Published in final edited form as:

J Acquir Immune Defic Syndr. 2021 November 01; 88(3): e17–e21. doi:10.1097/

QAI.0000000000002767.

Brief Report: HIV Pre-Exposure Prophylaxis Prescribing in an Urban Safety-Net Health System

Afiba Manza-A. Agovi^{1,2}, Ifedioranma Anikpo¹, Matthew Cvitanovich¹, Esther O. Fasanmi^{3,4}, Rohit P. Ojha^{1,2}, Julia L. Marcus⁵

¹Center for Epidemiology & Healthcare Delivery Research, JPS Health Network, Fort Worth, TX

²Department of Medical Education, TCU and UNTHSC School of Medicine, Fort Worth, TX

³Pharmacy Clinical Services Outpatient, JPS Health Network, Fort Worth, TX

⁴Healing Wings-Infectious Disease Clinic, JPS Health Network, Fort Worth, TX

⁵Harvard Medical School and Harvard Pilgrim Health Care Institute, Boston, MA

Keywords

HIV; Prevention; Pre-exposure Prophylaxis; Implementation; Safety Net

INTRODUCTION

Despite a population-level decline in HIV incidence in recent years, HIV incidence increased in certain subgroups and geographic regions in the United States (US).¹ The federal Ending the HIV Epidemic (EHE) initiative includes expansion of access to comprehensive HIV prevention approaches, particularly HIV pre-exposure prophylaxis (PrEP), for all individuals who could benefit² in geographic areas with high HIV incidence.³ Emtricitabine/tenofovir disoproxil fumarate (FTC/TDF) and emtricitabine/tenofovir alafenamide (FTC/TAF) are federally approved medications for PrEP and can prevent HIV infection in at-risk individuals. Nevertheless, implementation of PrEP has been slow⁴ and inequitable^{5–7}, limiting the impact of PrEP on HIV incidence at a population level.⁸

Unmet need for PrEP is particularly high in Black and Hispanic individuals⁶, who are at the highest risk of HIV acquisition. Safety-net health systems provided outpatient care to over 80 million individuals in 2018⁹, including ethnically and racially diverse communities that comprise high-priority groups for PrEP implementation. These settings are also a primary source of care for socioeconomically disadvantaged individuals, who have a high risk of HIV infection.^{10–12} Thus, the number of individuals who could benefit from PrEP in safety-net settings may be higher than in private practice settings, making safety-net health systems particularly important for PrEP implementation. Nevertheless,

CONFLICTS OF INTEREST STATEMENT

Julia Marcus has previously consulted for Kaiser Permanente Northern California on a research grant from Gilead Sciences unrelated to the submitted work.

safety-net health systems may have limited resources to prioritize PrEP implementation. Little evidence is currently available about the frequency of PrEP prescribing in safety-net health systems, particularly in EHE priority regions. This evidence could inform resource allocation for PrEP implementation efforts and identify disparities in PrEP prescribing for future intervention development. We evaluated PrEP prescribing among potential PrEP candidates in a safety-net health system that serves a county designated as an EHE priority area.

METHODS

Setting

JPS Health Network (JPS) is an urban safety-net health system that serves Tarrant County, Texas, which has over 2 million residents.¹³ Safety-net health systems provide care for socioeconomically disadvantaged populations including individuals who are low-income, uninsured, or underinsured. JPS is considered a core safety-net health system because of a legal mandate to provide care regardless of a person's ability to pay.¹⁴ In addition, the network is a member of America's Essential Hospitals,¹⁵ which is an organization of over 300 hospitals and health systems across the United States with a mission to serve vulnerable populations. JPS includes a 578-bed academic teaching hospital, a Ryan White funded HIV Clinic, and over 40 satellite community health clinics, which include accredited Primary Care Medical Homes (PCMHs). A PCMH is a primary care model that uses an integrated team-based approach to provide patient-centered care.^{16–18} Tarrant County is an HIV hotspot with increasing HIV incidence¹⁹ and a priority area for targeted EHE efforts.³

Study population

We used data from electronic health records (EHR) for patients receiving outpatient primary care within the network. Eligible individuals were aged ≥ 18 years; had ≥ 2 visits to a PCMH within the network between January 1, 2015 and December 31, 2019, and had indications for PrEP based on Centers for Disease Control and Prevention (CDC) guidelines²⁰ (Supplementary Table S1). PrEP indications were defined as a documented behavioral or sexual risk factor for HIV acquisition or a positive laboratory result for bacterial sexually transmitted infections (STIs) at the index visit date. STIs included chlamydia (males only), gonorrhea, or syphilis. The index clinic visit was defined as the first clinic visit at which the individual had a documented indication for PrEP. We excluded individuals who had a prior diagnosis of HIV infection. Individuals who received antiretroviral medications for post-exposure prophylaxis, but not PrEP, were only included in the denominator. This study was approved by the North Texas Institutional Review Board.

Measures

Our primary outcome of interest was PrEP prescribing, defined as a new prescription for PrEP for potential PrEP candidates from a JPS PCMH at any time after eligibility criteria were met. We reviewed the charts of patients who received a prescription order for an approved formulation for PrEP. Both drug names (FTC/TDF, FTC/TAF) and brand names (Truvada and Descovy) were used to ascertain PrEP prescribing documented in the medication list and provider notes. In order to capture PrEP indications that were behavioral

or sexual risk factors documented in the EHR, we used the following ICD-10 codes that indicate exposure to STIs, substance use disorders, injection drug use, or “high-risk sexual behavior”: A53, Z20.6, Z20.2, Z72.51, Z72.52, Z72.53, F11, F14, F15 F19.20, W46.1 and W46.0 (Supplementary Table S1). We extracted sociodemographic data, including age at the index visit (18 – 24, 25 – 34, 35 – 44, 45 – 54, 55 – 64 or 65 years), race and ethnicity (Hispanic, non-Hispanic Black, non-Hispanic White, non-Hispanic other), and sex (male or female). Health insurance coverage was defined as the primary payer for the eligible visit and categorized as commercial, public (Medicare or Medicaid), uninsured, or hospital-based managed care plan (offered to eligible individuals who are uninsured).

Data analysis

We estimated cumulative incidence and 95% confidence limits (CL) of PrEP prescribing based on failure probability (i.e. 1 – Kaplan-Meier estimate). Person-time was computed as time from the index date (date of encounter associated with first PrEP indication) to the prescription order date, administrative censoring at 365 days or end of study, whichever occurred first. Individuals with person-time <365 days were censored at the date of their last encounter. We designated one day of person-time contribution to the cohort for patients who received a prescription on the same day as the index date. This approach assumes no competing risks (e.g. death) for accurate estimation of cumulative incidence and is generally accurate when the frequency of deaths is <10%. Given the 1-year follow-up period, we would not expect to violate this assumption. We originally intended to assess potential disparities by age, sex, and race/ethnicity, but the low outcome frequency precluded analyses to estimate associations.

For a common measure to compare with prior studies, we estimated PrEP prevalence by emulating a repeated cross-sectional survey using EHR. Briefly, we applied the same eligibility criteria as used for the primary analysis. For eligible individuals with a primary care encounter within each calendar year, we applied an historical lookback period for each individual to identify whether PrEP was prescribed. Data from each calendar year were pooled to estimate prevalence across all years. We accounted for individuals being eligible for multiple calendar years by using clustered variance to estimate 95% CL for prevalence.

RESULTS

We identified 2,957 individuals without a prior HIV diagnosis who had least two encounters at a JPS PCMH from 2015 through 2019 and had a documented indication for PrEP. Table 1 summarizes characteristics of the study population, which was predominantly young (58% aged <45 years), female (56%), racial or ethnic minorities (67%), and uninsured or provided care through a hospital-based managed care plan for uninsured individuals (60%).

We identified 41 individuals who were prescribed PrEP. Among individuals prescribed PrEP, most were aged 25 – 45 years (61%), male (68%), and racial or ethnic minorities (62%), and nearly half were receiving charity care (42%). In addition, half (50%) of individuals prescribed PrEP had “high-risk sexual behavior” as a PrEP indication, with males accounting for the majority (74%) of individuals with “high-risk sexual behavior” as an indication for PrEP (Supplementary Table S2). Figure 1 illustrates the cumulative

incidence of PrEP prescribing among individuals with PrEP indications. The cumulative incidence of receiving a PrEP prescription was 0.76% (95% CL: 0.50%, 1.2%) within 90 days and 1.3% (95% CL: 0.91%, 1.7%) within 365 days of the first documented PrEP indication. The prevalence of PrEP prescribing in our population over the same period was 1.1% (0.70%, 1.6%) (Supplementary Table S3).

DISCUSSION

Our results suggest extremely low frequency of PrEP prescribing among potential PrEP candidates engaged in primary care at an urban safety-net health system. Scaling up PrEP as part of the EHE initiative will require investments in strategies to increase prescribing in safety-net settings, which serve populations who are at disproportionately high risk of HIV infection and have been underserved by PrEP delivery efforts to date.

Several limitations should be considered when interpreting our findings. PrEP indications were based on behavioral or clinical indications documented in EHR data. Sexual behaviors are often underreported and may be sensitive to recall and social desirability biases.^{21–23} In addition, the ascertainment of behavioral and clinical indications for PrEP is highly dependent on the patient-provider relationship.²⁴ Misclassification of behavioral or clinical indications would manifest as selection bias in our study because these individuals would have been excluded. Misclassification may also have influenced our findings. For example, misclassification of PrEP prescribing is a consideration because we were unable to determine whether patients received a PrEP prescription at another institution, which would result in underestimated cumulative incidence of PrEP prescribing. Our outcome of interest was PrEP prescribing, which aligned with our goal of understanding the provider and health system perspective but does not address PrEP uptake (i.e. actual use), which would provide more insight from a patient perspective. Lastly, our study focused on people engaged in primary care and our results may not be generalizable to all people eligible for PrEP provided care through our healthcare system (e.g. people who only received care in the emergency department).

Our estimates were lower than the few prior studies conducted in urban safety-net settings, which identified frequencies of PrEP prescribing between 13% and 96%.^{25–29} Several sources of variation may explain the lower estimate in our study. Foremost, the majority of prior studies in safety-net settings^{25–27} included data from community health centers that were early adopters of PrEP and specialize in care for sexual and gender minorities. In addition, sexual and gender minorities were the majority of patients in prior studies^{25–29}, with several studies including primarily non-Hispanic White individuals, for whom PrEP uptake has been highest. In contrast, although we were unable to identify gender identity or sexual orientation in our study population, our health system serves an urban population of primarily racial and ethnic minorities, and a minority of our study sample was non-Hispanic White. Lastly, we estimated cumulative incidence, whereas most prior studies estimated prevalence. Our study thus provides insight into the frequency of new PrEP prescriptions among potential PrEP candidates, whereas studies that reported prevalence provide insight into PrEP prescribing that could be current or past. Nevertheless, for comparison, we

estimated the prevalence of PrEP prescribing in our population. Our prevalence estimate was also low (1.1%, 95% CL: 0.70%, 1.6%).

The low frequency of PrEP prescribing in our setting may be related to multiple challenges. Barriers to accessing expensive medications such as PrEP may be exacerbated in our study population because Texas is one of the 12 states, primarily in the southern US, that did not expand Medicaid as part of the Affordable Care Act.³⁰

Providers could be hesitant to prescribe PrEP because of concerns about cost,³¹ considering that 60% of our study population was uninsured or provided care through a hospital-based managed care plan for uninsured individuals. Patient assistance programs to enhance PrEP access may inadequately address costs because low health literacy creates challenges navigating the complex application process.³² In addition, low provider knowledge of PrEP is a barrier to PrEP prescribing in safety-net settings.³³ Lastly safety-net systems operate with limited financial and staffing resources, which may constrain the ability to include PrEP as an essential medication on formularies³⁴, hire PrEP navigators, or implement new innovations in care delivery.³⁵

In summary, our results suggest very low cumulative incidence of PrEP prescribing among potential PrEP candidates in an urban safety-net health system. PrEP expansion in healthcare systems will require investment in strategies to overcome patient-, provider-, and system-level barriers to PrEP use in high-priority populations. For example, evidence is emerging that negative attitudes, concerns about cost, and lack of PrEP awareness, knowledge, and skills are provider-level barriers to prescribing PrEP.^{31, 33} Greater understanding of barriers that may be unique to safety-net settings, and development of interventions to mitigate these barriers could help improve PrEP implementation in high-priority populations.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

FUNDING

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors. Julia Marcus is supported in part by the National Institute of Allergy and Infectious Diseases [K01 AI122853].

AVAILABILITY OF DATA AND MATERIALS

The data that support the findings of this study are available from the authors upon reasonable request and within the limits of IRB rules.

REFERENCES

1. Centers for Disease Control and Prevention. CDC data confirm: Progress in HIV prevention has stalled. Accessed March 20th 2020. <https://www.cdc.gov/media/releases/2019/0227-hiv-prevention-stalled.html>
2. Giroir BP. The Time Is Now to End the HIV Epidemic. *Am J Public Health*. Jan 2020;110(1):22–24. doi:10.2105/AJPH.2019.305380 [PubMed: 31725312]

3. Fauci AS, Redfield RR, Sigounas G, Weahkee MD, Giroir BP. Ending the HIV Epidemic: A Plan for the United States. *JAMA*. Feb 7 2019;321(9):844–5. doi:10.1001/jama.2019.1343 [PubMed: 30730529]
4. Zhang C, McMahon J, Fiscella K, et al. HIV Pre-Exposure Prophylaxis Implementation Cascade Among Health Care Professionals in the United States: Implications from a Systematic Review and Meta-Analysis. *AIDS Patient Care STDS*. Dec 2019;33(12):507–527. doi:10.1089/apc.2019.0119 [PubMed: 31821044]
5. Sullivan PS, Giler RM, Mouhanna F, et al. Trends in the use of oral emtricitabine/tenofovir disoproxil fumarate for pre-exposure prophylaxis against HIV infection, United States, 2012–2017. *Ann Epidemiol*. 2018;28(12):833–40. doi:10.1016/j.annepidem.2018.06.009 [PubMed: 30037634]
6. Huang YA, Zhu W, Smith DK, Harris N, Hoover KW. HIV Preexposure Prophylaxis, by Race and Ethnicity - United States, 2014–2016. *MMWR Morb Mortal Wkly Rep*. Oct 19 2018;67(41):1147–1150. doi:10.15585/mmwr.mm6741a3 [PubMed: 30335734]
7. Marcus JL, Hurley LB, Hare CB, Silverberg MJ, Volk JE. Disparities in Uptake of HIV Preexposure Prophylaxis in a Large Integrated Health Care System. *Am J Public Health*. Oct 2016;106(10):e2–3. doi:10.2105/AJPH.2016.303339
8. Marcus JL, Paltiel AD, Walensky RP. Has Pre-exposure Prophylaxis Made a Difference at a Population Level? Jury Is Still Out. *Clin Infect Dis*. Dec 15 2020;71(12):3152–3153. doi:10.1093/cid/ciz1236 [PubMed: 32097454]
9. Clark D, Roberson B, Ramiah K. Essential data: Our hospitals, our patients. Essential Hospitals Institute; 2021. https://essentialhospitals.org/wp-content/uploads/2021/05/EssentialData2021_Web.pdf
10. Kogan SM, Cho J, Barnum S, Barton A, Hicks MR, Brown GL. Pathways to HIV-Related Behavior Among Heterosexual, Rural Black Men: A Person-Centered Analysis. *Arch Sex Behav*. May 2017;46(4):913–924. doi:10.1007/s10508-015-0661-7 [PubMed: 26699737]
11. Pellowski JA, Kalichman SC, Matthews KA, Adler N. A pandemic of the poor: social disadvantage and the U.S. HIV epidemic. *Am Psychol*. May-Jun 2013;68(4):197–209. doi:10.1037/a0032694 [PubMed: 23688088]
12. Io Medicine. America's Health Care Safety Net: Intact but Endangered. The National Academies Press; 2000:302.
13. Bureau USC. United States Census Bureau QuickFacts Tarrant County, Texas. Vol. 2020. 2020. Accessed 03/10/2020. <https://www.census.gov/quickfacts/tarrantcountytexas>
14. Altman S, Lewin ME. America's health care safety net: intact but endangered. National Academies Press; 2000.
15. America's Essential Hospitals. Members of America's Essential Hospitals. Accessed June 12, 2021. <https://essentialhospitals.org/about-americas-essential-hospitals/listing-of-americas-essential-hospitals-members/>
16. Defining the PCMH. Agency for Healthcare Research and Quality. Accessed June 6th, 2021. <https://pcmh.ahrq.gov/page/defining-pcmh>
17. Jackson G, Powers B, Chatterjee R, et al. The Patient-Centered Medical Home. *Annals of Internal Medicine*. 2013;158(3):169–undefined. doi:10.7326/0003-4819-158-3-201302050-00579 [PubMed: 24779044]
18. Rosenthal TC. The Medical Home: Growing Evidence to Support a New Approach to Primary Care. *The Journal of the American Board of Family Medicine*. 2008;21(5):427–440. doi:10.3122/jabfm.2008.05.070287 [PubMed: 18772297]
19. Texas Department of State Health Services. Texas HIV Surveillance Report, 2018 Annual Report. Texas Department of State Health Services. Updated December 13, 2019. <https://www.dshs.texas.gov/hivstd/reports/>
20. Centers for Disease Control and Prevention. US Public Health Service: Preexposure prophylaxis for the prevention of HIV infection in the United States—2017 Update: a clinical practice guideline. Accessed June 16, 2021. <https://www.cdc.gov/hiv/pdf/risk/prep/cdc-hiv-prep-guidelines-2017.pdf>

21. Catania JA, Gibson DR, Chitwood DD, Coates TJ. Methodological problems in AIDS behavioral research: influences on measurement error and participation bias in studies of sexual behavior. *Psychol Bull.* Nov 1990;108(3):339–62. [PubMed: 2270232]
22. Haberer JE, Bangsberg DR, Baeten JM, et al. Defining success with HIV pre-exposure prophylaxis: a prevention-effective adherence paradigm. *AIDS.* Jul 17 2015;29(11):1277–85. doi:10.1097/QAD.0000000000000647 [PubMed: 26103095]
23. Underhill K, Morrow KM, Collieran CM, et al. Access to healthcare, HIV/STI testing, and preferred pre-exposure prophylaxis providers among men who have sex with men and men who engage in street-based sex work in the US. *PloS one.* 2014;9(11):e112425. doi:10.1371/journal.pone.0112425 [PubMed: 25386746]
24. Maloney KM, Krakower DS, Ziobro D, Rosenberger JG, Novak D, Mayer KH. Culturally Competent Sexual Healthcare as a Prerequisite for Obtaining Preexposure Prophylaxis: Findings from a Qualitative Study. *LGBT Health.* Aug 2017;4(4):310–314. doi:10.1089/lgbt.2016.0068 [PubMed: 28514200]
25. Hojilla JC, Vlahov D, Crouch PC, Dawson-Rose C, Freeborn K, Carrico A. HIV Pre-exposure Prophylaxis (PrEP) Uptake and Retention Among Men Who Have Sex with Men in a Community-Based Sexual Health Clinic. *AIDS Behav.* Apr 2018;22(4):1096–1099. doi:10.1007/s10461-017-2009-x [PubMed: 29243109]
26. Marcus JL, Levine K, Grasso C, et al. HIV Preexposure Prophylaxis as a Gateway to Primary Care. *Am J Public Health.* Oct 2018;108(10):1418–1420. doi:10.2105/AJPH.2018.304561 [PubMed: 30024802]
27. Shover CL, Javanbakht M, Shoptaw S, et al. HIV Preexposure Prophylaxis Initiation at a Large Community Clinic: Differences Between Eligibility, Awareness, and Uptake. *Am J Public Health.* Oct 2018;108(10):1408–1417. doi:10.2105/AJPH.2018.304623 [PubMed: 30138062]
28. Caponi M, Burgess C, Leatherwood A, Molano LF. Demographic characteristics associated with the use of HIV pre-exposure prophylaxis (PrEP) in an urban, community health center. *Prev Med Rep.* Sep 2019;15:100889. doi:10.1016/j.pmedr.2019.100889 [PubMed: 31194089]
29. Pyra M, Rusie LK, Baker KK, Baker A, Ridgway J, Schneider J. Correlations of HIV Preexposure Prophylaxis Indications and Uptake, Chicago, Illinois, 2015–2018. *American Journal of Public Health.* 2020/03/01 2020;110(3):370–377. doi:10.2105/AJPH.2019.305469 [PubMed: 31944849]
30. Kaiser Family Foundation. Status of State Medicaid Expansion Decisions: Interactive Map. 2020;
31. Pleuhs B, Quinn KG, Walsh JL, Petroll AE, John SA. Health Care Provider Barriers to HIV Pre-Exposure Prophylaxis in the United States: A Systematic Review. *AIDS Patient Care STDS.* Mar 2020;34(3):111–123. doi:10.1089/apc.2019.0189 [PubMed: 32109141]
32. Marcus JL, Hurley LB, Dentoni-Lasofsky D, et al. Barriers to preexposure prophylaxis use among individuals with recently acquired HIV infection in Northern California. *AIDS Care.* May 2019;31(5):536–544. doi:10.1080/09540121.2018.1533238 [PubMed: 30304942]
33. Agovi AM, Anikpo I, Cvitanovich MJ, Craten KJ, Asuelime EO, Ojha RP. Knowledge needs for implementing HIV pre-exposure prophylaxis among primary care providers in a safety-net health system. *Prev Med Rep.* Dec 2020;20:101266. doi:10.1016/j.pmedr.2020.101266 [PubMed: 33364148]
34. Adams D, Wilson AL. Drug selection for safety-net-provider formularies. *Am J Health Syst Pharm.* Sep 1 2002;59(17):1675–8. doi:10.1093/ajhp/59.17.1675 [PubMed: 12224347]
35. Lyles CR, Handley MA, Ackerman SL, et al. Innovative Implementation Studies Conducted in US Safety Net Health Care Settings: A Systematic Review. *Am J Med Qual.* May/Jun 2019;34(3):293–306. doi:10.1177/1062860618798469 [PubMed: 30198304]
36. New York State Department of Health. Recommended ICD 10-CM Codes for PrEP (pre-exposure prophylaxis) and PEP (post-exposure prophylaxis). Accessed April 30th, 2019. https://www.health.ny.gov/diseases/aids/general/prep/docs/icd_codes.pdf.

Figure 1.
Cumulative incidence of HIV pre-exposure prophylaxis (PrEP) prescription among individuals with indications for PrEP at an urban safety-net health system.

Table 1.

Characteristics of 2,957 individuals who engaged in primary care and had documented indications for HIV pre-exposure prophylaxis (PrEP) at an urban safety-net health system, 2015 – 2019.

	<i>n</i> (%)
Sex	
Male	1,299 (44)
Female	1,658 (56)
Age (years)	
18 – 25	299 (10)
25 – 34	757 (26)
35 – 44	637 (22)
45 – 54	722 (24)
55 – 64	459 (16)
65	83 (3)
Race/ethnicity	
Non-Hispanic White	835 (28)
Non-Hispanic Black	1,415 (48)
Hispanic	567 (19)
Other	140 (5)
Insurance status	
Commercial insurance	397 (13)
Medicare/Medicaid	826 (28)
Hospital-based managed care plan	964 (33)
Uninsured	770 (27)
Indication for PrEP	
Sexually transmitted infection	508 (17)
Drug use disorders ^a	729 (25)
Diagnosis code for ‘high-risk sexual behavior’ ^b	1,720 (58)

^a Includes diagnosis for drug dependence, methamphetamine, and cocaine use.

^b Includes diagnosis for ‘high-risk sexual behavior’ (n=312); unprotected sex (n=130); contact with or exposure to sexually transmitted infection (n=1,278).