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Barriers and facilitators to pre-exposure prophylaxis uptake among Black/African American men who have sex with other men in Iowa: COM-B model analysis

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Abstract

Background: In Iowa, men who have sex with men (MSM) accounted for 54% of persons with HIV in 2022 and Non-Hispanic Black/African Americans were over 10 times more likely to be diagnosed with HIV than Non-Hispanic white Iowans. To address this disparity in HIV incidence and prevalence, the United States (US) government ending the HIV epidemic (EHE) initiative seeks to expand pre-exposure prophylaxis (PrEP) coverage across the United States. Recent data showed that PrEP coverage is suboptimal in Iowa (a rural state), and Black Iowans were less likely to engage with PrEP services.

Objectives: Using capability, opportunity, motivation and behavior (COM-B) model for behavior change, this study sought to identify the key barriers and facilitators to PrEP uptake among Black/African American MSM in small urban areas in Iowa.

Design: This was a phenomenological study aimed to explore subjective views of Black MSM on PrEP use.

Methods: In-depth semistructured interviews were conducted with 12 Black MSM aged 20–42 years in two small urban counties. Broad themes identified from the interview transcripts were analyzed inductively and mapped onto the COM-B constructs deductively.

Results: Results showed that barriers to PrEP uptake were closely associated with five (of six) COM-B subcomponents: physical capability, psychological capability, social opportunity, reflective motivation, and automatic motivation. The thematized barriers were (1) lack of medical insurance; (2) limited PrEP awareness; (3) PrEP stigma; (4) fear of distrust among partners; (5) anticipated side effects; and (6) doubt about PrEP effectiveness. Similarly, facilitators to PrEP uptake were aligned with four subcomponents of COM-B model: physical capability, psychological capability, social opportunity, and physical opportunity. The thematized facilitators were (1) increased PrEP awareness; (2) PrEP access without discrimination; (3) state provision of PrEP to uninsured; and (4) physicians buy-in and recommendation. No motivation-related facilitators were reported.

Conclusion: To reduce the current disparity in HIV incidence and to achieve the EHE goals of expanding PrEP coverage in Iowa, efforts should be directed toward the provision of low-cost or free PrEP services, healthcare providers' training on cultural competence, and the development of culturally appropriate strategies to deliver PrEP to the Black MSM community.

Keywords: Black/African American MSM, COM-B model, HIV/AIDS, Iowa, PrEP, United States

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Introduction

In the United States (US), Black/African American men who have sex with other men (BMSM) are disproportionately affected by HIV and experience significant differences in HIV incidence, access to HIV care, and prevention across all ages.[1–4] In 2021, 71% of the estimated 36,136 new HIV diagnoses in the US were among men who have sex with men (MSM), including BMSM (36%).[5] Similarly, in Iowa, MSM accounted for 73% of the 120 new HIV diagnoses and 54% ($n = 1,743$) of the 3228 persons with HIV (PWH) in 2022.[6] Of the 120 new HIV diagnoses in Iowa in 2022, 25% were among Black/African Americans and mostly males (77%).[6] Although 4% of an estimated 3.1 million Iowans were Non-Hispanic Black/African Americans, they accounted for 24% of PWH in 2022.[6] According to the Iowa Department of Public Health (IDPH) 2023 surveillance report, Non-Hispanic Black/African Americans were over 10 times more likely to be diagnosed with HIV than Non-Hispanic White Iowans.[6] Similarly, the Centers for Disease Control and Prevention (CDC) estimated that 50% of Black/African American MSM in the US will be diagnosed with HIV in their lifetime.[7]

To address the disparity in HIV incidence and prevalence across all races, one of the four US government strategic goals (ending the HIV epidemic (EHE) initiative) to eradicate HIV epidemic by 2030 is the expansion of pre-exposure prophylaxis (PrEP) – the use of prescription medication to prevent the spread of HIV – to reduce new HIV infections especially among priority populations such as MSM.[4,8,9] Through the EHE initiative, the US government seeks to reduce new HIV infections by 75% in 2025 and 90% by 2030.[8] Recent biomedical advancements have produced new HIV prevention methods such as PrEP to effectively curtail new HIV infections and several studies have found PrEP to be highly effective for HIV prevention especially for those at-risk.[3,10–12] For example, an increase in PrEP use and improved HIV testing have played an important part in recent declines in new HIV diagnoses in the US.[13] Despite the effectiveness of PrEP in preventing HIV, its uptake especially among minority MSM is very low across the US.[2,9,10] Common barriers to PrEP uptake identified in the literature included PrEP-related stigma, poverty, lack of adequate medical insurance, mistrust of healthcare systems, homophobia, providers' negative attitudes, PrEP availability and access especially in rural areas, and misconceptions about PrEP.[3,14–22] Research has also shown inconsistencies in how providers assess HIV risk factors and PrEP eligibility for MSM.[19,23] If not addressed, these barriers pose a serious challenge to the US plan to end HIV epidemic by 2030.

Furthermore, recent surveillance data from the CDC revealed that about 26% of the estimated 1.2 million adults who had indications for PrEP were prescribed PrEP in 2022 across the US, 81.3% were males, and 38.5% were Black/African Americans.[24] The majority of these eligible candidates for PrEP use were MSM (>70%)[3] when considering likely sources of HIV risk, with 69% PrEP coverage in White, and 9% in Black individuals despite having the highest indications for PrEP across all races. Specifically, recent data from IDPH showed that 8,260 Iowans would benefit from PrEP but only about 23.3% ($n = 1,925$) had active prescriptions for PrEP medications in 2021.[25] Also, a recent evaluation of the Iowa statewide TelePrEP program that sought to reduce access barriers revealed that only 10.7% ($n = 22/206$) of individuals who were navigated to TelePrEP and 10% ($n = 17/167$) of individuals who initiated PrEP were Black/African American, while 83% were White and 94% were MSM.[26] Although PrEP coverage is suboptimal in Iowa, success in initiating PrEP among Black/African Americans who were navigated to TelePrEP was high at 77% ($n = 17/22$).

Currently, there is a knowledge gap about what factors contribute to the poor engagement of Black MSM with PrEP care in Iowa. Several PrEP studies (including reviews) have focused on barriers and facilitators to PrEP uptake among Black MSM across the US including the Midwest.[19,21,27–31] In fact, Owens et al.[17] argued that there is scant literature on PrEP uptake among MSM in general, and those living in rural areas in the Midwest in particular. Specifically, data on Black MSM PrEP uptake in the Midwest is mostly concentrated on urban cities like Chicago, and no known literature on barriers and facilitators to PrEP uptake among Black MSM in Iowa at the time of this study. To the best of our knowledge, this is the first study that sought to qualitatively identify the barriers and facilitators to PrEP uptake among Black/African American MSM in Iowa from clients' perspectives.

Theoretically, the Capability (psychological and physical capabilities), Opportunity (social and physical opportunities), Motivation (automatic and reflective processes), and Behavior (COM-B)[32] model for behavior change was adopted in this study to show the complexities and intersection of multiple factors that impact BMSM PrEP uptake in Iowa. The COM-B framework focuses on individual's capability, opportunity, and motivation to engage in a healthy behavior. Capability includes relevant skills and knowledge that can influence behavior; opportunity includes the impact of socioenvironmental factors on individual's behavior while motivation is concerned with how thought processes influence behavior.[32] Michie et al.[32] developed the behavior change wheel (BCW) – a 'layered framework'[33] – with COM-B model at its core to indicate behavioral factors that can be targeted when developing behavior change interventions. Primarily, COM-B model is premised on how the interaction of the key domains (Capability, Opportunity, and Motivation) can bring about a desired behavior.

Studies (including systematic reviews) in America, Europe, and Africa have used COM-B framework domains and constructs to report barriers and facilitators to PrEP uptake among priority populations such as female sex workers, transgender women, and MSM.[34–37] For example, the data of a PrEP study conducted in the United Kingdom (UK) were mapped onto the main COM-B constructs to tease out factors that inhibit or facilitate PrEP uptake among MSM.[35] The study found limited PrEP awareness, limited PrEP access, homophobia, and stigma to be the major barriers to PrEP uptake among MSM in the UK and no facilitator was reported.[35] The study's results aligned with five (psychological capability, physical opportunity, social opportunity, reflective motivation, and automatic motivation) of the six COM-B subcomponents after mapping. Similarly, Camila-Bolivar et al.[36] used COM-B subcomponents to map out barriers and facilitators to PrEP uptake among transgender women in Colombia to show the intersection of many factors as well as their impact on health behavior. They identified nine barriers related to capacity ($n=1$), opportunity ($n=6$), and motivation ($n=2$) to develop potential behavioral change interventions.

Furthermore, Michie et al.[32] recommended a 3-steps method for designing behavior change interventions. The first step deals with the understanding the behavior (i.e. problem definition, selection of target behavior, identification of target behavior, and what needs to be changed), while the second step is about the identification of intervention options to change certain behaviors. Lastly, the third step deals with the identification of relevant contents and implementation options. The mapping of the current study's findings to the key domains of COM-B model to understand barriers and facilitators to PrEP uptake among Black MSM in Iowa provides an opportunity for developing future HIV prevention interventions and implementation strategies to address 'PrEP uptake' as the target behavior and 'Black MSM' as the target group.

Methods

Study setting

Iowa is generally a rural state with an estimated 3.1 million people according to the US Census Bureau.[6] Although several attempts were made to gather data in three Eastern Iowa counties (Black Hawk, Johnson, and Linn), the study was eventually conducted in two counties – Black Hawk and Johnson counties. These counties are small urban areas and are among top 10 counties most saddled with the HIV epidemic in Iowa state.[38] Notably, any incorporated place with at least 5000 people or 2000 housing units is considered urban in Iowa. In 2020, Black Hawk and Johnson Counties had 58,599 and 65,916 housing units, respectively, according to the US Census. The three counties are also in top five Iowa counties with most African American population in 2021.[39]

Research design

A qualitative study design (phenomenology) was adopted in this study. Individual in-depth interview ($n=12$) was conducted to understand the barriers and facilitators to PrEP use among Black/African American MSM. The choice of an in-depth interview provides us with the opportunity to explore the lived experience of participants within a historical, cultural, and social context. To ensure rigor and credibility, this study adheres to the eight criteria (i.e. worthy topic, rich rigor, sincerity, credibility, resonance, significant contribution, ethical, and meaningful coherence) of quality in qualitative research.[40] The reporting of

Table 1. Participants recruitment.

County	Required number of participants	Interviews conducted
Black Hawks County	10	2
Johnson County	10	10
Linn County	10	0
Total	30	12

In total, 125 responses received and 20 eligible Black/African American MSM contacted.
MSM, sex with men.

this study conforms to the consolidated criteria for reporting qualitative research (COREQ) checklist.[41]

Eligibility

Self-identified Non-Hispanic Black/African American MSM aged 18 years and older who were not living with HIV (self-reported) at the time of the study were included. They must be a resident in the study sites with no cognitive impairment that may affect their responses and consented to participate. Individuals who did not meet the inclusion criteria were excluded from the study. Current or past PrEP use was not part of the eligibility criteria because we wanted to ascertain the level of PrEP awareness in the community.

Population, recruitment, and sampling

The study population included 12 Black/African American MSM aged 20–42 years though the minimum recruitment age was 18 years. They were recruited from Black Hawk ($n=2$) and Johnson ($n=10$) counties despite our extensive recruitment strategies to recruit 30 BMSM across the initial three study sites (see Table 1). No eligible participants for Linn County. Three participants who indicated that they were from Linn County were from outside of the state of Iowa. It is important to mention that some states such as Oregon, Kansas, and Missouri have a Linn County. Purposive and snowball samplings were employed when recruiting participant. The study was advertised through local organizations (including Public Health Departments and LGBTQAI+ organizations), mass email advertisement, dating apps (e.g. Grindr and Tinder), tabling at community health, and LGBTQAI+ events. The most viable forms of recruitment for this study were through dating apps and trusted local organizations network social media platforms ($n=9$) and friends ($n=2$). However, a lot of out-of-state candidates contacted the research team via the dating apps and thus ineligible to participate.

Prior to data collection, 17 key organizations and institutions (e.g. LGBTQIA+ organizations, local HIV testing clinics, and Public Health Departments) and community were identified across the three counties to aid participants' recruitment. Of these, only seven organizations were able to support the recruitment process by sharing the study recruitment materials (e.g. recruitment letter and infographic) while the remaining 10 organizations did not either respond or interested in assisting with the recruitment. People who were interested in the study contacted the study team via email, and they were asked to complete a demographic form to ascertain their location, to collect information about their medical insurance status, employment status, as well as their consent to be interviewed. We did not collect data on HIV status or PrEP use (current or past), although we mentioned in the recruitment materials that the study was for individuals who identify as Black MSM and are HIV negative. Participants had no knowledge about the researchers except for the principal investigator's (PI) contact information (email address and office telephone number) in the recruitment materials.

Of the 125 responses received by the research team, only 20 Black MSM were eligible, and 12 interviews were conducted due to unavailability of some potential participants. Although 20 individuals were eligible according to the information provided, efforts to schedule interview with 8 of them proved abortive. We assumed that the low participation of BMSM in our study could have been impacted by the anti-homosexuality sentiments in Iowa. Also, we assumed that individuals who reached out to us were Black MSM not living with HIV and lived in the research sites in Iowa before we sent out the demographic form to obtain further information about their location, age, medical insurance status, and occupation. Most potential participants who contacted the research team were living outside of the study areas including the majority from outside of Iowa.

The smaller number of study participants is acceptable in qualitative research since in-depth meanings of thematic areas were explored.[42] In fact, a recent study among young MSM that was intentional about recruiting racially diverse sample (particularly young MSM of color) across the US only had 3 young Black MSM out of the 25 young MSM interviewed for the study.[19] Thus, a small sample of 12 BMSM from Iowa is justified. This is also like other studies conducted with a similar population in Colombia[36] and the UK.[35]

Data collection, procedure, and management

Following written and/or verbal informed consent, 12 face-to-face ($n=2$) and virtual (e.g. Zoom calls; $n=10$) semistructured interviews were conducted between March and September 2023 with a purposive sample of Black/African American MSM aged 20–42 years ($n=12$) by two trained researchers (the study PI (OA) and a trained graduate assistant) fluent in English and skilled in qualitative data collection. OA (Black male) obtained a PhD in sociology and has over a decade research experience conducting both qualitative and quantitative studies while the graduate student (Black female) was an MPH student at the time of the study. Both researchers have worked with the LGBTQAI+ persons extensively and did not consider their gender or sexual orientation to have had a significant impact on participant recruitment or the interviewing process. The interviews were conducted in English, audio recorded, and no one else was present except the interviewee and the interviewer. The interviews lasted between 28 and 93 min. Informed consent was taken and recorded using a digital recorder before the actual interview. Also, all participants completed a sociodemographic form that requires them to voluntarily accept or decline to participate in the study. A validated interview schedule used for a similar population in South Carolina was adapted. Questions about PrEP knowledge, barriers, and facilitators to PrEP uptake among BMSM were addressed during the interviews. Most participants preferred Zoom interviews for convenience and privacy, and the two face-to-face interviews were conducted in participants home as requested.

The interview audio files were transcribed verbatim into text in English by Rev.com and was checked by two researchers who conducted the interviews (OA and a female graduate student). All transcripts were de-identified to protect confidentiality. The transcripts were checked and compared with the recordings for quality control and to make sure that important meanings were not lost during transcription. The data were stored and managed in a secure web-based shared drive with restricted access. Participants were encouraged to use pseudo names during the interview. Each interview participant received US$30 worth of gift card after the interview.

Data analysis

The interview transcripts were manually and iteratively coded independently by two researchers (OA and a consultant – Black male and a PhD student) skilled in qualitative methods. The female graduate student who was part of participants recruitment and interviewing processes changed jobs after the data collection was completed and she was not available to participate in the coding and analysis; hence, the need for an experienced consultant to code the transcripts. Emerging themes were identified, and a structured coding framework informed by the study aims was developed. Coding was compared across coders for accuracy. Emerging themes – from the interview transcripts – that address the study aims were thematically analyzed inductively and deductively. Also, the analysis was discussed with the consultant, and we agreed on the themes presented in this manuscript. The data analysis was performed using a two-phase approach. First, inductive thematic analysis was performed to tease out emerging themes following the six steps (i.e. familiarization, coding, generating themes, reviewing themes, defining and renaming, and reporting) suggested by Braun and Clarke.[43] Second, themes were deductively mapped onto the COM-B model subcomponents, although this was not initially planned with the study. Previous studies have used inductive and deductive approaches in their data analysis to improve health behaviors.[35,36] Notably, not all the COM-B model subcomponents were represented in the barriers or facilitators to PrEP uptake among BMSM in Iowa as shown in Figure 1.

To determine data saturation, Francis et al.[44] recommended an initial analysis sample of 10 participants and an additional 3. Although concerted efforts were made to recruit more participants as previously planned, an initial analysis of 10 participants showed data saturation as no new themes

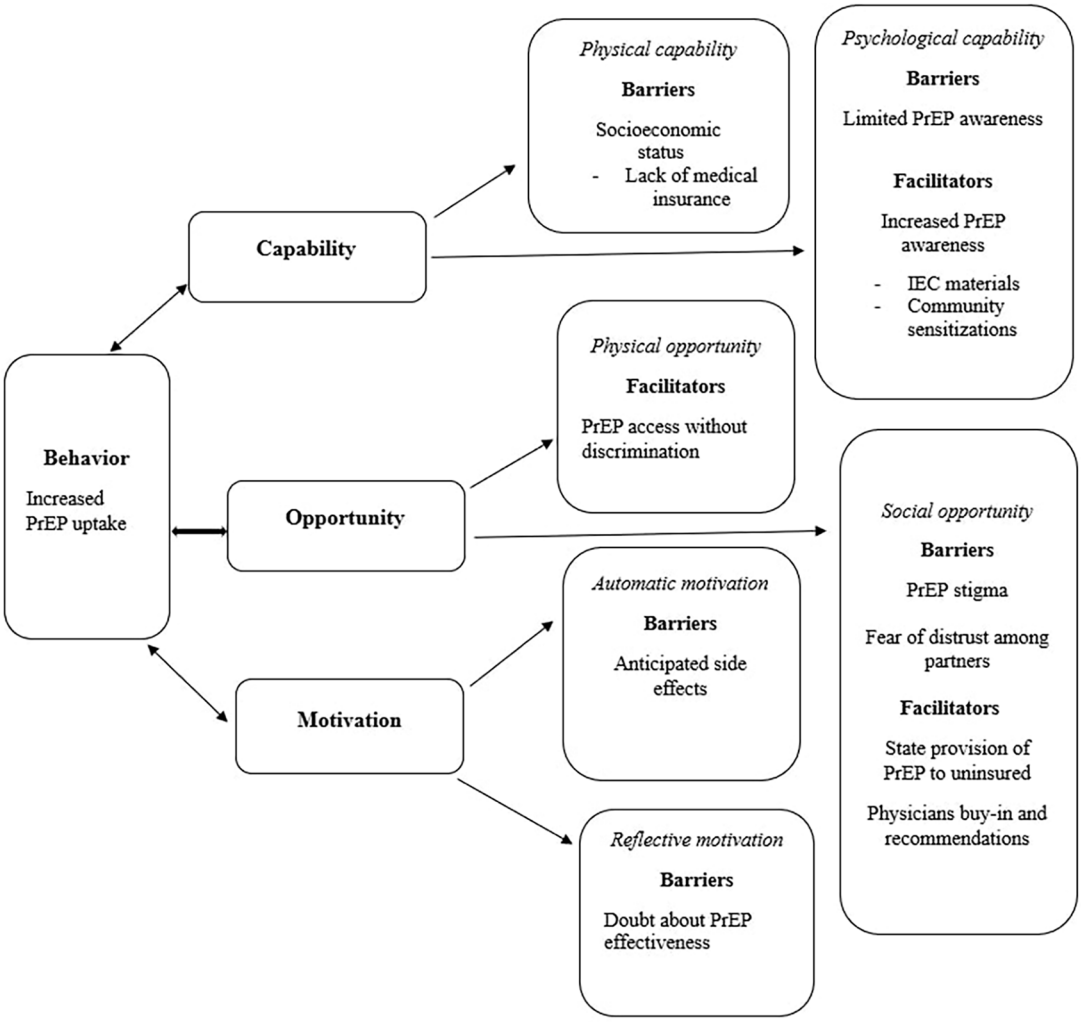

Figure 1. COM-B model for barriers and facilitators to PrEP uptake among Black/African American MSM in Iowa, United States.
COM-B, Capability, Opportunity, Motivation and Behavior; MSM, sex with men; PrEP, pre-exposure prophylaxis.

emerged and the stopping criterion was tested with 2 other interviews. Reiterated, the small number participants in this study corresponds with the number of participants in studies with a similar population in the US,[19] Colombia,[36] and the UK.[35]

Results

Approximately 58% ($n=7/12$) of the study participants were students, while 42% ($n=5/12$) had no medical insurance (see Table 2). Past or current PrEP use was not evaluated, and no participant reported using PrEP. After mapping the main themes across the three domains and subcomponents of COM-B model, six barriers were identified. Results showed that barriers to PrEP uptake were closely associated with five (of six) COM-B subcomponents: physical capability, psychological capability, social opportunity, reflective motivation, and automatic motivation (see Figure 1). The thematized barriers were (1) lack of medical insurance; (2) limited PrEP awareness; (3) PrEP stigma; (4) fear of distrust among partners; (5) anticipated side effects; and (6) doubt about PrEP effectiveness. Similarly, facilitators to PrEP uptake were aligned with four subcomponents of COM-B model: physical capability, psychological capability, social opportunity, and physical opportunity. The thematized facilitators were (1) increased PrEP awareness; (2) PrEP access without discrimination; (3) state

Table 2. Participant demographics.

Participant	Occupation	Medical insurance
Black Hawk county		
1	Mechanic	Public
2	Educator	No
Johnson county		
3	Fleet manager	No
4	Bartender	No
5	Driver	Public
6	Student	Private
7	Student	Private
8	Student	Private
9	Student	Private
10	Student	No
11	Student	No
12	Student	Private

provision of PrEP to uninsured; and (4) physicians buy-in and recommendation. No motivation-related facilitators were reported.

Barriers to PrEP uptake among Black/African American MSM

Six key themes mapped within the three main domains and subcomponents of the COM-B model were identified as the major barriers inhibiting PrEP uptake among Black MSM. The themes were limited PrEP knowledge, lack of medical insurance, PrEP-related stigma, fear of distrust among partners, anticipated side effects, and doubt about PrEP effectiveness. The themes are presented below with narrative excerpts from the interviews.

Physical capability

Lack of medical insurance. Participants' lower socioeconomic status was a primary barrier to PrEP uptake. Five of the study participants had no medical insurance while two had public medical insurance. Other participants with private insurance may be limited in what they could access since some of them were students and most likely be on their parents' medical insurance. Participants indicated that they cannot access PrEP without an appropriate medical insurance due to cost. The below quotes highlighted participants' thoughts about the impact of cost associated with taking PrEP:

> I feel like the main thing, that is insurance. Yeah. Some of them [PrEP providers] ask for insurance information, and yeah. It still boils down to privilege. I don't know if there are free PrEP initiatives here. I remember how someone told me about PrEP. He asked am I on PrEP? and I was like no. And then what he told me was, 'You won't be able to get it since you are not insured.' Imagine someone who is Black and doesn't have insurance, it's already creating that barrier. (29 years, Johnson)

> So, we have people who aren't insured to take it so that could be one of the barriers. (33 years, Black Hawk)

Most participants alluded to lack of adequate medical insurance associated with financial capacity as a major determinant for PrEP uptake.

Psychological capability

Limited PrEP awareness. Lack of PrEP awareness is one of the key barriers to PrEP uptake among Black/African American MSM who participated in this study. Most participants reported that they had little or no knowledge about PrEP before the interviews. The following participant reported that he joined the study to learn more about PrEP:

> Yeah, I'm not too conversant with it [PrEP], so that's why I actually decided to come on this study to actually learn more about it. (33 years, Johnson)

The following participant demonstrated little knowledge about PrEP:

> PrEP? Yeah, sure, I've heard of that, yeah. I feel is sometimes maybe a drug or injection taken by a person to prevent contracting HIV. (36 years, Black Hawk)

Limited knowledge about the benefits of PrEP and how to access it were reported by study participants. This could potentially impede on their ability to make an informed decision about PrEP use.

Social opportunity

PrEP stigma. Some participants reported the role of stigma and discrimination in accessing PrEP. Specifically, participants alluded to PrEP-related stigma and its pervasiveness in the gay community. They indicated that PrEP use is often associated with sexual promiscuity or prostitution (hook up) within the gay community, and this could discourage those interested taking PrEP due to fear of stigmatization or discrimination. The following participant provided a detailed account of PrEP stigma in the gay community:

> . . . There's like a stigma on PrEP too, like in the gay community, usually when someone is on PrEP, they see them as someone who love hooking up because if you are not hooking up, what would be the reason for you to be on PrEP? Which I think it's stupid because accident happen, you can go to a party and then one thing leads to another and then you end up in bed with someone and then you don't have a condom or anything, but just by being on PrEP, you actually have this piece of protection that would give you the peace of mind. (25 years, Johnson)

Fear of distrust among partners. Few participants reported that PrEP use could breed distrust in their monogamous relationships. They indicated that distrust associated with PrEP use might affect their relationships negatively. The following participant gave a detailed account of his fears:

> Hmm. I don't like the fact that you have to take a drug before engaging in sexual activity. It puts a hold on the whole thing. Because I earlier mentioned that for you to engage in a sexual relationship with a partner, there need to be a level of trust. So, you having to take a drug before you engage in sexual activities shows that there is no trust for your partner. And just imagine your partner feels that you don't have a kind of trust for him. It sounds so awkward, and then the whole relationship would actually be jeopardized. (35 years, Johnson)

Automatic motivation

Anticipated side effects. Participants' pessimistic thoughts about potential side effects of PrEP indicated the existence of automatic conclusions, which reflected low motivation to use PrEP. Some participants expressed fear for PrEP safety and serious side effects, such as cancer, that could emanate from taking PrEP:

> . . . People like me would actually want to jump on it, but first of all, you have to actually let them [BMSM] know that it is something that is safe. There is not going to be complications in the future, you know you can be preventing HIV and AIDS, and then you start noticing that the drug is causing cancer in your system. (33 years, Johnson)

Reflective motivation

Doubt about PrEP effectiveness. Participants reported their fears about PrEP efficacy and its potential failure to protect them from acquiring HIV. This is relevant because prophylactics, like PrEP, was thought to provide a sense of security for individuals, especially priority populations (e.g. MSM), from contracting HIV. The following participant's self-reflection about PrEP and fear of its potential failure is noteworthy:

> Well, PrEP, it's actually an effective drug, yeah, with now a beyond-90% guarantee. But in a situation where you rely so much on the drug and it fails, and then automatically you're infected, because if it fails, you rely absolutely on PrEP, and it get to be a

> point where it fails. I'm just imagining the probability that it fails. So, does that mean if I should rely on this drug, it's not hundred percent? And I'm banking on the fact that it's supposed to give me a guarantee to have sexual activity with my partner, irrespective of his status being positive or negative. I've absolutely eliminated that clause of my partner being infected. What if my partner is infected, and what's the eventuality I have sexual relationship with my partner and the drug happens to fail? Automatically I'm infected also. (35 years, Johnson)

Some participants thought that lack of testimonies about PrEP effectiveness from PrEP users, especially those with partners living with HIV, is also a major barrier to PrEP uptake. This subjective view impacts current reflective motivation to use PrEP:

> Well, the barriers here are kind of the testimonies. People believe in what they see. There are people that are taking PrEP, and then there's a way that they can come out and tell people that they have been taking PrEP and have had sex with someone that have HIV and have not had HIV. Like something that can really show the community that this is really happening. I believe it will help people to believe much better to get the drugs. But then, other people will need much persuasion . . . (24 years, Johnson)

Facilitators to PrEP uptake among Black/ African American MSM

Reiterated, facilitators to PrEP uptake were aligned with four subcomponents of COM-B model: physical capability, psychological capability, social opportunity, and physical opportunity. The thematized facilitators were (1) increased PrEP awareness; (2) PrEP access without discrimination; (3) state provision of PrEP to uninsured; and (4) physicians buy-in and recommendation. No motivation-related facilitators were reported by the study participants. The themes are presented below with narrative excerpts from the interviews.

Psychological capability

Increased PrEP awareness. To improve PrEP awareness in the gay community, participants suggested that PrEP education, community sensitizations, and strategic placement of PrEP-related education, information, and communication (IEC) materials should be prioritized. Participants indicated that the provision of culturally appropriate information about PrEP through different platforms would motivate more Black/ African American MSM to initiate and use PrEP:

> Yeah, I think you could reach out to them [BMSM] through the radio and flyers. You could put them in the barber's shop, the salon all the time, the supermarket. Yeah, I think those are public places that people could really access. (36 years, Black Hawk)

Another important strategy highlighted by participants is community sensitizations about the benefits of PrEP. They suggested that this could be achieved through symposia and community partnerships involving community leaders:

> . . . Conducting seminars, and focus group discussion, and teaching people about it [PrEP]. This really help by impacting people about it. . .Well, by maybe the community leaders, talking to the people in the community. I think it will help. (25 years, Johnson)

Physical opportunity

PrEP access without discrimination. Participants highlighted the need for Black MSM to have access to PrEP and other health services without discrimination. Limited access to friendly PrEP and other sexual health services represented a stumbling block involved with physically gaining access to sexual health services including PrEP. Some participants shared experiences of how they were discriminated against while accessing health services:

> That's what I said that the provision of PrEP and other pharmaceutical stuff, then the accessibility to members of the Black MSM community, despite the barriers because I've been a victim once . . . I walked into the pharmaceutical store where I needed a medication. And checking around, I couldn't find it and I asked the pharmacist there. It was a white lady and she told me that such medication is not there, that they don't have that actual medication in the store. So, while I wait for them because I went to pick a couple of drugs. While I wait for purchase of others, I saw someone else who was in the store placing the medication of which I just asked the lady for on the counter. So, I felt really bad. So, I think where people do place their biases alongside of their profession, it makes it difficult to access these services. (42 years, Johnson)

Social opportunity

State provision of PrEP to uninsured. Participants indicated that lack of adequate medical insurance (especially among low-income earners) was one of the major barriers inhibiting access to and uptake of PrEP among Black MSM. They suggested that the government should provide easy access to PrEP for those at-risk of acquiring HIV, whether insured or uninsured:

> Yeah, there are lots of persons who are uninsured really. And it would be nice if the government can actually make this a thing that everyone can access. Just like the self-test kit for HIV. (33 years, Black Hawk)

The provision of PrEP through low-income earners could limit social and financial limitations of accessing PrEP.

Physicians buy-in and recommendations. Participants highlighted the need to involve key stakeholders such as trusted physicians to promote and suggest PrEP to their clients especially MSM. They reported that BMSM were more likely to use PrEP if recommended by their trusted physicians:

> Talking about me, my medical provider knows about my medical history. So, for you to convince me to take something like PrEP, it has to come from someone I already trust that has a medical history, someone that has that medical background, that can talk to me to convince me that this is good even though it has some side effects, but he can only be the person that would actually downplay it to let me know that this side effects will not affect me and it's going to be good for me to actually take it. (33 years, Johnson)

Discussion

Mapping the inductive thematic results onto the COM-B model, the current study identified six key barriers to PrEP uptake among BMSM in Iowa: lack of medical insurance and limited PrEP awareness (capability); PrEP stigma and fear of distrust among partners (opportunity); and anticipated side effects and doubt about PrEP effectiveness (motivation). Also, the study identified four key facilitators for PrEP uptake: increased PrEP access without discrimination (physical opportunity); increased PrEP awareness (psychological capability); and state provision of PrEP to uninsured as well as physicians buy-in and recommendation (social opportunity). Overall, in-depth interviews with Black/African American MSM highlighted some of the current intersecting barriers and potential strategies to improve PrEP uptake among an underserved population subject to social stigmatization and prejudices.

First, lack of medical insurance and limited PrEP awareness associated with physical (e.g. socioeconomic status) and psychological capabilities (e.g. knowledge) were major barriers to PrEP uptake among Black MSM in this study. It is evident from the data analysis that limited PrEP knowledge impacted BMSM's ability to make an informed decision about PrEP use. Locating limited PrEP awareness within the BCW, this shows the need for a tailored PrEP education in future intervention design to increase PrEP knowledge among Black MSM. This finding is not peculiar to this study as other studies and reports have highlighted the negative impact of limited PrEP knowledge[20,22,29] on PrEP uptake decisions among MSM.[18,35] As suggested by our study participants, culturally sensitive tailored PrEP-related IEC materials (e.g. flyers) and community sensitizations through educational campaigns should be prioritized to increase PrEP knowledge in Black MSM community. The use of strategic places like barber's shop and entertainment spots frequented by sexual and gender minorities were seen as a priority. Studies and reviews from across the world have found community sensitizations and IEC materials to have positive impact on people's decision to imbibe healthy behaviors including PrEP uptake.[45–48] Notably, participants indicated that PrEP information and recommendation from trusted sources including their clinicians would improve PrEP knowledge and uptake. Thus, the provision of adequate PrEP information using credible sources such as healthcare providers could improve BMSM's psychological capabilities to make an informed decision about PrEP use.[31]

Another major barrier to PrEP uptake highlighted by our study participants is cost. Previous studies have documented the high cost (financial constraint)[18,19,49] associated with PrEP use as well as its impact on MSM especially those with lower income, underinsured, or uninsured. Although not racially aggregated, only 23.3% of Iowans who had indications for PrEP ($n = 8{,}260$) had active prescriptions in 2021.[25] The experiences of

Black MSM may be different in Iowa – a rural state with a 4% Black population. Since health outcomes among underserved communities is rooted in socioeconomic disparities, PrEP uptake among Black MSM can be improved through government provision of low-cost or free PrEP services to underinsured and uninsured as suggested by our study participants. Furthermore, a recent US report shows that HIV PrEP coverage is poor across the country due to inconsistencies in PrEP policy, while access to PrEP is solely determined by the payer.[50] To address these inconsistencies, the US Preventive Services Task Force should review the 2023 HIV PrEP recommendations[51] for any ambiguities that could affect effective delivery of PrEP.[13,50,52] Also, government should be encouraged to invest[53] in HIV PrEP to cover all modalities through the Affordable Care Act for low-income earners at-risk for acquiring HIV to have access to low-cost or free PrEP services. This will not only expand PrEP options and coverage, but it will also reduce the persistent HIV incidence and prevalence in Black MSM communities across the US. Thus, provision of financial support to cover all PrEP modalities might improve BMSM's physical capabilities to access and use PrEP without cost barrier.

Furthermore, another important barrier impeding our study participant's social opportunity is the pervasiveness of PrEP-related stigma and discrimination in the gay community. PrEP use is often associated with sexual promiscuity within the gay community. The association of PrEP with sexual promiscuity created social stigma that has had a negative impact on some BMSM's decision to use PrEP to prevent HIV. In fact, some participants were afraid that it might breed mistrust in their monogamous relationships with their partners. They do not want to offend their partners or jeopardize their relationships by taking PrEP. Prioritizing their relationships over taking PrEP could be an act of fear of being alone amidst the anti-homosexuality policies across the US. Previous studies conducted in similar settings corroborate our findings about the impact of PrEP-related stigma on MSM's PrEP upt ake[17,49,54–57] including the fear of family or significant others rejection[35,58] if they are found to be taking PrEP. Addressing PrEP-related stigma especially in the gay community is key to improving PrEP awareness, uptake, and adherence especially among underserved population.[59,60]

Furthermore, some participants reported unpleasant experiences of discrimination within the healthcare system. A recent study conducted in rural and urban US reported homophobia and nonaffirming providers as key factors inhibiting young sexual minority males from accessing sexual health services including PrEP.[19] Thus, addressing discriminatory practices in healthcare facilities (including pharmacies) is key to ensuring unbiased access to PrEP irrespective of one's sexual orientation, race, or ethnicity. This can be achieved by training healthcare providers (especially PrEP providers) on cultural competence and empathy to be able to deliver more equitable care to improve patient outcomes especially Black MSM.[36,49,61,62]

Lastly, anticipated side effects and doubt about PrEP effectiveness had negative impact on some participants' motivation to use PrEP. Due to past unethical research practices in Black communities, some participants were afraid that taking PrEP might lead to other health issues such as cancer. A study conducted in a similar setting in the US reported concerns about side effects as one of the main barriers to PrEP uptake among MSM.[18] Similarly, a study conducted in Colombia reported side effects as a major barrier to PrEP uptake among transgender women.[36] As discussed in the preceding paragraphs, it is evident that some participants had limited or no knowledge about how PrEP work, its benefits, and potential side effects. The findings of a study conducted in Chicago is consistent with our findings on the association of anticipated side effects with PrEP uptake among Black MSM.[55] Also, some participants were doubtful about the effectiveness of PrEP in preventing HIV, hence their reluctance to use PrEP. They were afraid of acquiring HIV even if they were taking PrEP and had sex with another man with HIV without condom. It is evident that our study participants cognitively assess their risk (e.g. perceived susceptibility, severity, and benefits) of taking PrEP and this impact their PrEP uptake decisions. Madhani and Finlay[35] reported similar findings on PrEP uptake in a sample of MSM in the UK. Other than PrEP education, PrEP promotion through trusted healthcare providers may alleviate PrEP effectiveness and side effects worries, and eventually increase PrEP uptake among Black MSM. Some of our participants would only take PrEP if it was suggested by trusted healthcare providers. Previous studies conducted in the US corroborate

our findings on the need for trusted and relatable healthcare providers to promote and deliver friendly PrEP services to MSM.[19,49,59,62]

Limitations and strengths

Since this was a qualitative study, generalizations of findings may be limited to Black MSM due to research settings, sampling, and sample size. Due to unequal sample size from the study sites, no demographic comparisons were conducted across the study sites. Notably, power analysis for sample size was not calculated and the research team faced significant challenges with participants recruitment; hence, the small sample size less than what was initially planned. Nevertheless, smaller number of study participants is acceptable in qualitative research since in-depth meanings of concepts and thematic areas were explored.[42] Also, most participants were students ($n=7$) and this provides a different context to insurance status and privacy as some of them may depend on their guardians' or parents' medical insurance which could limit their ability to use PrEP especially if they want to keep it confidential. Although an attempt was made to explore varied experiences and viewpoints of Black MSM in the research settings, our findings may not be reflective of experiences of all men especially other MSM groups and transgender women and men. However, individual in-depth interviews provided us the chance to draw on a range of personal experiences of Black MSM on HIV prevention particularly PrEP. This add nuance to our understanding of the various intersecting barriers faced by Black MSM in Iowa as well as ways in which PrEP services could be improved for the benefit of the community.

Conclusion

Drawing on COM-B model, this study identified major barriers and facilitators that influence PrEP uptake among Black MSM in Iowa, US. Mapping the barriers and facilitators to PrEP uptake against the COM-B model provides a solid background for the development of HIV prevention interventions and implementation strategies to address 'PrEP uptake' as the target behavior and 'Black MSM' as the target group. This study highlights the significance of addressing not only access barriers to PrEP (e.g. cost) but also the social and psychological factors that impact Black MSM decision making about PrEP uptake. Thematized barriers such as lack of medical insurance associated with financial constraints and limited PrEP awareness affected BMSM's capability, while PrEP-related stigma and fear of distrust among MSM partners limit their opportunity to access and use PrEP. Also, doubt about PrEP effectiveness and anticipated side effects demotivated them from accessing PrEP. These results expand the knowledge of the behavior change domains that must be targeted to increase PrEP uptake among Black MSM. To develop appropriate strategies to address the abovementioned barriers, further research is required to understand the impact of socioeconomic status and intersectional stigma (at different socioecological levels) on PrEP uptake among Black MSM in Iowa. To eradicate HIV epidemic in the US, efforts should be directed toward the provision of low-cost or free PrEP services, healthcare providers' training on cultural competence, and the development of culturally appropriate strategies to deliver PrEP to the Black MSM community.

Declarations

Ethics approval and consent to participate

This study was approved by the Institutional Review Board of the University of Iowa (Reference no: 202301186). All the researchers including interviewers received adequate training on research ethics such as confidentiality and voluntary participation. We ensured confidentiality at all levels of the research process and no participants' identifying information was used in any of our reports or presentations. Both verbal and written informed consent to participate was obtained. Verbal informed consent was taken and recorded using a digital recorder before the interview. Verbal permission to audiotape the qualitative interviews was obtained from the participants and all data were kept secured in a password-protected computer. Audio-files and transcripts will be destroyed as soon as the data analysis is complete. Participants were provided with adequate information about the study, and they were allowed to ask questions for clarification prior to their involvement in the study. Also, all participants completed a sociodemographic form that requires them to voluntarily accept or decline to participate in the study. This study conforms to the ethical guidelines and standards of the University of Iowa.

Consent for publication

Participants provided written and verbal consent for data collection and for publishing collected data under the protocol approved by University of Iowa Institutional Review Board (Reference no: 202301186).

Author contribution

Oluwafemi Adeagbo: Conceptualization; Data curation; Formal analysis; Funding acquisition; Investigation; Methodology; Project administration; Resources; Supervision; Validation; Writing – original draft; Writing – review & editing.

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Competing interests

The authors declare that there is no conflict of interest.

Availability of data and materials

The qualitative data analyzed for this manuscript are not publicly available. However, the corresponding author can make the data available upon reasonable request.

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References

1. Rouffiac AE, Whiteley L, Brown L, et al. A mobile intervention to improve uptake of pre-exposure prophylaxis for Southern Black men who have sex with men: protocol for intervention development and pilot randomized controlled trial. *JMIR Res Protoc* 2020; 9(2): e15781.
2. Mouhanna F, Castel AD, Sullivan PS, et al. Small-area spatial–temporal changes in pre-exposure prophylaxis (PrEP) use in the general population and among men who have sex with men in the United States between 2012 and 2018. *Ann Epidemiol* 2020; 49: 1–7.
3. Smith DK, Van Handel M and Grey J. Estimates of adults with indications for HIV pre-exposure prophylaxis by jurisdiction, transmission risk group, and race/ethnicity, United States, 2015. *Ann Epidemiol* 2018; 28(12): 850–857.e9.
4. Smith DK and Rawlings MK. PrEP and the Black community. In: *HIV in US communities of color* (ed. Ojikutu and Stone). Springer: Cham, Switzerland, 2021, pp. 51–64.
5. CDC. *Diagnoses of HIV infection in the United States and dependent areas, 2021*. vol. 34. Division of HIV Prevention NCfH, Viral Hepatitis, STD, and TB Prevention, HIV Surveillance Report 2023, 2023.
6. HHS I. *State of Iowa HIV disease end-of-year 2022 surveillance report, September, 2023*. Bureau of HIV SaH, 2023, pp. 1–31.
7. Hess KL, Hu X, Lansky A, et al. Lifetime risk of a diagnosis of HIV infection in the United States. *Ann Epidemiol* 2017; 27(4): 238–243.
8. Fauci AS, Redfield RR, Sigounas G, et al. Ending the HIV epidemic: a plan for the United States. *JAMA* 2019; 321(9): 844–845.
9. Rawlings MK and Parham-Hopson D. HIV in the South. In: *HIV in US communities of color* (Ojikutu and Stone). Cham, Switzerland: Springer, 2021, pp. 135–146.
10. Harawa T, Bempong GA, Fields S, et al. Engaging Black men who have sex with men (BMSM) in Los Angeles in HIV PreExposure Prophylaxis (PrEP). Los Angeles: *California HIV/AIDS Policy Centers*, 2016.
11. Harawa NT, Schrode KM, McWells C, et al. Small randomized controlled trial of the new passport to wellness HIV prevention intervention for Black men who have sex with men (BMSM). *AIDS Educ Prev* 2020; 32(4): 311–324.
12. Dunville R, Harper C, Johns MM, et al. Awareness and willingness to use biomedical prevention strategies for HIV among sexual and gender minority youth: results from a national survey. *J Adolesc Health* 2021; 68(1): 199–206.
13. Cantos VD, Kelley CF and Del Rio C. Updated USPSTF recommendations for preexposure prophylaxis – new choices, new obstacles. *JAMA Intern Med* 2023; 183(10): 1054.
14. Auerbach JD and Hoppe TA. Beyond 'getting drugs into bodies': social science perspectives on

pre-exposure prophylaxis for HIV. *J Int AIDS Soc* 2015; 18: 19983.

15. Bauermeister JA, Meanley S, Pingel E, et al. PrEP awareness and perceived barriers among single young men who have sex with men in the United States. *Curr HIV Res* 2013; 11(7): 520.
16. Owens C, Hubach RD, Lester JN, et al. Assessing determinants of pre-exposure prophylaxis (PrEP) adherence among a sample of rural Midwestern men who have sex with men (MSM). *AIDS Care* 2020; 32(12): 1581–1588.
17. Owens C, Hubach RD, Williams D, et al. Exploring the pre-exposure prophylaxis (PrEP) health care experiences among men who have sex with men (MSM) who live in rural areas of the Midwest. *AIDS Educ Prev* 2020; 32(1): 51–66.
18. Owens C, Hubach RD, Williams D, et al. Facilitators and barriers of pre-exposure prophylaxis (PrEP) uptake among rural men who have sex with men living in the Midwestern US. *Arch Sex Behav* 2020; 49(6): 2179–2191.
19. Jozsa K, Owens C, Hill R, et al. Young sexual minority males' perceptions and experiences of sexual healthcare in urban and rural areas. *Sex Res Soc Policy* 2023: 1–15.
20. Mayer KH, Agwu A and Malebranche D. Barriers to the wider use of pre-exposure prophylaxis in the United States: a narrative review. *Adv Ther* 2020; 37: 1778–1811.
21. Adeagbo O, Harrison S, Qiao S, et al. Pre-exposure prophylaxis (PrEP) uptake among Black men who have sex with men (BMSM) in the Southern U.S. *Int J Environ Res Public Health* 2021; 18(18): 9715.
22. Coukan F, Murray KK, Papageorgiou V, et al. Barriers and facilitators to HIV pre-exposure prophylaxis (PrEP) in specialist sexual health services in the United Kingdom: a systematic review using the PrEP care continuum. *HIV Med* 2023; 24(8): 893–913.
23. Mullins TLK, Lally M, Zimet G, et al.; The Adolescent Medicine Trials Network for HIV/AIDS Interventions. Clinician attitudes toward CDC interim pre-exposure prophylaxis (PrEP) guidance and operationalizing PrEP for adolescents. *AIDS Patient Care STD* 2015; 29(4): 193–203.
24. CDC. Core indicators for monitoring the Ending the HIV Epidemic initiative (preliminary data): National HIV Surveillance System data reported through September 2022; and preexposure prophylaxis (PrEP) data reported through June 2022, September 2022, pp. 1–35. https://www.cdc.gov/hiv/pdf/library/reports/surveillance-data-tables/cdc-hiv-surveillance-data-tables-vol-3-no-4.pdf (2022, accessed 26 November 2023).
25. *HIV and hepatitis prevention program snapshot integrated testing services PrEP screening and referral services: 2022*. vol. 1. Bureau of HIV, STI, and Hepatisis, Iowa Department of Health & Human Services, 2023.
26. Chasco EE, Shafer C, Dillon DM, et al. Bringing Iowa TelePrEP to scale: a qualitative evaluation. *Am J Prev Med* 2021; 61(5): S108–S117.
27. Chen YT, Duncan DT, Issema R, et al. Social–environmental resilience, PrEP uptake, and viral suppression among young Black men who have sex with men and young Black transgender women: the neighborhoods and networks (N2) study in Chicago. *J Urban Health* 2020; 97(5): 728–738.
28. Patel RR, Crane JS, Lopez J, et al. Pre-exposure prophylaxis for HIV prevention preferences among young adult African American men who have sex with men. *PLoS One* 2018; 13(12): e0209484.
29. Dang M, Scheim AI, Teti M, et al. Barriers and facilitators to HIV pre-exposure prophylaxis uptake, adherence, and persistence among transgender populations in the United States: a systematic review. *AIDS Patient Care STDS* 2022; 36(6): 236–248.
30. Quinn KG, Dickson-Gomez J, Craig A, et al. Intersectional discrimination and PrEP use among young Black sexual minority individuals: the importance of Black LGBTQ communities and social support. *AIDS Behav* 2023; 27(1): 290–302.
31. Arlinghaus KR and Johnston CA. Advocating for behavior change with education. *Am J Lifestyle Med* 2018; 12(2): 113–116.
32. Michie S, Van Stralen MM and West R. The behaviour change wheel: a new method for characterising and designing behaviour change interventions. *Implement Sci* 2011; 6(1): 1–12.
33. Ojo SO, Bailey DP, Hewson DJ, et al. Perceived barriers and facilitators to breaking up sitting time among desk-based office workers: a qualitative investigation using the TDF and COM-B. *Int J Environ Res Public Health* 2019; 16(16): 2903.
34. Kawuma S, Katwesigye R, Walusaga H, et al. Determinants to continuation on HIV pre-exposure propylaxis among female sex workers at a referral hospital in Uganda: a mixed methods study using Com-b model. *Res Sq* 2024; 1–26.

35. Madhani A and Finlay KA. Using the COM-B model to characterize the barriers and facilitators of pre-exposure prophylaxis (PrEP) uptake in men who have sex with men. *Br J Health Psychol* 2022; 27(4): 1330–1353.

36. Camila-Bolívar M, Gomez-Peñaloza SA, Camargo-Plazas P, et al. Barriers and facilitators to HIV pre-exposure prophylaxis uptake among transgender women in Colombia: a qualitative analysis using the COM-B model. *PLoS Glob Public Health* 2023; 3(9): e0001395.

37. Pantoja Solana A. *Barriers and facilitators of PrEP uptake among MSM in Europe: a systematic review and evidence synthesis using the COM-B model*, Utrecht: Utrecht University, 2022.

38. IDPH. State of Iowa HIV disease end-of-year 2020 surveillance report 2021, https://idph.iowa.gov/hivstdhep/hiv/data (accessed September 15, 2023). Des Moines: Bureau of HIV, STI, and Hepatisis, Iowa Department of Health & Human Services, 2021.

39. ICSAA. *African-Americans in Iowa: 2023*. ICSAA, Des Moines: Iowa State Data Center, 2023, pp. 1–4.

40. Tracy SJ. Qualitative quality: eight 'big-tent' criteria for excellent qualitative research. *Qual Inq* 2010; 16(10): 837–851.

41. Tong A, Sainsbury P and Craig J. Consolidated criteria for reporting qualitative research (COREQ): a 32-item checklist for interviews and focus groups. *Int J Qual Health Care* 2007; 19(6): 349–357.

42. Denzin NK and Lincoln YS. *The Sage handbook of qualitative research*. Sage: Thousand Oaks, CA, 2011.

43. Braun V and Clarke V. Using thematic analysis in psychology. *Qual Res Psychol* 2006; 3(2): 77–101.

44. Francis JJ, Johnston M, Robertson C, et al. What is an adequate sample size? Operationalising data saturation for theory-based interview studies. *Psychol Health* 2010; 25(10): 1229–1245.

45. Adeagbo OA, Seeley J, Gumede D, et al. Process evaluation of peer-to-peer delivery of HIV self-testing and sexual health information to support HIV prevention among youth in rural KwaZulu-Natal, South Africa: qualitative analysis. *BMJ Open* 2022; 12(2): e048780.

46. Shahmanesh M, Mthiyane TN, Herbsst C, et al. Effect of peer-distributed HIV self-test kits on demand for biomedical HIV prevention in rural KwaZulu-Natal, South Africa: a three-armed cluster-randomised trial comparing social networks versus direct delivery. *BMJ Glob Health* 2021; 6(Suppl. 4): e004574.

47. Nwagu EN, Abugu LI, Yohanna W, et al. Behaviour change communication for control of tuberculosis by healthcare workers in DOTS facilities in Nigeria. *Pan Afr Med J* 2020; 36(1): 306.

48. Juma K, Reid M, Roy M, et al. From HIV prevention to non-communicable disease health promotion efforts in sub-Saharan Africa: a narrative review. *AIDS* 2018; 32: S63–S73.

49. Pichon LC, Teti M, McGoy S, et al. Engaging Black men who have sex with men (MSM) in the South in identifying strategies to increase PrEP uptake. *BMC Health Serv Res* 2022; 22(1): 1491.

50. Hughes IV R. The task force's latest PrEP recommendation for HIV is just more of the same. *Health Affairs Forefront*, 2023.

51. Barry MJ, Nicholson WK, Silverstein M, et al. Preexposure prophylaxis to prevent acquisition of HIV: US Preventive Services Task Force recommendation statement. *JAMA* 2023; 330(8): 736–745.

52. Liu AY, Scott HM and Buchbinder SP. New USPSTF guidelines for HIV preexposure prophylaxis: will more choices lead to greater impact? *JAMA* 2023; 330(8): 699–701.

53. Johnson J, Killelea A and Farrow K. Investing in national HIV PrEP preparedness. *N Engl J Med* 2023; 388(9): 769–771.

54. Dubov A, Galbo P Jr, Altice FL, et al. Stigma and shame experiences by MSM who take PrEP for HIV prevention: a qualitative study. *Am J Men's Health* 2018; 12(6): 1843–1854.

55. Biello KB, Hosek S, Drucker MT, et al. Preferences for injectable PrEP among young U.S. cisgender men and transgender women and men who have sex with men. *Arch Sex Behav* 2018; 47(7): 2101–2107.

56. Schuyler A, Alidina Z, Dolcini MM, et al. Pre-exposure prophylaxis (PrEP) dissemination: adapting diffusion theory to examine PrEP adoption. *AIDS Behav* 2021; 25(10): 3145–3158.

57. Quinn K, Bowleg L and Dickson-Gomez J. 'The fear of being Black plus the fear of being gay': the effects of intersectional stigma on PrEP use among young Black gay, bisexual, and other men who have sex with men. *Soc Sci Med* 2019; 232: 86–93.

58. Galea JT, Kinsler JJ, Salazar X, et al. Acceptability of pre-exposure prophylaxis as an HIV prevention strategy: barriers and facilitators to pre-exposure prophylaxis uptake among at-risk Peruvian populations. *Int J STD AIDS* 2011; 22(5): 256–262.

59. Elopre L, Hussen SA, Ott C, et al. A qualitative study: the journey to self-acceptance of sexual identity among young, Black MSM in the South. *Behav Med* 2021; 47(4): 324–334.

60. Wheeler DP, Fields SD, Beauchamp G, et al. Pre-exposure prophylaxis initiation and adherence among Black men who have sex with men (MSM) in three US cities: results from the HPTN 073 study. *J Int AIDS Soc* 2019; 22(2): e25223.

61. Pleuhs B, Quinn KG, Walsh JL, et al. Health care provider barriers to HIV pre-exposure prophylaxis in the United States: a systematic review. *AIDS Patient Care STDS* 2020; 34(3): 111–123.

62. Saha S, Korthuis PT, Cohn JA, et al. Primary care provider cultural competence and racial disparities in HIV care and outcomes. *J Gen Intern Med* 2013; 28: 622–629.