

# UC San Diego

## UC San Diego Previously Published Works

### Title

HIV Pre-exposure Prophylaxis Prescription Initiation and Maintenance Among Homeless-Experienced People Who Use Drugs

### Permalink

<https://escholarship.org/uc/item/44r5g39m>

### Journal

J AIDS Journal of Acquired Immune Deficiency Syndromes, 98(3)

### ISSN

1525-4135

### Authors

Eger, William H

Shaw, Leah C

Biello, Katie B

et al.

### Publication Date

2025-03-01

### DOI

10.1097/qai.0000000000003568

Peer reviewed



Published in final edited form as:

*J Acquir Immune Defic Syndr.* 2025 March 01; 98(3): 234–241. doi:10.1097/QAI.0000000000003568.

## HIV Pre-exposure Prophylaxis Prescription Initiation and Maintenance Among Homeless-Experienced People Who Use Drugs

William H. Eger, MPH<sup>a,b</sup>, Leah C. Shaw, MPH<sup>c,d</sup>, Katie B. Biello, PhD<sup>d</sup>, Claudia Lopez, BSc<sup>c,d</sup>, Jennifer K. Brody, MD, MPH<sup>c,e</sup>, Angela R. Bazzi, PhD, MPH<sup>f,g</sup>

<sup>a</sup>School of Social Work, San Diego State University, San Diego, CA

<sup>b</sup>School of Medicine, University of California San Diego, La Jolla, CA

<sup>c</sup>Institute for Research, Quality, and Policy in Homeless Health Care, Boston Health Care for the Homeless Program, Boston, MA

<sup>d</sup>Brown University School of Public Health, Providence, RI

<sup>e</sup>Harvard Medical School, Boston, MA

<sup>f</sup>Herbert Wertheim School of Public Health, University of California San Diego, La Jolla, CA

<sup>g</sup>Boston University School of Public Health, Boston, MA.

### Abstract

**Background:** HIV pre-exposure prophylaxis (PrEP) remains particularly underused among homeless-experienced people who use drugs (PWUD).

**Setting:** Boston Health Care for the Homeless Program, a Federally Qualified Health Center serving homeless-experienced individuals in Boston, Massachusetts.

**Methods:** To identify determinants of PrEP prescription initiation and continuation, we analyzed electronic medical records and pharmacy data between April 2018 and March 2022. Participants were HIV-negative and reported sexual, drug, or community-related HIV exposures. Adjusted multinomial logistic regression explored associations between sociodemographics, social vulnerabilities, behavioral factors (eg, injection drug use), and mental health and substance use disorder diagnoses with filling of 1 and more than 1 PrEP prescription.

Correspondence to: Angela R. Bazzi, PhD, MPH, Herbert Wertheim School of Public Health, University of California San Diego, 9500 Gilman Drive, San Diego, La Jolla, CA 92093 (abazzi@health.ucsd.edu). W.H.E. and L.C.S. had full access to all the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis. *Concept and design:* A.R.B., K.B.B. *Acquisition, analysis, or interpretation of data:* W.H.E., L.C.S., C.L. *Drafting of the manuscript:* W.H.E., L.C.S. *Critical review of the manuscript for important intellectual content:* W.H.E., L.C.S., K.B.B., C.L., J.B., A.R.B. *Statistical analysis:* W.H.E. *Obtained funding:* N/A. *Administrative, technical, or material support:* C.L., J.B. *Supervision:* K.B.B., A.R.B.

The authors have no funding or conflicts of interest to disclose.

Supplemental digital content is available for this article. Direct URL citations appear in the printed text and are provided in the HTML and PDF versions of this article on the journal's Web site ([www.jaids.com](http://www.jaids.com)).

De-identified data are available upon reasonable request to Angela R. Bazzi at [abazzi@health.ucsd.edu](mailto:abazzi@health.ucsd.edu).

The Brown University Institutional Review Board reviewed and approved this protocol for analyzing de-identified data.

**Results:** Among 509 participants, mean age was 38 years, 28% were women, 19% were Black, and 24% were Hispanic/Latino. At program enrollment, most were experiencing homelessness (92%), injecting drugs (78%), and living with a mental health disorder (71%). In multivariable-adjusted models, injection drug use was positively associated with filling 1 and more than 1 PrEP prescription (adjusted odds ratio [AOR]: 2.88, 95% confidence interval [CI]: 1.33 to 6.26; and AOR: 3.60, 95% CI: 2.02 to 6.42, respectively). Participants with opioid use disorder and generalized anxiety disorder were more likely to fill 1 and more than 1 prescription, whereas those with bipolar disorder were less likely to fill 1 prescription. No sociodemographic characteristics, sexual behaviors, or other mental health or substance use disorders were associated with study outcomes.

**Conclusions:** A low-threshold, harm reduction-oriented PrEP program supported prescription initiation and continuation for homeless-experienced PWUD. Implementation research is needed to facilitate scale-up of this approach.

### Keywords

HIV prevention; people who use drugs; injection drug use; homelessness

## INTRODUCTION

People who use drugs (PWUD), especially those who inject drugs, are a priority community for HIV prevention efforts.<sup>1,2</sup> PWUD face HIV acquisition risk from injection and sexual exposures in the context of substance use disorders (SUD).<sup>2-4</sup> Oral antiretroviral HIV pre-exposure prophylaxis (PrEP) can prevent up to 74% and 99% of HIV transmissions among persons at risk from injection and sexual exposures, respectively,<sup>5,6</sup> and is a key strategy highlighted in the United States Ending the HIV Epidemic Initiative.<sup>1</sup> However, widespread implementation of PrEP for PWUD remains limited,<sup>7-9</sup> especially for those using unregulated substances such as fentanyl and methamphetamine, who face a disproportionate burden of homelessness and additional, intersecting structural barriers.<sup>10,11</sup>

Specific challenges to oral PrEP access and use for PWUD currently experiencing or who have experienced homelessness (hereafter “homeless-experienced PWUD”) include comorbid mental health and substance use disorders, intersectional stigma within health care settings, and lost or stolen prescriptions because of housing insecurity.<sup>12-14</sup> In addition, some prescribers are hesitant to prescribe oral PrEP to PWUD, particularly those with current or past experiences of homelessness. This is often because of the belief that these individuals are not “ideal” candidates for PrEP because they may struggle to adhere to daily oral medications, attend scheduled appointments, or otherwise be retained in care.<sup>15</sup> These concerns may be reinforced by the omission of PWUD from clinical trials and specific prescribing guidelines, particularly in the context of recently approved long-acting injectable PrEP modalities.<sup>16</sup> Yet, emerging research from real-world programs has suggested that appropriate supports can help PWUD adhere to daily medications (eg, for HIV and hepatitis C virus treatment),<sup>14,17,18</sup> especially in community-based settings.<sup>19</sup>

The “motivational PrEP cascade” conceptualizes behavior change along a continuum of PrEP care that helps identify actionable intervention targets across 5 stages: (1) PrEP

precontemplation; (2) PrEP contemplation; (3) PrEP action and initiation; and (5) PrEP maintenance.<sup>20</sup> Although PrEP awareness remains low among PWUD compared with other priority communities for HIV prevention (eg, men who have sex with men),<sup>21,22</sup> there are even greater gaps between PrEP awareness and initiation in this community. Advancing PrEP implementation and delivery strategies to address the multiple intersecting barriers to PrEP for homeless-experienced PWUD could increase the proportion of this community that moves through the PrEP case cascade,<sup>14</sup> yet these strategies remain scarce and understudied.

Indeed, early studies of a low-threshold, harm reduction-oriented oral PrEP program implemented by Boston Health Care for the Homeless Program (BHCHP) revealed that, in less than 2 years of operation, the organization doubled the number of PrEP prescriptions written to homeless-experienced PWUD and achieved a 44% cumulative probability of retaining PrEP patients in care for 6 months, a retention level similar to those observed in other communities lacking the extensive, intersecting structural barriers experienced by BHCHP's patient population.<sup>23</sup> This harm reduction-oriented oral PrEP program combined several innovative components, including intensive yet flexible navigation services, phone- and street-based outreach (with phlebotomy and medication provision), appointment accompaniment, and flexible prescription lengths (ranging from 1 to 30 days), which were found to be highly acceptable and feasible among patients and providers.<sup>24</sup> However, this early evaluation research did not investigate potential subgroup differences in PrEP initiation or maintenance, leaving knowledge gaps regarding specific social, behavioral, and health vulnerabilities that may present significant challenges to PrEP prescription initiation and maintenance. Furthermore, previous research has been conducted over relatively brief periods and has overemphasized the earliest stages of the motivational PrEP cascade (eg, precontemplation and contemplation).<sup>25,26</sup> To better inform future scale-up of this innovative approach, including adaptations that may help support the most vulnerable individuals who could benefit from PrEP, this analysis extends previous research by examining the determinants of PrEP initiation and maintenance over a longer period (approximately 4 years). We hypothesized that specific sociodemographics (eg, Black race), social vulnerabilities (eg, unsheltered homelessness), behaviors (eg, injection drug use), and mental health and substance use disorder diagnoses (eg, depressive disorder, OUD) would negatively affect individuals' PrEP prescription initiation and maintenance.

## MATERIALS AND METHODS

### Study Design and Participants

This retrospective study from BHCHP's PrEP program includes all HIV-negative individuals who were referred to receive oral PrEP from April 2018 to March 2022 and who had a minimum follow-up period of 60 days to allow time to receive more than 1 PrEP prescription. BHCHP is a Federally Qualified Health Center (FQHC) in Boston, MA, that serves >10,000 homeless-experienced individuals annually. Through over 30 clinical sites (eg, clinics, shelters, vans, motels, drop-in centers), BHCHP provides a range of services tailored to the needs of homeless-experienced individuals. Eligible participants for BHCHP's PrEP program included HIV-negative individuals reporting sexual or drug use

behaviors that are associated with increased risk for HIV transmission (eg, transactional sex, condomless sex, receptive sharing of syringes, or other drug injection preparation equipment). Current homelessness, substance use, or primary care utilization were not prerequisites for receiving PrEP care, and any person seeking PrEP could be seen at BHCHP. All eligible individuals were referred to the PrEP program by BHCHP's HIV counselors, clinicians, or personnel from partner organizations, including local syringe services programs and shelters. The Brown University Institutional Review Board (IRB) reviewed and approved this protocol for analyzing de-identified data, as described below.

## Data Collection & Measures

**Data Collection**—We extracted data from BHCHP's PrEP program notes, electronic medical records (EMRs), and pharmacy records. BHCHP's PrEP program staff maintained an internal tracking system to document PrEP clinical indicators, intakes, follow-up appointments, laboratory tests, and other points of contact with participants. These data provided program staff with real-time information on the number of participants on PrEP and their specific needs for follow-up. In addition, EMR and pharmacy data were extracted to provide information on race/ethnicity, housing status, substance use and mental health disorder diagnoses, and PrEP prescription dispensing dates. All data were merged at the participant level and de-identified.

**Outcomes of Interest**—The number of times a participant picked up (ie, “filled”) an oral PrEP prescription from the BHCHP pharmacy was categorized into a nominal, 3-level variable indicating whether a participant filled a PrEP prescription zero times (ie, prescribed but never picked up), exactly once (ie, initial prescription only), or more than once (ie, multiple prescriptions) after their enrollment into the BHCHP PrEP program. We, therefore, operationalized filling a prescription exactly once as “initiation” and filling a prescription more than once as “maintenance.”

**Primary Exposures of Interest**—Exposures of interest included *sociodemographics*, *social vulnerabilities*, *behaviors*, and *mental health and substance use disorder diagnoses* that we hypothesized could affect individuals' PrEP prescription initiation and maintenance. *Behaviors* were pulled from the internal tracking system, and all other primary exposures of interest were pulled from the EMR.

*Sociodemographics* included race (categorized as White, Black, or Other/Multiple/Unknown, which included Asian, Pacific Islander, multiple, or unknown race); Hispanic/Latino ethnicity (dichotomous); gender (categorized as cisgender woman, cisgender man, transgender/nonbinary); and sexual orientation (classified as straight, gay/lesbian, bisexual/other, or unknown).

Social vulnerabilities included housing status (classified from BHCHP's standard list of options as a 3-level variable indicating those not currently experiencing homelessness [housed with or without supportive services], currently experiencing sheltered homelessness [“doubled up” or in a shelter, motel, transitional housing, or residential treatment program], or currently experiencing unsheltered homelessness [ie, living on the street]) and whether they had a primary care provider (including providers external to BHCHP if such

information was available, and dichotomized) at the time of PrEP program referral. Of note, is that all participants receiving services from BHCHP have previous experiences with homelessness and are thus considered “homeless experienced.”

Behaviors included past-month injection drug use and sexual behaviors associated with HIV transmission (eg, transactional sex, multiple sex partners, condomless sex), which were self-reported by participants at the time of PrEP program referral.

*Mental health disorder diagnoses* included generalized anxiety disorder, depressive disorder, bipolar disorder, schizophrenia, and post-traumatic stress disorder (PTSD), which were obtained from the EMR (ie, active diagnosis on the problem list, ICD-10 codes) at the time of PrEP program referral (see Table 1, Supplemental Digital Content, <http://links.lww.com/QAI/C392>). We also created a variable for “any mental health diagnosis” that combined these diagnoses.

*Substance use disorder (SUD) diagnoses*, also obtained from the EMR (see Table 1, Supplemental Digital Content, <http://links.lww.com/QAI/C392>), included alcohol use disorder, opioid use disorder (OUD), and stimulant use disorder (which included cocaine and/or methamphetamine use disorders). We also created a dichotomous variable for use in separate analyses called “any SUD” that combined these diagnoses. Last, we included whether participants with OUD received medications for opioid use disorder (MOUD; ie, buprenorphine or naltrexone) from BHCHP.

**Other Covariates**—Other covariates included age (in years, continuous); preferred language (English, Spanish, Other); insurance status (commercial, public [Medicaid, Medicare, Health Safety Net], or no coverage information); and time period. Insurance status was included as a covariate and not as a social vulnerability because of a lack of variation in levels of this variable in our sample.

*Time period* was created by dividing the data chronologically into 16 mutually exclusive and consecutive 3-month periods (“quarters”) starting from April 2018 and ending in March 2022. A detailed list of each time period is outlined in Table 2, Supplemental Digital Content, <http://links.lww.com/QAI/C392>.

## Statistical Analysis

We first calculated descriptive statistics to characterize subgroups of participants by PrEP prescription outcome categories (ie, none, 1, or more than 1 prescription filled since program enrollment). Next, we used multivariable multinomial logistic regression to estimate adjusted odds ratios (AORs) and 95% confidence intervals (CIs) to examine the effects of our primary exposures of interest on our PrEP prescription outcome, with no PrEP prescriptions filled (ie, prescribed but never picked up) as the reference category. For all regression analyses, we adjusted for time period and used separate adjusted models accounting for relevant covariates to examine the effects of each exposure of interest on our outcome based on existing literature and hypothesized causal mechanisms. To identify the appropriate variables to include in each adjusted model to account for potential confounding, we created directed acyclic graphs (DAGs) to depict known or plausible causal

interrelationships among each exposure of interest, each outcome of interest, and relevant covariates (see Table 1 footnotes).<sup>27</sup> Thus, variables in our multivariable models were based on our hypotheses about the known or plausible causal interrelationships depicted in our DAGs rather than associations observed in unadjusted analyses. To interpret each exposure–outcome relationship, we focused on the effect estimate’s magnitude and the range of values within its confidence interval.<sup>28,29</sup> We created all DAGs in DAGitty. net and used R version 4.2.2. for statistical analyses.

Given that PrEP prescriptions could range from 1 to 30 days in length, we also conducted a separate sensitivity analysis to determine if participants with shorter PrEP prescriptions ( $\leq 7$  days) were more or less likely to continue PrEP than participants with longer PrEP prescriptions ( $> 7$  days), which revealed no differences between the groups.

## RESULTS

Among 509 HIV-negative participants referred to BHCHP’s PrEP program between April 2018 and March 2022, the mean age was 38.1 years (SD: 8.77), and a minority identified as cisgender women (28%), Black (19%), Hispanic/ Latino (24%), and gay/lesbian (4%); 7.9% spoke Spanish (Table 2). Most (92%) were currently experiencing homelessness at the time of program referral, with 51% being sheltered and 41% being unsheltered. Most had public insurance (98%) and about half had a primary care provider (51%). Most reported past-month injection drug use (78%) and 40% reported past-month sexual behaviors associated with HIV transmission. The majority had at least 1 mental health disorder diagnosis (71%), including generalized anxiety disorder (42%), depressive disorder (40%), PTSD (22%), bipolar disorder (14%), and schizophrenia (3%). Most also had at least 1 SUD (77%), including OUD (69%), stimulant use disorder (31%), and alcohol use disorder (18%). However, although the most common SUD diagnosis was OUD (69%), only 17% of participants with OUD were receiving MOUD (ie, buprenorphine or naltrexone) from BHCHP at the time of PrEP program referral. Overall, 146 (29%) filled zero PrEP prescriptions, 84 (17%) filled 1 PrEP prescription, and 279 (55%) filled more than 1 PrEP prescription.

After covariate adjustment, compared with those who had not recently injected drugs, participants reporting past-month injection drug use had 2.88 times higher odds of picking up 1 PrEP prescription (vs. none; 95% CI: 1.33 to 6.26; Table 1). Participants with generalized anxiety disorder (AOR = 1.96; 95% CI: 1.08 to 3.54), OUD (AOR = 1.94; 95% CI: 0.96 to 3.94), and any SUD (AOR = 3.09; 95% CI: 1.40 to 6.80) also had higher odds of filling 1 PrEP prescription (vs. none). Participants with bipolar disorder, however, had lower odds of filling 1 PrEP prescription (vs. none; AOR = 0.27, 95% CI: 0.10 to 0.76). Also in separate multivariable models, participants reporting past-month injection drug use (AOR = 3.60; 95% CI: 2.02 to 6.42), generalized anxiety disorder (AOR = 1.84; 95% CI: 1.17 to 2.89), OUD (AOR = 1.83; 95% CI: 1.09 to 3.09), and any SUD (AOR = 1.96; 95% CI: 1.13 to 3.41) were more likely to fill multiple PrEP prescriptions (vs. none). Sociodemographics, sexual behaviors, and other mental health and SUDs were not associated with study outcomes.

## DISCUSSION

In this multiyear evaluation of an innovative, low-threshold PrEP program, we found that over half of homeless-experienced PWUD facing a high burden of social, behavioral, and health vulnerabilities were able to fill multiple PrEP prescriptions. When investigating subgroup differences according to specific sources of vulnerability (and likely elevated levels of PrEP need), we found that participants who recently injected drugs, had generalized anxiety disorder, and had various substance use disorders (especially OUD) were more likely to pick up an initial and at least 1 subsequent PrEP prescription. The success of the program in supporting PrEP use among homeless-experienced PWUD with elevated sources of vulnerability likely relied, in part, on the low-threshold, collaborative, flexible nature of this program,<sup>24</sup> underscoring the importance of tailoring PrEP services for homeless-experienced PWUD. Despite this program's unique strengths and context, our findings may carry implications for bringing this innovative approach to scale.

Overall, more than half of BHCHP's PrEP program participants filled multiple PrEP prescriptions, which is high, even compared with other more stably housed communities.<sup>30</sup> We attribute the increased rate of PrEP prescription maintenance, in part, to BHCHP's low-threshold, harm reduction-based model that does not penalize missed appointments or active substance use, tailors supports to meet the needs of individual participants and provides intensive phone- and street-based outreach, outreach-based phlebotomy, and accompaniment to appointments. In addition, in response to pervasive homeless encampment sweeps nationally and in Boston,<sup>31,32</sup> the BHCHP pharmacy provided flexible PrEP prescriptions (such as 7-day pill bottles) that participants could more easily replace if their medication was lost or stolen and offered a weeklong window to provide confirmatory HIV test results to sustain participants in follow-up PrEP care. This prescription flexibility, combined with other medication maintenance plans discussed at intake that included safe medication storage and directly observed therapy (DOT), likely facilitated participants' ability to continually receive PrEP despite traditional maintenance challenges such as losing their medication.

Importantly, we found that participants who recently injected drugs were more than twice as likely to receive initial and multiple PrEP prescriptions compared with those who had not injected drugs. This may relate to the expertise of BHCHP's staff that centers people who inject drugs as their priority population for PrEP, the co-location of addiction treatment services, and the rapid-start approach to PrEP delivery. First, BHCHP had a dedicated PrEP navigation team that supported PrEP outreach efforts directly tailored to homeless-experienced PWUD and offered outreach-based phlebotomy and care coordination with clinic-based teams. In addition, street-based Harm Reduction nurses offered mobile safe medication storage and DOT in which they hand-delivered PrEP 7 days per week in high-density areas of homelessness and injection drug use. Second, compared with a traditional service delivery model where separate providers in siloed settings prescribe PrEP and MOUD,<sup>33</sup> BHCHP has a co-located office-based addiction treatment (OBAT) program offering MOUD that was used to support, engage, and retain participants with OUD, many of whom are indicated for PrEP.<sup>34</sup> Although receiving MOUD from BHCHP was not independently associated with PrEP initiation or maintenance in our analysis, it is

possible that participants were receiving MOUD from other sources (predominantly offsite methadone programs), which may have biased our results. However, it is still likely that the expertise of BHCHP staff and co-located PrEP and OBAT services supported participants who inject drugs and those living with SUDs (particularly OUD), who we also observed to be nearly twice as likely to continue PrEP than others, regardless of MOUD receipt. Third, BHCHP provides same-day access to both PrEP and MOUD. The process of receiving these prescriptions in more traditional settings is complicated and may take weeks, which contributes to medication discontinuation for homeless-experienced PWUD.<sup>35</sup> Same-day access to these co-located services can streamline processes and circumvent the need for PrEP-specific appointments that may be of lower priority to homeless experienced PWUD with OUD,<sup>22,36</sup> resulting in the higher initiation and maintenance of PrEP seen with this group. Finally, previous research has suggested that local health and harm reduction efforts by BHCHP and other partner organizations may have increased community awareness of recent HIV outbreaks, leading to an increased perceived need for PrEP among participants who inject drugs.<sup>24,37</sup>

Despite the success of the BHCHP PrEP program, especially for specific subgroups of homeless-experienced PWUD, we found that participants diagnosed with bipolar disorder were less likely to initiate PrEP. In 2021, BHCHP started street-based behavioral health services centered on unsheltered PWUD and collaborated with the PrEP navigation team. However, further efforts may be needed to integrate onsite PrEP services with behavioral and mental health care, particularly those for more serious mental illnesses such as bipolar and schizophrenia.<sup>38</sup> Although it is not well understood why those with generalized anxiety disorder were more likely to persist in PrEP care than those with other mental health diagnoses, co-location of mental health services for participants with these challenges, in combination with co-located MOUD, may further facilitate PrEP initiation and maintenance in this community.

There are several limitations to this study. First, we used EMR data, which may be prone to missing information and inconsistencies over time that could have affected the accuracy of results.<sup>39,40</sup> In addition, homeless-experienced PWUD regularly experience multilevel barriers to health care access, including stigma that results in avoidance of traditional health care settings, mistrust of health care providers, and underreporting of substance use behaviors or SUD symptoms. Nevertheless, BHCHP's EMR is continuously monitored for federally established quality benchmarks, and providers are viewed with higher levels of trust by patients, possibly increasing the quality and completeness of the data. In addition, individuals who are well connected to BHCHP, possibly through primary care or the OBAT team, may be more likely to have active diagnoses in the EMR. Second, clinical indications for PrEP (ie, risk for HIV) and our exposures of interest were assessed at a single point upon referral to BHCHP's PrEP program. Yet, individuals' risk for HIV and their behaviors may change over time, affecting their PrEP need, interest, and use. Additional longitudinal data would be required to understand the evolution of PrEP needs over time in this population. Third, this analysis of prescription outcomes did not assess actual PrEP uptake, adherence, or retention in longer-term PrEP-related care, which are critical components of the PrEP care continuum that remain essential areas for future research. In addition, this study does not consider that a person could have received PrEP from other

organizations or transferred care at any point to another health care facility. Finally, BHCHP is a unique program located within an urban center in a state with nearly universal health insurance coverage, limiting the generalizability of our findings to other contexts. Yet, there are hundreds of FQHCs operating nationally,<sup>41</sup> and homelessness and street sweeps of homeless encampments (despite the documented public health harm of these interventions) are increasing nationally.<sup>32,42</sup>

## CONCLUSIONS

This study highlights how a low-threshold PrEP program tailored to the needs of homeless-experienced PWUD can successfully provide initial and continued PrEP prescriptions while reaching particularly vulnerable subgroups of individuals with recent injection drug use, generalized anxiety disorder, and OUD. Despite the unique attributes of BHCHP's innovative PrEP program, findings here underscore the potential of intensive navigation and outreach, interdisciplinary and community-based collaboration, and flexible and same-day low-threshold services for effectively delivering underused preventative services to vulnerable unhoused communities living with multiple comorbid health conditions. This work can inform PrEP clinical guidelines for homeless-experienced PWUD by highlighting the ability of this community to initiate and maintain PrEP with appropriate supports. Updated guidelines may emphasize same-day access to PrEP and combination MOUD. However, future studies are needed to identify specific implementation considerations that likely influence the adaptability and sustainability of BHCHP's PrEP program in other settings, addressing program cost and complexity in particular.<sup>43</sup> Additional research is also needed to test specific implementation strategies (eg, community engagement, peer champions) that could help bring this innovative programmatic approach to scale.<sup>44</sup> As the United States is experiencing an unprecedented housing crisis and increasing incidence of HIV and other infections resulting from substance use, there is an immense need for a paradigm shift in how PrEP and other preventative medications are marketed and how providers view care for homeless-experienced PWUD to encourage medication initiation and maintenance in this highly vulnerable community.

## Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

## ACKNOWLEDGMENTS

The authors gratefully acknowledge the Boston Health Care for the Homeless Program staff and participants who contributed their skills, knowledge, and time to facilitate and participate in this project.

Supported in part by the National Institute on Drug Abuse (grants R01DA051849, R01DA047975, and T32DA023356) and the Providence/Boston Center for AIDS Research (P30AI042853).

## REFERENCES

1. Fauci AS, Redfield RR, Sigounas G, et al. Ending the HIV epidemic: a plan for the United States. *JAMA*. 2019;321:844–845. [PubMed: 30730529]
2. HIV and injection drug Use; 2021.

3. HIV in the United States and Dependent Areas. Centers for Disease Control and Prevention. Available at: <https://www.cdc.gov/hiv/statistics/overview/ata glance.html>. Accessed April 11, 2022.
4. Kenny KS, Kolla G, Greig S, et al. Association of illicit fentanyl use with injection risk practices among people who inject drugs. *AIDS Behav.* 2023;27:1757–1765. [PubMed: 36401145]
5. 2021 key strategies in the plan; 2020.
6. Effectiveness of prevention strategies to reduce the risk of acquiring or transmitting HIV; 2022.
7. Mayer KH, Chan PA, Patel RR, et al. Evolving models and ongoing challenges for HIV preexposure prophylaxis implementation in the United States. *J Acquir Immune Defic Syndr.* 2018;77:119–127. [PubMed: 29084044]
8. Sullivan PS, Siegler AJ. Getting pre-exposure prophylaxis (PrEP) to the people: opportunities, challenges and emerging models of PrEP implementation. *Sex Health.* 2018;15:522–527. [PubMed: 30476461]
9. Biello KB, Mimiaga MJ, Valente PK, et al. The past, present, and future of PrEP implementation among people who use drugs. *Curr HIV/AIDS Rep.* 2021;18:328–338. [PubMed: 33907971]
10. Linton SL, Celentano DD, Kirk GD, et al. The longitudinal association between homelessness, injection drug use, and injection-related risk behavior among persons with a history of injection drug use in Baltimore, MD. *Drug Alcohol Depend.* 2013;132:457–465. [PubMed: 23578590]
11. Milloy MJ, Kerr T, Bangsberg DR, et al. Homelessness as a structural barrier to effective antiretroviral therapy among HIV-seropositive illicit drug users in a Canadian setting. *AIDS Patient Care STDS.* 2012;26:60–67. [PubMed: 22107040]
12. Turan JM, Elafros MA, Logie CH, et al. Challenges and opportunities in examining and addressing intersectional stigma and health. *BMC Med.* 2019;17:7. [PubMed: 30764816]
13. Meyers SA, Earnshaw VA, D'Ambrosio B, et al. The intersection of gender and drug use-related stigma: a mixed methods systematic review and synthesis of the literature. *Drug Alcohol Depend.* 2021;223:108706. [PubMed: 33901753]
14. Biello KB, Bazzi AR, Mimiaga MJ, et al. Perspectives on HIV preexposure prophylaxis (PrEP) utilization and related intervention needs among people who inject drugs. *Harm Reduct J.* 2018;15:55. [PubMed: 30419926]
15. Edelman EJ, Moore BA, Calabrese SK, et al. Primary care physicians' willingness to prescribe HIV pre-exposure prophylaxis for people who inject drugs. *AIDS Behav.* 2017;21:1025–1033. [PubMed: 27896552]
16. Brody JK, Taylor J, Biello K, et al. Towards equity for people who inject drugs in HIV prevention drug trials. *Int J Drug Policy.* 2021;96:103284. [PubMed: 34092469]
17. Bazzi AR, Drainoni ML, Biancarelli DL, et al. Systematic review of HIV treatment adherence research among people who inject drugs in the United States and Canada: evidence to inform pre-exposure prophylaxis (PrEP) adherence interventions. *BMC Public Health.* 2019;19:31. [PubMed: 30621657]
18. Eckhardt B, Mateu-Gelabert P, Aponte-Melendez Y, et al. Accessible hepatitis C care for people who inject drugs: a randomized clinical trial. *JAMA Intern Med.* 2022;182:494–502. [PubMed: 35285851]
19. Schwarz T, Horváth I, Fenz L, et al. Interventions to increase linkage to care and adherence to treatment for hepatitis C among people who inject drugs: a systematic review and practical considerations from an expert panel consultation. *The Int J Drug Pol.* 2022;102:103588.
20. 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. *J Acquir Immune Defic Syndr.* 2017;74:285–292. [PubMed: 28187084]
21. National Institute on Drug Abuse (NIDA). Awareness and use of preexposure prophylaxis for HIV rise in at-risk groups, but not enough. Available at: <https://nida.nih.gov/news-events/nida-notes/2021/03/awareness-use-pre-exposure-prophylaxis-for-hiv-rise-in-at-risk-groups-but-not-enough>. Accessed June 6, 2023.
22. Bazzi AR, Biancarelli DL, Childs E, et al. Limited knowledge and mixed interest in pre-exposure prophylaxis for HIV prevention among people who inject drugs. *AIDS Patient Care STDS.* 2018;32:529–537. [PubMed: 30311777]

23. Biello KB, Bazzi AR, Vahey S, et al. Delivering preexposure prophylaxis to people who use drugs and experience homelessness, Boston, MA, 2018–2020. *Am J Public Health*. 2021;111:1045–1048. [PubMed: 33950728]
24. Bazzi AR, Shaw LC, Biello KB, et al. Patient and provider perspectives on a novel, low-threshold HIV PrEP program for people who inject drugs experiencing homelessness. *J Gen Intern Med*. 2023;38:913–921.
25. Kitzman JV, Booth NH, Hatch RC, et al. Antagonism of xylazine sedation by 4-aminopyridine and yohimbine in cattle. *Am J Vet Res*. 1982;43:2165–2169. [PubMed: 6131631]
26. Merle JL, Zapata JP, Quieroz A, et al. Pre-exposure prophylaxis (PrEP) among people who use drugs: a qualitative scoping review of implementation determinants and change methods. *Addict Sci Clin Pract*. 2024;19:46. [PubMed: 38816889]
27. Greenland S, Pearl J, Robins JM. Causal diagrams for epidemiologic research. *Epidemiology*. 1999;10:37–48. [PubMed: 9888278]
28. Sterne JA, Davey Smith G. Sifting the evidence—what’s wrong with significance tests? *BMJ*. 2001;322:226–231. [PubMed: 11159626]
29. Amrhein V, Greenland S, McShane B. Scientists rise up against statistical significance. *Nature*. 2019;567:305–307. [PubMed: 30894741]
30. Hojilla JC, Vlahov D, Crouch PC, et al. HIV pre-exposure prophylaxis (PrEP) uptake and retention among men who have sex with men in a community-based sexual health clinic. *AIDS Behav*. 2018;22:1096–1099. [PubMed: 29243109]
31. Qi D, Abri K, Mukherjee MR, et al. Health impact of street sweeps from the perspective of healthcare providers. *J Gen Intern Med*. 2022;37:3707–3714. [PubMed: 35296981]
32. Goldshear JL, Kitonga N, Angelo N, et al. Notice of major cleaning”: a qualitative study of the negative impact of encampment sweeps on the ontological security of unhoused people who use drugs. *Soc Sci Med*. 2023;339:116408. [PubMed: 37980786]
33. Eger WH, Altice FL, Lee J, et al. Using nominal group technique to identify barriers and facilitators to preventing HIV using combination same-day pre-exposure prophylaxis and medications for opioid use disorder. *Harm Reduction J*. 2022;19:120.
34. Earlywine JJ, Bazzi AR, Biello KB, et al. High prevalence of indications for pre-exposure prophylaxis among people who inject drugs in Boston, Massachusetts. *Am J Prev Med*. 2021;60:369–378. [PubMed: 33229144]
35. Kamis KF, Marx GE, Scott KA, et al. Same-day HIV pre-exposure prophylaxis (PrEP) initiation during drop-in sexually transmitted diseases clinic appointments is a highly acceptable, feasible, and safe model that engages individuals at risk for HIV into PrEP care. *Open Forum Infect Dis*. 2019;6:ofz310. [PubMed: 31341933]
36. Motavalli D, Taylor JL, Childs E, et al. “Health is on the back burner:” multilevel barriers and facilitators to primary care among people who inject drugs. *J Gen Intern Med*. 2021;36:129–137. [PubMed: 32918199]
37. Shaw LC, Biello KB, Vahey S, et al. PrEP disclosure and discussions within social networks of people who inject drugs experiencing homelessness: a brief report. *BMC Public Health*. 2023;23:263. [PubMed: 36750814]
38. Substance Abuse and Mental Health Services Administration. Key Substance Use and Mental Health Indicators in the United States: Results from the 2021 National Survey on Drug Use and Health. Center for Behavioral Health Statistics and Quality SAaMHSA; 2022. Available at: <https://www.samhsa.gov/data/report/2021-nsduh-annual-national-report>
39. Honeyford K, Expert P, Mendelsohn EE, et al. Challenges and recommendations for high quality research using electronic health records. *Front Digit Health*. 2022;4:940330. [PubMed: 36060540]
40. Edmondson ME, Reimer AP. Challenges frequently encountered in the secondary use of electronic medical record data for research. *Comput Inform Nurs*. 2020;38:338–348. [PubMed: 32149742]
41. Definitive Healthcare. How many federally qualified health centers are there? Available at: <https://www.definitivehc.com/blog/how-many-fqhcs-are-there>. Accessed January 29, 2024.
42. Barocas JA, Nall SK, Axelrath S, et al. Population-level health effects of involuntary displacement of people experiencing unsheltered homelessness who inject drugs in US cities. *JAMA*. 2023;329:1478–1486. [PubMed: 37036716]

43. Damschroder LJ, Aron DC, Keith RE, et al. Fostering implementation of health services research findings into practice: a consolidated framework for advancing implementation science. *Implementation Sci IS*. 2009;4:50. [PubMed: 19664226]
44. Powell BJ, Waltz TJ, Chinman MJ, et al. A refined compilation of implementation strategies: results from the Expert Recommendations for Implementing Change (ERIC) project. *Implementation Sci IS*. 2015;10:21. [PubMed: 25889199]

Author Manuscript

Author Manuscript

Author Manuscript

Author Manuscript

TABLE 1.

Associations Between Filling None, One, and More Than One PrEP Prescription and Sociodemographics, Social Vulnerabilities, Behaviors Associated With HIV Transmission, and Mental Health and Substance use Disorder Diagnoses at the Time of PrEP Program Referral (N = 509), April 2018 to March 2022

|                                                                    | Filled 1 PrEP Prescription (n = 84) AOR<br>(95% CI) * | Filled More than 1 PrEP Prescription (n=279) AOR<br>(95% CI) * |
|--------------------------------------------------------------------|-------------------------------------------------------|----------------------------------------------------------------|
| Sociodemographics <sup>†</sup>                                     |                                                       |                                                                |
| Gender                                                             |                                                       |                                                                |
| Cisgender woman                                                    | 1.00 (0.54 to 1.83)                                   | 0.88 (0.56 to 1.39)                                            |
| Transgender/nonbinary                                              | 0.89 (0.26 to 3.09)                                   | 0.57 (0.23 to 1.43)                                            |
| Race                                                               |                                                       |                                                                |
| Black                                                              | 1.11 (0.54 to 2.26)                                   | 1.09 (0.64 to 1.88)                                            |
| Other/Multiple/Unknown                                             | 0.66 (0.33 to 1.32)                                   | 0.69 (0.42 to 1.15)                                            |
| Ethnicity                                                          |                                                       |                                                                |
| Hispanic or Latino/a                                               | 0.93 (0.47 to 1.84)                                   | 1.25 (0.76 to 2.05)                                            |
| Sexual orientation                                                 |                                                       |                                                                |
| Gay/lesbian                                                        | 0.40 (0.08 to 2.05)                                   | 0.56 (0.20 to 1.57)                                            |
| Bisexual/other                                                     | 0.45 (0.11 to 1.83)                                   | 0.51 (0.19 to 1.34)                                            |
| Social vulnerabilities                                             |                                                       |                                                                |
| Housing                                                            |                                                       |                                                                |
| Sheltered homelessness <sup>‡,§</sup>                              | 0.91 (0.33 to 2.50)                                   | 0.87 (0.39 to 1.95)                                            |
| Unsheltered homelessness <sup>‡,  </sup>                           | 0.81 (0.27 to 2.42)                                   | 1.85 (0.79 to 4.35)                                            |
| Has a BHCHP primary care provider <sup>¶</sup>                     | 0.78 (0.41 to 1.49)                                   | 1.08 (0.66 to 1.77)                                            |
| Behaviors                                                          |                                                       |                                                                |
| Injected drugs <sup>#</sup>                                        | 2.88 (1.33 to 6.26)                                   | 3.60 (2.02 to 6.42)                                            |
| Sexual behaviors associated with HIV transmission <sup>**,††</sup> | 1.45 (0.73 to 2.87)                                   | 1.27 (0.76 to 2.15)                                            |
| Mental health disorder diagnoses                                   |                                                       |                                                                |
| Depressive disorder <sup>##</sup>                                  | 1.10 (0.60 to 1.99)                                   | 0.97 (0.62 to 1.51)                                            |
| Generalized anxiety disorder <sup>##</sup>                         | 1.96 (1.08 to 3.54)                                   | 1.84 (1.17 to 2.89)                                            |
| Bipolar disorder <sup>##</sup>                                     | 0.27 (0.10 to 0.76)                                   | 0.71 (0.40 to 1.26)                                            |

|                                                   | Filled 1 PrEP Prescription (n = 84) AOR<br>(95% CI) * | Filled More than 1 PrEP Prescription (n=279) AOR<br>(95% CI) * |
|---------------------------------------------------|-------------------------------------------------------|----------------------------------------------------------------|
| Schizophrenia <sup>##</sup>                       | 0.35 (0.04 to 3.40)                                   | 0.90 (0.25 to 3.24)                                            |
| PTSD <sup>##</sup>                                | 1.15 (0.56 to 2.36)                                   | 1.39 (0.82 to 2.37)                                            |
| Any major mental health disorder <sup>##,§§</sup> | 0.90 (0.47 to 1.73)                                   | 1.37 (0.83 to 2.26)                                            |
| SUD diagnoses                                     |                                                       |                                                                |
| Alcohol use disorder <sup>  </sup>                | 1.10 (0.51 to 2.40)                                   | 1.06 (0.59 to 1.90)                                            |
| Stimulant use disorder <sup>**</sup>              | 1.23 (0.64 to 2.38)                                   | 1.14 (0.69 to 1.88)                                            |
| Opioid use disorder (OUD) <sup>**</sup>           | 1.94 (0.96 to 3.94)                                   | 1.83 (1.09 to 3.09)                                            |
| Participants with OUD on MOUD <sup>¶,##</sup>     | 2.09 (0.82 to 5.37)                                   | 1.25 (0.56 to 2.78)                                            |
| Any SUD diagnosis <sup>** ***</sup>               | 3.09 (1.40 to 6.80)                                   | 1.96 (1.13 to 3.41)                                            |

\* AOR (95% CI) = adjusted odds ratio and 95% confidence interval for multivariable multinomial logistic regression models with none (ie, prescribed but never picked up) as the reference category.

<sup>†</sup> All models with a sociodemographic exposure (ie, gender, race, ethnicity, and sexual orientation) were adjusted for time period only.

<sup>‡</sup> Adjusted for age, gender, preferred language, race, ethnicity, sexual orientation, and time period.

<sup>§</sup> Defined as living “doubled up” or in a shelter, transitional housing, residential treatment, housing with no supportive services, or motel.

<sup>||</sup> Defined as living on the street.

<sup>¶</sup> Adjusted for characteristics in (c) and housing status, injection drug use, any major mental health disorder, any substance use disorder, and high-risk sexual behavior.

<sup>#</sup> Adjusted for characteristics in (c) and housing status, any major mental health disorder, and high-risk sexual behavior.

<sup>\*\*</sup> Adjusted for characteristics in (c) and housing status, any major mental health disorder, and injection drug use.

<sup>††</sup> High-risk sexual behavior was listed as an indicator for PrEP from internal tracking.

<sup>##</sup> Adjusted for characteristics in (c) and housing status.

<sup>§§</sup> Defined as having an ICD-10 code for depressive disorder, generalized anxiety disorder, bipolar disorder, schizophrenia, or PTSD.

<sup>||</sup> Adjusted for characteristics in (j) and any major mental health disorder.

<sup>¶¶</sup> Adjusted for characteristics in (c) and housing status, injection drug use, any major mental health disorder, and stimulant use disorder.

<sup>###</sup> This model was limited to participants with opioid use disorder (n = 352).

<sup>\*\*\*</sup> Defined as having an ICD-10 code for alcohol use disorder, stimulant use disorder, or opioid use disorder.

TABLE 2.

Baseline Demographic Characteristics of HIV-Negative PWUD Attending a Low-Threshold Health Clinic in Boston, Massachusetts (N = 509), April 2018 to March 2022

|                                       | Did Not Fill a PrEP prescription (n = 146) | Filled 1 PrEP prescription (n = 84) | Filled More than 1 PrEP prescription (n = 279) | Overall (N = 509) |
|---------------------------------------|--------------------------------------------|-------------------------------------|------------------------------------------------|-------------------|
| Mean age at intake (SD)               | 37.7 (9.50)                                | 38.2 (9.16)                         | 38.3 (8.26)                                    | 38.1 (8.77)       |
| Gender                                |                                            |                                     |                                                |                   |
| Cisgender man                         | 92 (63.0%)                                 | 56 (66.7%)                          | 192 (68.8%)                                    | 340 (66.8%)       |
| Cisgender woman                       | 44 (30.1%)                                 | 24 (28.6%)                          | 76 (27.2%)                                     | 144 (28.3%)       |
| Transgender/nonbinary                 | 10 (6.8%)                                  | 4 (4.8%)                            | 11 (3.9%)                                      | 25 (4.9%)         |
| Race                                  |                                            |                                     |                                                |                   |
| White                                 | 85 (58.2%)                                 | 51 (60.7%)                          | 170 (60.9%)                                    | 306 (60.1%)       |
| Black                                 | 25 (17.1%)                                 | 17 (20.2%)                          | 56 (20.1%)                                     | 98 (19.3%)        |
| Other/Multiple/Unknown                | 36 (24.7%)                                 | 16 (19.0%)                          | 53 (19.0%)                                     | 105 (20.6%)       |
| Ethnicity                             |                                            |                                     |                                                |                   |
| Non-Hispanic or Latino/a              | 92 (63.0%)                                 | 56 (66.7%)                          | 180 (64.5%)                                    | 328 (64.4%)       |
| Hispanic or Latino/a                  | 30 (20.5%)                                 | 17 (20.2%)                          | 74 (26.5%)                                     | 121 (23.8%)       |
| Patient refused                       | 24 (16.4%)                                 | 11 (13.1%)                          | 25 (9.0%)                                      | 60 (11.8%)        |
| Sexual orientation                    |                                            |                                     |                                                |                   |
| Straight                              | 50 (34.2%)                                 | 43 (51.2%)                          | 137 (49.1%)                                    | 230 (45.2%)       |
| Gay/lesbian                           | 7 (4.8%)                                   | 2 (2.4%)                            | 10 (3.6%)                                      | 19 (3.7%)         |
| Bisexual/other                        | 8 (5.5%)                                   | 3 (3.6%)                            | 11 (3.9%)                                      | 22 (4.3%)         |
| Chose not to disclose                 | 81 (55.5%)                                 | 36 (42.9%)                          | 121 (43.4%)                                    | 238 (46.8%)       |
| Preferred language                    |                                            |                                     |                                                |                   |
| English                               | 138 (94.5%)                                | 78 (92.9%)                          | 248 (88.9%)                                    | 464 (91.2%)       |
| Spanish                               | 8 (5.5%)                                   | 5 (6.0%)                            | 27 (9.7%)                                      | 40 (7.9%)         |
| Other                                 | 0 (0%)                                     | 1 (1.2%)                            | 4 (1.4%)                                       | 5 (1.0%)          |
| Housing status                        |                                            |                                     |                                                |                   |
| Currently housed                      | 12 (8.2%)                                  | 8 (9.5%)                            | 21 (7.5%)                                      | 41 (8.1%)         |
| Sheltered homelessness <sup>*</sup>   | 88 (60.3%)                                 | 48 (57.1%)                          | 125 (44.8%)                                    | 261 (51.3%)       |
| Unsheltered homelessness <sup>†</sup> | 46 (31.5%)                                 | 28 (33.3%)                          | 133 (47.7%)                                    | 207 (40.7%)       |
| Has a primary care provider           | 68 (46.6%)                                 | 38 (45.2%)                          | 152 (54.5%)                                    | 258 (50.7%)       |

|                                                                                 | Did Not Fill a PrEP prescription (n = 146) | Filled 1 PrEP prescription (n = 84) | Filled More than 1 PrEP prescription (n = 279) | Overall (N = 509) |
|---------------------------------------------------------------------------------|--------------------------------------------|-------------------------------------|------------------------------------------------|-------------------|
| Insurance status                                                                |                                            |                                     |                                                |                   |
| Commercial                                                                      | 2 (1.4%)                                   | 0 (0%)                              | 2 (0.7%)                                       | 5 (1.0%)          |
| Public                                                                          | 138 (94.5%)                                | 83 (98.8%)                          | 277 (99.3%)                                    | 497 (97.6%)       |
| No coverage information                                                         | 6 (4.1%)                                   | 1 (1.2%)                            | 0 (0%)                                         | 7 (1.4%)          |
| Injection drug use (past month)                                                 | 95 (65.1%)                                 | 68 (81.0%)                          | 236 (84.6%)                                    | 399 (78.4%)       |
| Sexual behaviors associated with HIV transmission (past month) <sup>‡</sup>     | 65 (44.5%)                                 | 33 (39.3%)                          | 106 (38.0%)                                    | 204 (40.1%)       |
| Mental health disorder diagnoses <sup>§</sup>                                   |                                            |                                     |                                                |                   |
| Depressive disorder                                                             | 56 (38.4%)                                 | 34 (40.5%)                          | 112 (40.1%)                                    | 202 (39.7%)       |
| Generalized anxiety disorder                                                    | 47 (32.2%)                                 | 38 (45.2%)                          | 127 (45.5%)                                    | 212 (41.7%)       |
| Bipolar disorder                                                                | 26 (17.8%)                                 | 5 (6.0%)                            | 40 (14.3%)                                     | 71 (13.9%)        |
| Schizophrenia                                                                   | 4 (2.7%)                                   | 1 (1.2%)                            | 8 (2.9%)                                       | 13 (2.6%)         |
| Post-traumatic stress disorder                                                  | 27 (18.5%)                                 | 17 (20.2%)                          | 68 (24.4%)                                     | 112 (22.0%)       |
| Any major mental health diagnosis <sup>  </sup>                                 | 97 (66.4%)                                 | 54 (64.3%)                          | 208 (74.6%)                                    | 359 (70.5%)       |
| SUD diagnoses <sup>§</sup>                                                      |                                            |                                     |                                                |                   |
| Alcohol use disorder                                                            | 23 (15.8%)                                 | 16 (19.0%)                          | 54 (19.4%)                                     | 93 (18.3%)        |
| Opioid use disorder (OUD)                                                       | 79 (54.1%)                                 | 61 (72.6%)                          | 212 (76.0%)                                    | 352 (69.2%)       |
| Participants with OUD on medication for opioid use disorder (MOUD) <sup>¶</sup> | 10 (12.7%)                                 | 14 (23.0%)                          | 37 (17.5%)                                     | 61 (17.3%)        |
| Stimulant use disorder                                                          | 37 (25.3%)                                 | 26 (31.0%)                          | 93 (33.3%)                                     | 156 (30.6%)       |
| Any SUD diagnosis <sup>#</sup>                                                  | 91 (62.3%)                                 | 70 (83.3%)                          | 230 (82.4%)                                    | 391 (76.8%)       |

Four participants tested positive for HIV at intake and were excluded from this analysis.

\* Defined as living “doubled up” or in a shelter, transitional housing, residential treatment, housing with no supportive services, or motel.

<sup>‡</sup> Defined as living on the street.

<sup>§</sup> High-risk sexual behavior was listed as an indicator for PrEP from internal tracking.

<sup>§</sup> All diagnoses are based on the problem list at the date of referral using International Classification for Disease (ICD)-10 codes and descriptions.

<sup>||</sup> Defined as having an ICD-10 code for depressive disorder, generalized anxiety disorder, bipolar disorder, schizophrenia, or PTSD.

<sup>¶</sup> This variable was limited to participants with opioid use disorder (n = 352).

<sup>#</sup> Defined as having an ICD-10 code for alcohol use disorder, stimulant use disorder, or opioid use disorder.