous exposure. New Engl J Med. 1997;337(21):1485–90. [PubMed: 9366579]
32. Calabrese S, Underhill K. How stigma surrounding the use of HIV preexposure prophylaxis undermines prevention and pleasure: a call to destigmatize “Truvada Whores”. Am J Public Health. 2015;105(10):1960–4. [PubMed: 26270298]
33. McDoom MM, Bokhour B, Sullivan M, Drainoni M-L. How older black women perceive the effects of stigma and social support on engagement in HIV care. AIDS Patient Care STDs. 2015;29(2):95–101. [PubMed: 25494607]
34. Saha S, Korthuis PT, Cohn J, Sharp V, Moore R, Beach M. Primary care provider cultural competence and racial disparities in HIV care and outcomes. J Gen Intern Med. 2013;28(5):622–9. [PubMed: 23307396]
35. Gaston GB. African-Americans’ perceptions of health care provider cultural competence that promote HIV medical self-care and antiretroviral medication adherence. AIDS Care. 2013;25(9):1159–65. [PubMed: 23356569]

36. Kuhar D, Henderson D, Struble K, et al. Updated US Public Health Service guidelines for the management of occupational exposures to human immunodeficiency virus and recommendations for postexposure prophylaxis. Infect Control Hosp Epidemiol. 2013;34(9):875–92. [PubMed: 23917901]
37. Centers for Disease Control and Prevention. Antiretroviral post-exposure prophylaxis after sexual, injection-drug use, or other non-occupational exposure to HIV in the United States. MMWR Recomm Rep. 2005;54:1–2.
38. Centers for Disease Control and Prevention. Perspectives in disease prevention and health promotion update: universal precautions for prevention of transmission of human immunodeficiency virus, hepatitis B virus, and other bloodborne pathogens in health care settings. MMWR. 1988;37(24):377–88. [PubMed: 2836717]
39. Centers for Disease Control and Prevention. PEP 101. 2018 https://www.cdc.gov/hiv/pdf/library/factsheets/cdc-hiv-pep101.pdf.Accessed 2 Feb 2018.
40. Rodríguez A, Castel A, Parish C, et al. HIV medical providers' perceptions of the use of antiretroviral therapy as nonoccupational postexposure prophylaxis in 2 major metropolitan areas. J Acquir Immune Defic Syndr. 2013;64(Suppl 1):S68–79. [PubMed: 24126450]
41. Minniear T, Gilmore B, Arnold S, Flynn P, Knapp K, Gaur A. Implementation of and barriers to routine HIV screening for adolescents. Pediatrics. 2009;124(4):1076–84. [PubMed: 19752084]
42. Simmons E, Brown M, Sly K, Ma M, Sutton M, McLellan-Lemal E. Barriers and facilitators to HIV testing in primary care among health care providers. J Natl Med Assoc. 2011;103(5):432–8. [PubMed: 21809793]
43. Sullivan K, Berger M, Quinlivan E, et al. Perspectives from the field: HIV testing and linkage to care in North Carolina. J Int Assoc Provid AIDS Care. 2016;15(6):477–85. [PubMed: 26586789]
44. Weis K, Liese A, Hussey J, et al. A routine HIV screening program in a South Carolina community health center in an area of low HIV prevalence. AIDS Patient Care STDs. 2009;23(4):251–8. [PubMed: 19281345]
45. Davis T, Teaster P, Thornton A, Watkins J, Alexander L, Zanjani F. Primary care providers' HIV prevention practices among older adults. J Appl Gerontol. 2016;35(12):1325–42. [PubMed: 25736425]
46. Lanier Y, Castellanos T, Barrow R, Jordan W, Caine V, Sutton M. Brief sexual histories and routine HIV/STD testing by medical providers. AIDS Patient Care STDs. 2014;28(3):113–20. [PubMed: 24564387]
47. Beer L, Weiser J, West B, Duke C, Gremel G, Skarbinski J. Delivery of HIV transmission risk-reduction services by HIV care providers in the United States-2013. J Intl Assoc Provid AIDS Care. 2016;15(6):494–504.
48. Goyal M, Dowshen N, Mehta A, Hayes K, Lee S, Mistry R. Pediatric primary care provider practices, knowledge, and attitudes of human immunodeficiency virus screening among adolescents. J Pediatr. 2013;163(6):1711–5. [PubMed: 24084105]
49. O'Leary S, Hurley L, Kennedy E, et al. Provider attitudes regarding vaccine tracking systems in pediatric practices. Acad Pediatr. 2016;16(1):34–41. [PubMed: 26525990]
50. Jensen J, Weng C, Spraker Perlman H. A provider-based survey to assess bereavement care knowledge, attitudes, and practices in pediatric oncologists. J Palliat Med. 2017;20(3):266–72. [PubMed: 28072917]
51. McManus RJ, Wood S, Bray EP, et al. Self-monitoring in hyper-tension: a web-based survey of primary care physicians. J Hum Hypertens. 2014;28(2):123–7. [PubMed: 23823583]
52. Shirts B, Perera S, Hanlon J, et al. Provider management of and satisfaction with laboratory testing in the nursing home setting: results of a national internet-based survey. J Am Med Dir Assoc. 2009;10(3):161–6. [PubMed: 19233055]
53. Ward K, Jacobson J, Turok D, Murphy P. A survey of provider experience with misoprostol to facilitate intrauterine device insertion in nulliparous women. Contraception. 2011;84(6):594–9. [PubMed: 22078188]

Table 1

Characteristics, knowledge, and clinical practices of primary care providers in the Southeast United States–Knowledge, Behaviors, Attitudes and Practices of HIV-Related Care among Providers in the Southeast (K-BAP) Study, 2017

Characteristic	Raw[a] (N = 820)	Weighted %
Gender		
Female	543	59.4
Male	198	40.6
Race and ethnicity		
White (non-Hispanic)	488	60.2
Black (non-Hispanic)	93	10.8
Asian (non-Hispanic)	85	18.7
Hispanic	42	9.1
Other	14	1.2
Provider type		
Physician	367	75.6
Nurse practitioner	296	20.7
Physician assistant	157	3.6
Age (years)		
<40	251	26.9
40–49	203	23.4
50–59	158	25.8
≥60	122	23.9
MSA		
Atlanta	176	20.3
DC and Baltimore	344	47.6
Miami	88	23.2
Baton Rouge and New Orleans	212	8.8
Any HIV-related training		
Yes	273	36.3
No	511	63.7
How do you offer tests for HIV?		

Characteristic	Raw[a] (N = 820)	Weighted %
Yes (by request, openly available, or patients encouraged)	152	20.6
No or not certain	601	79.4
Are you familiar with the concept of providing nPEP?		
"Good" understanding of concept	420	48.5
Know little about it/Never heard of it	345	51.5
Has a patient ever requested nPEP?		
Yes	212	36.9
No	510	63.1
Approximately to how many patients have you prescribed nPEP?		
None	550	69.5
1 to 5	106	18.4
6 to 20	43	8.0
21 or more	21	4.1
Are you familiar with the concept of PrEP?		
"Good" understanding of concept	272	41.9
Know little about it/never heard of it	490	52.1
Has a patient ever requested PrEP?		
Yes	148	22.1
No	593	77.9
Have you ever prescribed PrEP?		
Yes	114	18.1
No	626	81.9

MSA metropolitan statistical area, *DC* District of Columbia, *MSM* men who have sex with men, *STD* sexually transmitted diseases, *nPEP* non-occupational post-exposure prophylaxis, *PrEP* pre-exposure prophylaxis

[a]Due to missing values, not all categories have the same denominator

Table 2

Associations of provider characteristics with HIV-related training among primary care providers in the Southeast—Knowledge, Behaviors, Attitudes and Practices of HIV-Related Care among Providers in the Southeast (K-BAP) Study, 2017, n = 820

	HIV-related training						
	Yes	No					
	N (Weighted %)	N (Weighted %)	p value	PR (95% CI)	p value	aPR (95% CI)	p value
Characteristics							
Gender			0.839				
Female	184 (58.1)	355 (59.8)					
Male	68 (41.9)	129 (40.2)					
Race and ethnicity			0.068				
White (non-Hispanic)	162 (61.3)	325 (60.0)					
Black (non-Hispanic)	38 (13.3)	55 (9.6)					
Asian (non-Hispanic)	24 (12.8)	58 (21.5)					
Hispanic	15 (11.8)	27 (7.7)					
Other	5 (0.8)	8 (1.2)					
Provider type			0.498				
Physician	100 (74.6)	246 (75.6)					
Nurse practitioner	95 (20.0)	189 (21.5)					
Physician assistant	78 (5.4)	76 (2.9)					
Age (years)			0.837				
<40	87 (25.7)	164 (27.5)					
40–49	70 (26.6)	133 (21.7)					
50–59	56 (22.4)	102 (27.6)					
≥60	38 (25.3)	84 (23.2)					
MSA							
Atlanta	44 (15.3)	127 (24.4)	<0.001	Ref.		Ref.	
DC and Baltimore	129 (47.2)	199 (46.9)		1.38 (0.88, 2.16)	0.187	1.16 (0.78, 1.73)	0.466
Miami	47 (30.8)	35 (18.5)		1.85 (1.52, 2.25)	<0.001	1.53 (1.31, 1.78)	<0.001
Baton Rouge and New Orleans	53 (6.7)	150 (10.2)		1.03 (0.74, 1.42)	0.853	1.26 (0.95, 1.67)	0.126
How do you offer tests for HIV?							

	HIV-related training						
	Yes	No					
	N (Weighted %)	N (Weighted %)	p value	PR (95% CI)	p value	aPR (95% CI)	p value
Routine/opt-out or repeated/every 3–12 months	122 (44.8)	159 (33.9)	0.018	1.54 (1.25, 1.92)	<0.001	1.25 (0.85, 1.85)	0.245
Less than annually or never	147 (55.2)	351 (66.1)		Ref.		Ref.	
How often do you offer HIV testing to MSM?			0.153				
Annually or more	149 (82.5)	213 (71.2)					
Less than annually or never	37 (17.5)	83 (28.8)					
How often do you offer HIV testing to transgender patients?			0.056				
Annually or more	140 (83.7)	176 (68.3)					
Less than annually or never	31 (16.3)	85 (31.7)					
How often do you offer HIV testing to patients who inject drugs?			0.419				
Annually or more	147 (84.6)	214 (78.5)					
Less than annually or never	29 (15.4)	67 (21.5)					
How often do you offer HIV testing to patients who have been diagnosed with an STD?			0.243				
Annually or more	174 (84.4)	283 (76.8)					
Less than annually or never	34 (15.6)	87 (23.2)					
How often do you offer HIV testing to patients with signs and symptoms of an STD?			0.157				
Annually or more	178 (86.0)	290 (78.1)					
Less than annually or never	30 (14.0)	83 (21.9)					
How often do you offer HIV testing to pregnant women?			0.062				
Annually or more	89 (60.5)	138 (69.1)					
Less than annually or never	40 (39.5)	76 (30.9)					
Offer rapid HIV testing (oral swab or blood) in your practice?			0.517				
Yes-first-line test/all patients receive HIV testing	40 (15.5)	48 (11.0)					
Yes-use for many patients receiving HIV testing	30 (11.5)	25 (7.6)					
Yes-but rarely	22 (12.4)	29 (9.6)					
Never	126 (60.6)	297 (71.8)					
Offer routine HIV testing via standard venipuncture sent to lab?			0.167				
Yes-first-line test/all patients receive HIV testing	150 (68.6)	300 (75.3)					
Yes-use for many patients receiving HIV testing	39 (19.3)	48 (12.1)					
Yes-but rarely	25 (10.1)	37 (9.3)					

	HIV-related training						
	Yes	No					
	N (Weighted %)	N (Weighted %)	p value	PR (95% CI)	p value	aPR (95% CI)	p value
Never	5 (2.0)	19 (3.4)					
Do you provide condoms to the patients in your practice?			0.010				
Yes (by request, openly available, or encouraged)	85 (31.7)	66 (14.3)		1.79 (1.20, 2.63)	0.014	1.52 (1.03, 2.27)	0.044
No or not certain	176 (68.3)	422 (85.7)		Ref.			
Are you familiar with the concept of providing nPEP?			<0.001				
"Good" understanding of concept	164 (69.3)	180 (42.8)		2.08 (1.67, 2.56)	<0.001	1.32 (1.05, 1.67)	0.008
Know little about it/Never heard of it	96 (30.7)	312 (57.2)		Ref.		Ref.	
Has a patient ever requested nPEP?			<0.001				
Yes	95 (47.2)	117 (31.5)		1.52 (1.20, 1.92)	0.004	0.84 (0.64, 1.12)	0.198
No	156 (52.8)	351 (68.5)		Ref.		Ref.	
Approximately to how many patients have you prescribed nPEP?			<0.001				
None	166 (56.4)	384 (76.8)		Ref.		Ref.	
1 to 5	46 (23.2)	60 (15.7)		1.55 (0.94, 2.56)	0.100	1.21 (0.59, 2.46)	0.308
6 to 20	23 (10.5)	20 (6.6)		1.61 (1.18, 2.20)	<0.001	1.56 (1.25, 1.96)	0.124
21 or more	17 (10.0)	4 (0.9)		2.96 (2.23, 3.93)	<0.001	2.04 (1.15, 3.62)	0.062
Are you familiar with the concept of PrEP?			<0.001				
"Good" understanding of concept	148 (65.3)	122 (29.2)		2.63 (2.13, 3.23)	<0.001	1.67 (1.19, 2.38)	0.027
Know little about it/Never heard of it	113 (34.7)	372 (70.8)		Ref.		Ref.	
Has a patient ever requested PrEP?			<0.001				
Yes	76 (29.7)	71 (17.8)		1.49 (1.22, 1.82)	<0.001	1.47 (1.12, 1.89)	0.003
No	181 (70.3)	409 (82.2)		Ref.		Ref.	
Have you ever prescribed PrEP?			<0.001				
Yes	69 (30.9)	45 (11.3)		2.00 (1.59, 2.56)	<0.001	1.75 (1.10, 2.78)	0.015
No	186 (69.1)	436 (88.7)		Ref.		Ref.	

PR prevalence ratio, *CI* confidence interval, *aPR* adjusted prevalence ratio, *MSA* metropolitan statistical area, *DC* District of Columbia, *MSM* men who have sex with men, *STD* sexually transmitted diseases, *nPEP* non-occupational post-exposure prophylaxis, *PrEP* pre-exposure prophylaxis