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Barriers and Facilitators to PrEP Use among People Who Inject Drugs in Rural Appalachia: A Qualitative Study

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Abstract

The opioid crisis has increased risks for injection drug use-associated HIV outbreaks in rural communities throughout the United States. Existing research has examined pre-exposure prophylaxis (PrEP) utilization among people who inject drugs (PWID); however, no studies have been conducted to explore barriers and facilitators of PrEP use among rural PWID in Appalachia. We conducted qualitative interviews with PWID (n=48) in two rural counties in West Virginia to explore barriers and facilitators of PrEP use. Among our participants, the majority (68.8%) had never heard of PrEP. Upon learning about PrEP, most participants expressed willingness to use it. Rural PWID described several factors that may impede PrEP utilization (e.g., housing instability, forgetting to take PrEP). Participants also identified practical strategies to support sustained PrEP utilization, such as integrating PrEP services into venues PWID access. This research provides important insights into the barriers and facilitators of PrEP utilization among rural PWID.

Keywords

HIV; PrEP; rural health; people who inject drugs

Introduction

People who inject drugs (PWID) are disproportionately affected by HIV in the United States (US), and in 2016, accounted for 9% of new HIV diagnoses [1]. An estimated 1 in 23

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Conflicts of Interest

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women and 1 in 36 men who inject drugs will contract HIV in their lifetime [2]. Despite these alarming statistics, HIV incidence among PWID has been declining, with new infections decreasing by 32% from 2010 to 2014 [1]. However, increasing rates of substance use stemming from the modern opioid crisis have led to concomitant increases in the risks for outbreaks of HIV and viral hepatitis [1, 3–5]. Following a 2015 injection drug use-associated HIV outbreak in rural Scott County, Indiana, analyses were conducted to identify other communities that may be vulnerable to similar outbreaks [5]. From this work, six indicators (drug overdose deaths, prescription opioid sales, per capita income, white, non-Hispanic race/ethnicity, unemployment, and buprenorphine prescribing potential by waiver) were found to be associated with county-level vulnerability to an HIV outbreak. In total, 220 counties across 26 states were identified as being at high risk of experiencing an outbreak similar to Scott County with most counties located in the rural Appalachian Mountain region of the eastern US [5]. The high concentration of HIV risk vulnerability in Appalachia is especially concerning given that rural areas are characterized by multiple barriers to HIV prevention, including: a lack of syringe services programs (SSPs); low access to medication assisted treatment; few transportation options; and, stigmatization of substance use [6–13]. Collectively, these challenges may obstruct the routine use of HIV preventative services (e.g., SSP utilization, testing). Biomedical approaches to HIV prevention may enable rural PWID to overcome community-level HIV prevention challenges.

Pre-exposure prophylaxis (PrEP) refers to a biomedical strategy in which HIV negative individuals who are at high-risk of infection (e.g., PWID) take a daily medication that contains two medicines (tenofovir disoproxil fumarate and emtricitabine) to lower their risks of HIV acquisition [14]. The Food and Drug Administration (FDA) approved PrEP for HIV prevention in July 2012 following studies documenting its HIV prevention efficacy among vulnerable groups (i.e., PWID, men who have sex with men) [15–19]. According to the Centers for Disease Control and Prevention (CDC), when taken daily, PrEP can reduce the risks of HIV acquisition from sex by 99%. Similarly, PrEP decreases HIV risks by at least 74% among PWID when taken daily [14]. These high-levels of protection are noteworthy as PWID may have HIV risks stemming from sexual behaviors and high-risk injection practices [20, 21]. Sexual risk behaviors for HIV among PWID may also serve as a mechanism for HIV transmission outside of PWID networks [21]. In 2019, the US Preventative Services Task Force gave PrEP an “A” rating for HIV prevention, underscoring the scientific consensus that it is an effective biomedical HIV prevention strategy [22]. While PrEP has the potential to significantly improve the HIV prevention landscape, it is currently underutilized. In 2015, there were an estimated 1.1 million Americans at substantial risk for HIV and candidates for PrEP; however, only 90,000 PrEP prescriptions were filled in this year [23]. There are also substantial geographic disparities in PrEP utilization. In 2016, for example, persons in five states (California, Texas, Illinois, Florida, and New York) accounted for nearly 50% of all PrEP users [24]. In contrast, predominantly rural states have few persons that utilize PrEP; for instance, in 2018, there were 324 known PrEP users in the state of West Virginia (WV) [24]. This low number of PrEP users is concerning as 28 of the 55 counties in the state were identified as vulnerable to an injection drug use-associated HIV outbreak [5].

The underutilization of PrEP can be partially explained by PWID lacking PrEP awareness. A number of studies conducted in urban areas report low knowledge of PrEP among PWID, ranging from 3% to 31% [25–30]. However, after PWID are informed about PrEP, their interest or “willingness” to use it has been found to be moderately high with higher interest among younger PWID and individuals reporting more frequent sexual and injection risk behaviors [25–30]. While existing research, predominantly from urban settings, is informative, it does not necessarily reflect rural PWID populations. There is an ongoing need for research to better understand how to scale up PrEP access and utilization among rural PWID populations.

In recent years, there have been concentrated efforts by health departments and public health officials to increase PrEP utilization across the US. Multiple studies have been published that examine barriers and facilitators to PrEP implementation and utilization across a variety of settings [29, 31–37]. From this work, it is evident that initiatives aimed at enhancing PrEP uptake must be implemented with thoughtful consideration of community-level contexts. Unfortunately, existing research surrounding barriers and facilitators to PrEP utilization reflects neither rural contexts of HIV prevention nor the perspectives of PWID in nonurban areas, such as those residing in rural Appalachian counties vulnerable to HIV outbreaks. To address these gaps in our PrEP knowledge, we conducted in-depth interviews with PWID in two rural counties (Cabell and Kanawha) in West Virginia to explore barriers and facilitators to PrEP utilization.

Methods

Study Settings

While Cabell and Kanawha counties contain the cities of Huntington and Charleston, respectively, the US Census Bureau considers most of their physical land space as rural (86.2% and 90.3%, respectively) [38]. Eligible participants were current residents of Cabell or Kanawha County, aged 18 years or over, who had injected illicit drugs in the past 30 days. During June and July 2018, participants from Cabell County were recruited from the Cabell-Huntington Harm Reduction Program (which is housed at the Cabell-Huntington Health Department) and in nearby areas where PWID frequent (e.g., surrounding neighborhoods, hangouts in the downtown area). During September 2018, research team members recruited PWID in Kanawha County from venues frequented by PWID in Charleston, such as public parks, community service providers, and parking lots [6]. We invited eligible individuals to complete the 45–75 minute in-depth interview. The Johns Hopkins Bloomberg School of Public Health Institutional Review Board approved the study protocol and participants provided oral consent.

Data collection

The interview followed a semi-structured format. After collecting demographic information from each participant (e.g., age, gender, race/ethnicity), we asked participants about a range of HIV prevention topics, including: perceptions of HIV risk, current challenges to HIV prevention, awareness and interest in PrEP, and perceived barriers and facilitators to PrEP utilization. Participants were compensated \$40 for their time. Interviews were audio

recorded with participants' permission and transcribed *verbatim*. Given that the interviews involved a number of sensitive topics, all data were collected anonymously.

Data analysis

We used an iterative, constant comparative approach to analyze interview data [39, 40]. An initial coding framework was developed by the lead qualitative researcher by reading 10 transcripts and creating a preliminary coding framework via open coding. The codebook was revised as additional transcripts were coded and discussed amongst three qualitative coders and other co-authors. Using the revised codebook, three coders then independently applied the codes systematically to a cross-section of transcripts, and the reliability between coders was tested. Consistency between coders was found to be satisfactory ($k = 0.70$) [41], and the coders then independently coded the remaining transcripts in Atlas.ti software. Thematic codes were compared within a single interview and between interviews, and variability was considered based on participants' gender and county of residence [40]. Qualitative data are presented in this article using direct quotes from participants in order to enhance trustworthiness of analysis.

Results

Forty-eight individuals participated in the in-depth interviews (21 in Cabell County, 27 in Kanawha County). Participant characteristics are presented in Table 1. Most participants were male (62.5%) and White (91.7%). On average, participants were 37.8 years old. The majority (60.4%) reported heroin as their injection drug of choice. Three interviews were not completed in entirety; as a result, we were not able to glean significant insights into PrEP utilization from these participants. However, these interviews did afford background information on the broader HIV prevention landscape in each county and factors affecting the public health of PWID.

Awareness and interest in PrEP

Most participants (68.8%) had never heard of PrEP and, among those who had, none were able to accurately describe its utility for HIV prevention. After interviewers explained PrEP to all participants (including that it must be taken daily, is only available by prescription, and requires routine visits to a healthcare provider), the majority (64.6%) reported they would be interested in taking PrEP to reduce their risks of HIV infection. For example, a 28-year-old male participant in Cabell County stated that, "I'd be probably interested just because if it helps prevent or helps the sickness, it'd probably take care of a lot of the HIV that is getting passed around, so that'd be great." Similarly, a 39-year-old female participant in Kanawha County succinctly described their willingness to use PrEP as, "I mean, I think that's kind of self-explanatory. No one wants AIDS."

In Kanawha County, participants noted that PrEP could be critically important for HIV prevention among PWID since the SSP at the local health department had suspended operations. A 29-year-old male participant, for example, commented, "That's [PrEP] a good idea for people, especially since they don't have the needle exchange and it prevents you from catching it [HIV]. Yeah, that's awesome." A 24-year-old female also elaborated, "I

think it's [PrEP] a great thing... definitely would be a plus to have something that—because, let's say they don't open back the exchange [SSP], well, then we need that [PrEP] now more than ever.”

The minority of participants who were not interested in PrEP primarily described their reasoning in terms of perceptions of low HIV risk; for instance, a 27-year-old male in Cabell County stated:

For me, I don't think I would need it [PrEP] so much because, like I said, I've been with my girlfriend for three years. We're about to have a baby. But that [PrEP] would be a great thing for somebody... that's not in a relationship and that is trying to find somebody, that's going out to the bars and having fun. And might go home with somebody that night... That person might have AIDS. They have sex. And now she's got AIDS because she was drunk and went home with somebody. But if she took that pill or even if it was a him, if he took that pill that would prevent-- that would be a chance that he might not catch it [HIV]. So, I really think that would be a great thing for people who aren't in a relationship and that are having sex with multiple people to have.

Echoing this sentiment, a 41-year-old female in Kanawha County explained:

Honestly, I don't think I would [be interested in PrEP], just because I don't feel that my risk is that high, to add something else to my body. I already put enough chemicals in my body. Now, if my lifestyle were to change, or something-- it's not that I'm against it [PrEP], I just don't feel that I'm really a candidate for that. Like I said, I have one sexual partner. I don't share needles... I don't feel like, that my risk is high enough to necessitate something like that [taking PrEP].

Barriers and Facilitators

Discussions surrounding barriers to PrEP utilization centered around four themes: costs, forgetting to take PrEP, homelessness and unstable housing, and access to healthcare.

Discussions about potential facilitators of PrEP use primarily reflected four themes: integration of PrEP visits with other services for PWID, support from others, providing safe storage opportunities for those who are homeless or unstably housed, and developing a long-acting PrEP option.

PrEP Barriers

Costs.—Being able to afford PrEP was frequently described as an element of concern for its sustained utilization. Participants explained that they may have issues affording both doctor copays and medication costs. A 37-year-old female in Cabell County explained, “...if it [PrEP] was covered by a medical card, then I wouldn't have an issue at all, but if I had to pay anything for it, and I was in the position I'm in right now, I wouldn't [use PrEP]. I wouldn't do it.” A 39-year-old female in Kanawha County shared this concern: “I mean, as long as it didn't cost too much money. I mean, if I have to pay for my doctor visits and all that stuff like that, then it would be hard for me to do it every month.”

Forgetting to take PrEP.—Among our participants, forgetting to take PrEP was often described as a potential barrier. Succinctly stated by a 61-year-old male in Kanawha County, “If I wanted to use it [PrEP], hell, I’d probably forget it most times...” Participants reported a variety of scenarios that may impede their ability to remember to take PrEP; for example, a 24-year-old female in Kanawha County explained that her childcare responsibilities would make it challenging to remember to take PrEP: “I give the kids their allergy medicine and [child’s name] his Trazadone [antidepressant], but then I forget to take mine [medications]. It’s like, I’ve got to take care of them first and foremost, and then I forget about myself.” Many participants also explained that their drug use may limit their ability to remain adherent to PrEP. A 25-year-old woman in Cabell County explained, “I would be too worried about getting high and not even remember it [PrEP].”

Homelessness and unstable housing.—Participants who were homeless or unstably housed believed this would be their biggest hurdle for utilizing PrEP, particularly among participants in Kanawha County. Some participants felt that utilizing PrEP would be overridden by their immediate priorities (e.g., a safe space to sleep). Explained by a 43-year-old homeless female in Kanawha County: “You’re so worried about getting in a safe place [for the night] and I don’t know, I just, I forget a lot of times at night [to take medicine].” Participants also had concerns that their possessions, including PrEP, could get damaged from rain and snow. Participants identified the lack of secure storage for their medicine as a significant and likely insurmountable impediment to sustained PrEP use as they felt their medication would be stolen. A 32-year-old woman from Cabell County said, “I mean, out here, no, [there is no safe place to store medicine], things get stolen every day, every day. I’ve had my clothes stolen all the time, everything.” As explained by a 28-year-old man from Kanawha County, challenges stemming from homelessness and living in fear of experiencing violent crime may supersede PrEP utilization efforts:

It’s never safe out here. Your stuff is subject to get stolen any minute, any hour of the day. So it [PrEP] wouldn’t be ever really safe unless you kept it in your pocket 24/7, and that’s still not safe, ‘cause you could still get robbed...It’s very, very, very scary out here to be honest with you. I don’t like to sleep out here. I don’t.

Access to healthcare.—Access to healthcare was the fourth barrier participants discussed at length, and this barrier was more pronounced for participants who were homeless or unstably housed. Concerns regarding challenges accessing healthcare included not knowing what healthcare provider could prescribe PrEP, finding transportation to get to appointments, and remembering follow-up appointments. A 29-year-old male in Cabell County elaborated that his greatest healthcare-associated challenge to PrEP use was, “Probably just getting into a doctor somewhere and knowing what doctors to talk to about it [PrEP]...” Among participants that said remembering appointments was a barrier to using PrEP, they typically discussed this challenge as stemming from complexities associated with homelessness and substance use. For example, a 25-year-old man in Kanawha County explained:

Well, I do have a problem making it back [to doctor appointments], because usually they’ll call me. They will call me, to set up another appointment, but usually, by

then, you know, the phone that I gave that number to the doctor will be stolen, or I'll have a completely different phone, or no phone, and, you know?

PrEP Facilitators

Integrating PrEP visits with other services for PWID.—Challenges related to accessing healthcare services for PrEP may be attenuated by offering PrEP services at venues PWID already frequent, such as SSPs. A 28-year-old male participant in Kanawha County suggested, for example:

If they would just start having a [PrEP] program or something that just gave it, like [at the local health department], anywhere like that where you could just go there while you're doing the other services or anything and just get it then... or just making a place where they could go and handle that [get PrEP], kind of like the needle exchange program. Put the needle exchange program back and put that [PrEP program] with it. Save a lot of lives.

Participants expanded on this concept by suggesting that limited supplies of PrEP could be dispensed at venues where PWID access other services; a participant in Cabell County elaborated, "Even if they just gave you just the seven doses [of PrEP]... and you come back on Monday and pick up the rest. I would be all in for that..." By receiving limited supplies of PrEP and having to visit service providers to get additional medications, participants felt they would be less likely to have medications stolen and more likely to be adherent.

Support from others.—Participants identified support from others as an important factor in adhering to PrEP regimens and routine healthcare provider appointments. Some participants suggested having a family member or someone they spoke to everyday remind them to take PrEP was a viable strategy to enhance medication adherence. Other participants felt it would be helpful if clinics or organizations providing services to PWID directly monitored their daily PrEP use. These participants referenced methadone programs where PWID must attend daily as an example for how this approach may be implemented. Participants also noted a need for additional support from their healthcare providers; for example, if PrEP was stolen, PWID could call their provider and get a refill: "As long as you would be able to call your doctor and be like, 'Hey man, I'm homeless and my book bag got stolen.' As long as they would understand that they were actually telling the truth." (24-year-old female, Kanawha County)

Safe storage.—To assist those who are homeless or unstably housed, participants identified opportunities to allow for the safe storage of their medications. Participants with supportive family members noted that they could keep their medicine at their family member's house. Others discussed the possibility of local organizations storing PrEP, noting that some organizations provide lockers and other safe spaces for homeless individuals to store important items. A male participant in Kanawha County, for instance, stated, "I mean, I could, you know, stash it [PrEP] like at-- down at one of the shelters or something. They would keep it for me." Finally, expanding access to lockers for homeless or unstably housed individuals was proposed as this could help persons keep their belongings (including PrEP) safe:

I've also been wondering, well, why hasn't somebody made like a-- like a locker area, where you can like rent a key out to people? I'm sure, I mean, it'd be big business, with all the homeless people out here needing to store their stuff somewhere. If it's, you know, a fairly low cost, I mean, you're still going to make a lot of money, because it's going to be in high demand. You know? (25-year-old male, Kanawha County)

Long acting PrEP option.—Participants explained that the availability of a long acting PrEP option, whether in pill or injectable form, would alleviate many of the barriers PWID face in taking PrEP. Participants discussed the parallels between potential long acting PrEP options and extended release formulations of medication assisted treatment (e.g., naltrexone) for substance use. A 41-year-old male participant in Cabell County suggested this, saying: “What’s that thing called that they give to alcoholics? Vivitrol [naltrexone], I think it’s called. Right, Vivitrol?...Now, that’s a 30-day thing, all right?...Now, the 30-day, if they had it [PrEP] for 30 days, you go every 30 days, I guarantee you more people would do it than take a pill [everyday].”

Discussion

This is the first published study to explore barriers and facilitators to PrEP utilization among rural PWID in Appalachia. Our findings fill an important gap in the literature given the volume of rural counties across the US that are vulnerable to an injection drug use-associated HIV outbreak [5]. Further, this study has immediate implications for the HIV prevention landscape in West Virginia as an HIV cluster among PWID was identified in early 2019 in Cabell County [42]. While most PWID in our study were initially unaware of PrEP, the majority reported being willing to use PrEP for HIV prevention upon learning about it. These data suggest that for rural PWID who reside in geographically-isolated areas characterized by multiple barriers to HIV prevention, PrEP may be an efficacious biomedical prevention strategy. However, community-level HIV prevention education campaigns may be required as many perceived their HIV risk as low.

Paralleling urban-based PrEP research [37], we found that most rural PWID were unaware of PrEP and that persons not interested in PrEP reported low HIV risk perceptions. This is a striking finding given the high prevalence of syringe sharing among non-urban PWID; for example, a recent study conducted among PWID in Cabell County found that 41% reported recent syringe sharing [43]. Similar to research conducted in Boston, MA and Providence, RI [44], we found that rural PWID reported a number of clinical barriers to PrEP utilization, including knowing where to acquire PrEP and paying for it. Interventions are needed to not only increase PrEP awareness and acceptability among rural PWID, but also support individuals in efforts to overcome barriers to PrEP utilization.

Although willingness to use PrEP was high among our sample, participants frequently described four barriers to consistent PrEP utilization. First, participants described PrEP-related costs as potentially impeding their ability to use this HIV prevention strategy. Second, participants reported a variety of issues they perceived as potentially impeding their ability to remember to take PrEP daily, ranging from childcare responsibilities to challenges

stemming from addiction. Third, PWID explained that attempts to utilize PrEP may be superseded by efforts to address immediate basic needs (e.g., shelter, personal safety). Finally, PWID explained that accessing healthcare services to initiate and sustain PrEP utilization may be problematic due to uncertainties associated with locating a PrEP prescriber and traveling to and from PrEP appointments. These findings demonstrate that while rural PWID have a strong desire to avert HIV infection, persons may be confronted with complex and challenging obstacles that limit their ability to engage in protective health behaviors. These obstacles may also be exacerbated by healthcare providers' willingness to prescribe PrEP; for example, research has shown that providers have low willingness to prescribe PrEP to persons in greatest need, such as PWID [45, 46]. Expanding access to and utilization of PrEP among rural PWID populations may be achieved via structural and individual-level interventions that address the myriad of barriers that could impede PrEP uptake, adherence, and sustained utilization. Rural PWID may benefit from interventions that address their immediate basic needs, such as housing and safety. Ensuring PWID have access to stable housing and safe living conditions may support their sustained utilization of PrEP. In addition, PrEP utilization among rural PWID may be enhanced by instituting reforms throughout the healthcare system, such as mandating providers complete PrEP education and stigma reduction trainings and implementing strategies to ensure PrEP is immediately available and at no cost to PWID.

Discussions with participants about potential strategies to support PrEP utilization centered around four themes: integrating PrEP services at venues already frequented by PWID, supporting PWID that use PrEP, storing PrEP in a safe and secure location, and developing a long-lasting PrEP formulation. These facilitators predominantly reflected strategies to address challenges stemming from homelessness and housing insecurity. For example, many participants reported not having a safe space to sleep and store belongings; as a result, they felt that providing persons with a secure location to store PrEP and having access to a supportive network of individuals and organizations to remind them of the importance of taking PrEP daily could facilitate their sustained PrEP utilization. Our findings highlight the necessity of implementing comprehensive public health programs for disease prevention as simply providing access to PrEP is likely insufficient to avert an HIV outbreak among PWID populations characterized by multiple vulnerabilities (e.g., homelessness, poverty, lack access to SSPs). The colocation of PrEP services with existing service providers frequented by rural PWID, such as homeless shelters or SSPs (when available), may enable persons to receive coordinated care and supportive services that enhance their ability to initiate and sustain PrEP utilization.

Evidence suggests that reductions in HIV transmission among PWID are greatest when a combination of high coverage biomedical, harm reduction, and structural HIV prevention approaches are employed [47]. However, PWID in rural areas may lack access to essential HIV prevention services, such as SSPs [48, 49]. For PWID in these settings, PrEP may be a viable HIV prevention strategy. The utility of PrEP for HIV prevention among PWID in areas without access to harm reduction services was noted by our participants in Kanawha County. In 2015, a SSP was implemented at the Kanawha-Charleston Health Department; unfortunately, the program was implicated as precipitating increases in discarded syringes and crime, resulting in law enforcement implementing several rules that would have forced

the SSP to operate in ways contrary to best practice (e.g., distributing retractable syringes) and the program was indefinitely suspended in March 2018 [6]. Participants in our study discussed how, in the absence of the SSP, PrEP could support their efforts to remain HIV negative.

While our data demonstrate the potential value of PrEP for HIV prevention among a group of rural PWID at high-risk of HIV infection, it should be noted that in 2018, there were only 324 known PrEP users in the entirety of West Virginia [24]. This small number of PrEP users is deeply concerning as 28 of 55 counties in the state were identified as vulnerable to an injection drug use-associated HIV outbreak [5]. Importantly, following the identification of a cluster of HIV infections among PWID in Cabell County, the Cabell-Huntington Health Department implemented a multipronged response strategy to identify incident HIV infections and prevent future infections, including both expanding access to HIV testing and launching a PrEP program [42, 50]. These efforts are commendable given the rapidity with which they were implemented, but also because HIV prevention services, including PrEP, are collocated with other services at the Cabell-Huntington Health Department.

This study fills an important gap in the literature by enhancing our understanding of barriers and facilitators to PrEP use from the perspective of PWID residing in rural Appalachia. This research, though, is not without limitations. We recruited participants and conducted all interviews in the cities of Huntington and Charleston, West Virginia, but not from more rural areas of Cabell and Kanawha counties. It is possible that barriers and facilitators to PrEP utilization could vary geographically and by the degree to which PWID access existing HIV prevention services. Our sample also lacked racial and ethnic diversity, limiting our ability to explore racial/ethnic differences in PrEP awareness, interest, and perceptions of barriers and facilitators. The homogeneity of our sample parallels the demographic characteristics of both Cabell and Kanawha counties, which are 91.2% and 88.6% White, respectively [51, 52]. Lastly, three interviews were not completed in entirety, limiting our ability to glean insights into PrEP utilization. However, these individuals were able to speak to the broader HIV prevention landscape in each county.

In conclusion, this research demonstrates that while rural PWID were largely unaware of PrEP, most expressed willingness to use PrEP after learning about its utility for HIV prevention. Rural PWID described a number of barriers to sustained PrEP utilization, but also identified several practical strategies to overcome these challenges. Rural PWID may face many obstacles in preventing HIV acquisition; however, PrEP is a powerful biomedical HIV prevention strategy that may enable persons to avert HIV infection. This research provides important insights into the types of barriers and facilitators rural PWID in Appalachia may experience if they were to utilize PrEP.

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References

1. Centers for Disease Control and Prevention. HIV Among People Who Inject Drugs. <https://www.cdc.gov/hiv/group/hiv-idu.html> Accessed 19 Aug 2019.
2. Centers for Disease Control and Prevention. Lifetime risk of HIV diagnosis: half of black gay men and a quarter of Latino gay men projected to be diagnosed within their lifetime [Press Release]. <https://www.cdc.gov/nchhstp/newsroom/2016/croi-press-releaserisk.html> Accessed 19 August 2019.
3. Jones CM, Logan J, Gladden RM, Bohm MK. Vital Signs: Demographic and Substance Use Trends Among Heroin Users - United States, 2002–2013. *MMWR*. 2015;64(26):719–25. [PubMed: 26158353]
4. Zibbell JE, Asher AK, Patel RC, Kupronis B, Iqbal K, Ward JW, et al. Increases in Acute Hepatitis C Virus Infection Related to a Growing Opioid Epidemic and Associated Injection Drug Use, United States, 2004 to 2014. *Am J Public Health*. 2018;108(2):175–81. [PubMed: 29267061]
5. Van Handel MM, Rose CE, Hallisey EJ, Kolling JL, Zibbell JE, Lewis B, et al. County-Level Vulnerability Assessment for Rapid Dissemination of HIV or HCV Infections Among Persons Who Inject Drugs, United States. *J Acquir Immune Defic Syndr*. 2016;73(3):323–31. [PubMed: 27763996]
6. Allen ST, Grieb SM, O'Rourke A, Yoder R, Planchet E, White RH, et al. Understanding the public health consequences of suspending a rural syringe services program: a qualitative study of the experiences of people who inject drugs. *Harm Reduct J*. 2019;16(1):33. [PubMed: 31109339]
7. Havens JR, Oser CB, Leukefeld CG. Injection risk behaviors among rural drug users: implications for HIV prevention. *AIDS Care*. 2011;23(5):638–45. [PubMed: 21293995]
8. Reif S, Golin CE, Smith SR. Barriers to accessing HIV/AIDS care in North Carolina: rural and urban differences. *AIDS Care*. 2005;17(5):558–65. [PubMed: 16036242]
9. Crosby RA, Yarber WL, DiClemente RJ, Wingood GM, Meyerson B. HIV-associated histories, perceptions, and practices among low-income African American women: does rural residence matter? *Am J Public Health*. 2002;92(4):655–9. [PubMed: 11919067]
10. Gamm LD. Mental health and substance abuse services among rural minorities. *J Rural Health*. 2004;20(3):206–9. [PubMed: 15298094]
11. Sung H-E, Mahoney AM, Mellow J. Substance Abuse Treatment Gap Among Adult Parolees: Prevalence, Correlates, and Barriers. *Criminal Justice Review*. 2011;36(1):40–57.
12. Sexton RL, Carlson RG, Leukefeld CG, Booth BM. Barriers to formal drug abuse treatment in the rural south: a preliminary ethnographic assessment. *J Psychoactive Drugs*. 2008;40(2):121–9. [PubMed: 18720660]
13. Staton-Tindall M, Webster JM, Oser CB, Havens JR, Leukefeld CG. Drug use, hepatitis C, and service availability: perspectives of incarcerated rural women. *Soc Work Public Health*. 2015;30(4):385–96. [PubMed: 25950907]
14. Centers for Disease Control and Prevention. PrEP. <https://www.cdc.gov/hiv/basics/prep.html> Accessed 19 August 2019.
15. Centers for Disease Control and Prevention. CDC Statement on FDA Approval of Drug for HIV Prevention [Press Release]. <https://www.cdc.gov/nchhstp/newsroom/2012/fda-approvesdrugstatement.html> Accessed 19 August 2019.
16. Centers for Disease Control and Prevention. Preexposure prophylaxis for the prevention of HIV infection in the United States—2017 Update: a clinical practice guideline. <https://www.cdc.gov/hiv/pdf/risk/prep/cdc-hiv-prep-guidelines-2017.pdf> Accessed 19 August 2019.
17. Grant RM, Lama JR, Anderson PL, McMahan V, Liu AY, Vargas L, et al. Preexposure chemoprophylaxis for HIV prevention in men who have sex with men. *N Engl J Med*. 2010;363(27):2587–99. [PubMed: 21091279]
18. Thigpen MC, Kebaabetswe PM, Paxton LA, Smith DK, Rose CE, Segolodi TM, et al. Antiretroviral preexposure prophylaxis for heterosexual HIV transmission in Botswana. *N Engl J Med*. 2012;367(5):423–34. [PubMed: 22784038]

19. Baeten JM, Donnell D, Ndase P, Mugo NR, Campbell JD, Wangisi J, et al. Antiretroviral prophylaxis for HIV prevention in heterosexual men and women. *N Engl J Med.* 2012;367(5):399–410. [PubMed: 22784037]
20. Centers for Disease Control and Prevention. Injection Drug Use and HIV Risk. <https://www.cdc.gov/hiv/pdf/risk/cdc-hiv-idu-fact-sheet.pdf> Accessed 12 December 2019.
21. Alpren C, Dawson EL, John B, Cranston K, Panneer N, et al. Opioid Use Fueling HIV Transmission in an Urban Setting: An Outbreak of HIV Infection Among People Who Inject Drugs–Massachusetts, 2015–2018. *Am J Public Health.* 2020;110(1):37–44. [PubMed: 31725317]
22. US Preventive Services Task Force. Preexposure Prophylaxis for the Prevention of HIV Infection: US Preventive Services Task Force Recommendation Statement. *JAMA.* 2019;321(22):2203–13. [PubMed: 31184747]
23. Centers for Disease Control and Prevention. HIV prevention pill not reaching most Americans who could benefit – especially people of color [Press Release]. <https://www.cdc.gov/nchhstp/newsroom/2018/croi-2018-PrEP-press-release.html> Accessed 19 August 2019.
24. AIDS Vu. Mapping PrEP: First Ever Data on PrEP Users Across the U.S. <https://aidsvu.org/prep/> Accessed 19 August 2019.
25. Stein M, Thurmond P, Bailey G. Willingness to use HIV pre-exposure prophylaxis among opiate users. *AIDS Behav.* 2014;18(9):1694–700. [PubMed: 24752703]
26. Walters SM, Reilly KH, Neaigus A, Braunstein S. Awareness of pre-exposure prophylaxis (PrEP) among women who inject drugs in NYC: the importance of networks and syringe exchange programs for HIV prevention. *Harm Reduct J.* 2017;14(1):40. [PubMed: 28662716]
27. Walters SM, Rivera AV, Starbuck L, Reilly KH, Boldon N, Anderson BJ, et al. Differences in Awareness of Pre-exposure Prophylaxis and Post-exposure Prophylaxis Among Groups At-Risk for HIV in New York State: New York City and Long Island, NY, 2011–2013. *J Acquir Immune Defic Syndr.* 2017;75 Suppl 3:S383–s91. [PubMed: 28604443]
28. Kuo I, Olsen H, Patrick R, Phillips G 2nd, Magnus M, Opoku J, et al. Willingness to use HIV pre-exposure prophylaxis among community-recruited, older people who inject drugs in Washington, DC. *Drug Alcohol Depend.* 2016;164:8–13. [PubMed: 27177804]
29. Sherman SG, Schneider KE, Park JN, Allen ST, Hunt D, Chaulk CP, et al. PrEP awareness, eligibility, and interest among people who inject drugs in Baltimore, Maryland. *Drug Alcohol Depend.* 2019;195:148–55. [PubMed: 30639794]
30. Escudero DJ, Kerr T, Wood E, Nguyen P, Lurie MN, Sued O, et al. Acceptability of HIV Pre-exposure Prophylaxis (PrEP) Among People Who Inject Drugs (PWID) in a Canadian Setting. *AIDS Behav.* 2015;19(5):752–7. [PubMed: 25086669]
31. Pinto RM, Berringer KR, Melendez R, Mmeje O. Improving PrEP Implementation Through Multilevel Interventions: A Synthesis of the Literature. *AIDS Behav.* 2018;22(11):3681–91. [PubMed: 29872999]
32. Mayer KH, Chan PA, R RP, Flash CA, Krakower DS. Evolving Models and Ongoing Challenges for HIV Preexposure Prophylaxis Implementation in the United States. *J Acquir Immune Defic Syndr.* 2018;77(2):119–27. [PubMed: 29084044]
33. Mack N, Odhiambo J, Wong CM, Agot K. Barriers and facilitators to pre-exposure prophylaxis (PrEP) eligibility screening and ongoing HIV testing among target populations in Bondo and Rarieda, Kenya: Results of a consultation with community stakeholders. *BMC Health Services Research.* 2014;14(1):231. [PubMed: 24886646]
34. Ojikutu BO, Bogart LM, Higgins-Biddle M, Dale SK, Allen W, Dominique T, et al. Facilitators and Barriers to Pre-Exposure Prophylaxis (PrEP) Use Among Black Individuals in the United States: Results from the National Survey on HIV in the Black Community (NSHBC). *AIDS Behav.* 2018;22(11):3576–87. [PubMed: 29468493]
35. Rice WS, Stringer KL, Sohail M, Crockett KB, Atkins GC, Kudroff K, et al. Accessing Pre-exposure Prophylaxis (PrEP): Perceptions of Current and Potential PrEP Users in Birmingham, Alabama. *AIDS Behav.* 2019.
36. Petroll AE, Walsh JL, Owczarzak JL, McAuliffe TL, Bogart LM, Kelly JA. PrEP Awareness, Familiarity, Comfort, and Prescribing Experience among US Primary Care Providers and HIV Specialists. *AIDS Behav.* 2017;21(5):1256–67. [PubMed: 27885552]

37. Bazzi AR, Biancarelli DL, Childs E, Drainoni ML, Edeza A, Salhaney P, 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(12):529–37. [PubMed: 30311777]
38. US Census Bureau. 2010 Census Urban and Rural Classification and Urban Area Criteria.
39. Bernard HR, Wutich A, Ryan GW. *Analyzing qualitative data: Systematic approaches*: SAGE publications; 2016.
40. Boeije H A purposeful approach to the constant comparative method in the analysis of qualitative interviews. *Qual Quant*. 2002;36(4):391–409.
41. Cohen J A coefficient of agreement for nominal scales. *Educ Psychol Meas*. 1960;20(1):37–46.
42. Nash B Cabell County HIV cluster climbs to 53 cases. *Huntington Herald-Dispatch*. 2019-06-22. https://www.herald-dispatch.com/news/cabell-county-hiv-cluster-climbs-to-cases/article_0d1f73cc-9491-11e9-8bc2-431f0c058403.html Accessed 19 August 2019.
43. Allen ST, O'Rourke A, White RH, Schneider KE, Kilkenny M, Sherman SG. Estimating the Number of People Who Inject Drugs in A Rural County in Appalachia. *Am J Public Health*. 2019;109(3):445–50. [PubMed: 30676803]
44. Biello KB, Bazzi AR, Mimiaga MJ, Biancarelli DL, Edeza A, Salhaney P, et al. Perspectives on HIV pre-exposure prophylaxis (PrEP) utilization and related intervention needs among people who inject drugs. *Harm Reduct J*. 2018;15(1):55. [PubMed: 30419926]
45. Calabrese SK, Earnshaw VA, Underhill K, et al. Prevention paradox: Medical students are less inclined to prescribe HIV pre-exposure prophylaxis for patients in highest need. *J Int AIDS Soc*. 2018;21(6):e25147. [PubMed: 29939488]
46. Adams LM, Balderson BH. HIV providers' likelihood to prescribe pre-exposure prophylaxis (PrEP) for HIV prevention differs by patient type: a short report. *AIDS Care*. 2016;28(9):1154–8. [PubMed: 26915281]
47. Degenhardt L, Mathers B, Vickerman P, Rhodes T, Latkin C, Hickman M. Prevention of HIV infection for people who inject drugs: why individual, structural, and combination approaches are needed. *Lancet*. 2010;376(9737):285–301. [PubMed: 20650522]
48. Canary L, Hariri S, Campbell C, Young R, Whitcomb J, Kaufman H, et al. Geographic Disparities in Access to Syringe Services Programs Among Young Persons With Hepatitis C Virus Infection in the United States. *Clin Infectious Dis*. 2017;65(3):514–7.
49. Des Jarlais DC, Nugent A, Solberg A, Feelemyer J, Mermin J, Holtzman D. Syringe Service Programs for Persons Who Inject Drugs in Urban, Suburban, and Rural Areas - United States, 2013. *MMWR*. 2015;64(48):1337–41. [PubMed: 26655918]
50. Brown R Cabell-Huntington Health Department to begin prescribing PrEP to curb spread of HIV. *WCHSTV*. 2019-04-25. <https://wchstv.com/news/local/cabell-huntington-health-department-to-begin-prescribing-prep-to-curb-spread-of-hiv> Accessed 19 August 2019.
51. US Census Bureau. QuickFacts: Cabell County, West Virginia. US Census Bureau, 2018 <https://www.census.gov/quickfacts/cabellcountywestvirginia> Accessed 19 August 2019.
52. US Census Bureau. QuickFacts: Kanawha County, West Virginia. US Census Bureau, 2018 <https://www.census.gov/quickfacts/kanawhacountywestvirginia> Accessed 19 August 2019.

Table I.

Sociodemographic characteristics, drug use, and PrEP awareness and interest among people who inject drugs in Kanawha County (n = 27) and Cabell County (n = 21), West Virginia

	Kanawha County	Cabell County	Total n (%)
Age, mean (SD)	38.2 (9.8)	37.3 (8.8)	37.8 (9.3)
Gender			
Male	16 (59.3)	14 (66.7)	30 (62.5)
Female	11 (40.7)	7 (33.3)	18 (37.5)
Race/Ethnicity			
White	24 (88.9)	20 (95.2)	44 (91.7)
Black/African American	3 (11.1)	0 (0.0)	3 (6.3)
Mixed	0 (0.0)	1 (4.8)	1 (2.1)
Preferred injection drug *			
Heroin	11 (40.7)	18 (85.7)	29 (60.4)
Suboxone	7 (25.9)	0 (0.0)	7 (14.6)
Speedball (heroin and cocaine)	1 (3.7)	0 (0.0)	1 (2.1)
Crystal Methamphetamine	16 (59.3)	5 (23.8)	21 (43.8)
Cocaine	0 (0.0)	2 (9.5)	2 (4.2)
Awareness of PrEP			
Yes	5 (18.5)	7 (33.3)	12 (25.0)
No	20 (74.1)	13 (61.9)	33 (68.8)
Missing	2 (7.4)	1 (4.8)	3 (6.3)
Interested in using PrEP			
Yes	16 (59.3)	15 (71.4)	31 (64.6)
No	9 (33.3)	6 (28.6)	15 (31.3)
Missing	2 (7.4)	0 (0.0)	2 (4.2)

* participants could indicate more than one preferred drug