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## Understanding Preferences for Visualized New and Future HIV Prevention Products Among Gay, Bisexual and Other Men Who Have Sex with Men in the Southern United States: A Mixed-Methods Study

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### Abstract

Men who have sex with men (MSM) are vulnerable to HIV infection. Although daily oral pre-exposure prophylaxis (PrEP) prevents HIV among MSM, its usage remains low. We conducted virtual in-depth interviews (IDIs) and focus groups (FGs) with Black, Hispanic/Latino, and White MSM consisting of current PrEP users and those aware of but not currently using PrEP. We delved into their preferences regarding six emerging PrEP products: a weekly oral pill, event-driven oral pills, anal douche/enema, anal suppository, long-acting injection, and a skin implant. Our mixed methods analysis involved inductive content analysis of transcripts for thematic identification and calculations of preferences. Among the sample (n=98), the weekly oral pill emerged as the favored option among both PrEP Users and PrEP Aware IDI participants. Ranking exercises during FGs also corroborated this preference, with the weekly oral pill being most preferred. However, PrEP Users in FGs leaned toward the long-acting injectable. Conversely, the anal suppository and douche/enema were the least preferred products. Overall, participants were open to emerging PrEP products and valued flexibility but expressed concerns about limited protection for products

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#### DECLARATION OF CONFLICTING INTERESTS

The Author(s) declare(s) that there is no conflict of interest.

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designed solely for receptive sex. Public health practitioners should tailor recommendations based on individuals' current sexual behaviors and long-term vulnerability to infection.

### Keywords

HIV; MSM; PrEP; Pre-Exposure Prophylaxis; HIV Prevention

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## INTRODUCTION

HIV remains a significant public health challenge. Gay, bisexual, and other men (based on assigned male sex at birth) who report male-to-male sexual contact (MSM) are disproportionately affected (Centers for Disease Control and Prevention, 2023). While recent data show diagnoses of HIV infection from 2017 to 2021 decreased among some MSM (aged 13–24 and 45–54), the incidence of new infections has remained steady (aged 25–34 and 35–44) or increased (aged 55) in other instances despite advances in HIV treatment and prevention (Centers for Disease Control and Prevention, 2023). To address this, additional modalities of pre-exposure prophylaxis (PrEP) are emerging as promising new tools to prevent HIV transmission among MSM.

Currently, there are two FDA-approved daily oral PrEP options for HIV prevention: tenofovir disoproxil fumarate (TDF) and tenofovir alafenamide (TAF), both in combination with emtricitabine (FTC) (Grant et al., 2010) and one long-acting injectable option, cabotegravir (Landovitz et al., 2021). When taken consistently, the current options have been shown to reduce the risk of HIV infection from anal sex by ~99% (Centers for Disease Control and Prevention, 2022; Grant et al., 2010). Despite the high efficacy, (Marcus et al., 2017) PrEP is not widely used among MSM in some geographic locations and among some demographic groups in the United States (Peng et al., 2018). In particular, uptake for PrEP has been low among MSM in the South (18.6 – 29.6%) as well as among Black and Hispanic/Latino MSM (23.1 – 26.2%, and 16.3 – 30%, respectively) (Finlayson et al., 2019; Sullivan et al., 2020). A national study of U.S. MSM found that daily dosing was a barrier for use (93%), but preferences for episodic or event-driven PrEP use (74%) were identified (Elsesser et al., 2016).

The further development of novel biomedical HIV prevention products marks a substantial turning point for the reduction of HIV incidence among MSM who are most susceptible to infection (Bekker et al., 2022; Hillis et al., 2020). The pipeline of emerging biomedical HIV prevention products is robust, and many clinical and behavioral studies are underway with primary findings pointing to a reduction in HIV incidence among enrolled populations (e.g., MSM) (Atujuna et al., 2018; Mutchler et al., 2015; National Institutes of Health, 2022). Examples of products in development include new PrEP compounds and molecules, delivery systems, and oral, injectable, and topical administration modalities (AVAC, 2022).

With a plethora of potential options for HIV prevention, implementation questions remain as to why uptake is so varied across different populations, especially among MSM with significant existing HIV disparities. There is a need for more research to facilitate successful implementation of PrEP in a dynamic environment with novel, emerging options. This

study aimed to advance understanding of the opinions and preferences of MSM living in the US South related to new and emerging PrEP delivery methods for HIV prevention products. Interviewers and moderators presented visual images (graphic artist illustrations and photographs) as well as a live showcase of each of the six emerging PrEP product prototypes via videoconference using a mixed methods strategy (i.e., in-depth interviews (IDIs) and focus groups (FGs) combined with survey questions) with two discrete groups – MSM who were aware of PrEP but not currently using it, and those who are currently using it. We utilized IDIs to inquire on individual preferences and conducted FGs to investigate whether the group dynamic revealed any additional insights. We compared factors that may facilitate or deter acceptability and use of emerging delivery modalities, which included a weekly oral pill, event-driven oral pills, anal suppository, anal douche, long-acting injection, and a skin implant.

## **METHODS**

### **Theoretical Approach**

To better understand personal history of PrEP use as well as opinions, preferences, facilitators, and barriers to use of emerging PrEP products, this study utilized virtual IDIs, FGs, and a brief quantitative survey of demographics and history of and attitudes about PrEP use which was given to each IDI or FG participant. Given that product acceptability is a key consideration for new PrEP modalities, the Theoretical Framework of Acceptability (TFA) served as a foundation for this study's assessment of prospective acceptability. In particular, the following constructs were considered: affective attitude (how one feels about an intervention), intervention coherence (extent to which one understands how it works), burden (perceived amount of effort required to use it), and perceived effectiveness (extent to which intervention is perceived as likely to achieve its purpose) (Sekhon et al., 2017).

### **Sampling and Eligibility**

We used purposive sampling with referral assistance from community partners to recruit a sample of self-identified MSM from the Atlanta, GA, Houston, TX, and Miami, FL metropolitan statistical areas (MSAs). The collaborating community partners supported outreach by distributing flyers and study information through their websites, email list serves, and social media posts. Field assistants were also deployed in each MSA to conduct in-person outreach. Potential participants were provided a toll-free number to call to be screened for eligibility by study staff. Individuals were eligible for participation if they were 18 years of age or older, self-identified as MSM, non-Hispanic Black/African American, Hispanic/Latino, or non-Hispanic White, and self-reported an HIV-negative status, having condomless anal sex and/or a sexually transmitted infection (STI) in the past six months. Eligible participants identified as either being prescribed and currently taking PrEP (referred hereafter as PrEP user) or having heard of or been offered PrEP but not currently taking it (referred hereafter as PrEP aware). All participants were offered an informed consent document to review in advance, were read the consent form verbatim, and provided verbal informed consent prior to participating in the study. Study procedures were approved by the CDC Institutional Review Board (Protocol #7224).

## Assessment

For IDIs, study staff conducted 60 individual one hour virtual interviews for participants across the three cities via Zoom Video Communications™ software. Participants were purposively selected across race/ethnicity and PrEP status (PrEP user and PrEP Aware) within each city. For FGs, 11 multi-city virtual sessions consisting of 3–5 participants from any of the three cities were conducted via Zoom for approximately one and a half hours each. Participants were purposively selected and each FG was conducted separately by both race/ethnicity (Black, Hispanic/Latino, and White) and PrEP status. Each IDI and FG participant received \$40 and \$60, respectively, in virtual gift cards as tokens of appreciation.

Prior to each IDI and FG, study staff also individually administered brief virtual quantitative surveys capturing demographic data and history of and attitudes about PrEP use. Both the IDI and FG guides focused on understanding general PrEP knowledge and awareness and gathering opinions on potential use of six emerging PrEP products. Additionally, the IDIs and FGs explored what would make participants more interested in potentially using these products, and individual (IDIs) and group rank ordered collective preferences (FGs) for use among the products.

Participants were presented with brief descriptions and visual images (graphic artist illustrations and photographs) of each emerging PrEP product prototype as well as a live showcase of the physical prototype via videoconference. They were told to assume each product was as effective as daily oral PrEP and were then asked about their opinions of each product in turn. For the *weekly oral pill* option, participants were told that the pill would be available in a 3-month supply and must be taken around the same time of day every seven days for each dose to be effective. Participants were told that the *event-driven oral pill* option would require them to take two pills 2–24 hours before having anal sex and then one pill a day for two days after sex. It would be available in a 3-month supply (16 pills/month, 48 pills total). For the *anal suppository*, participants were told that a solid dissolvable medication would be inserted into the anus before having anal sex and, once inside the anus, it would dissolve and spread throughout the rectum. They were also told it would be inserted 1–24 hours before sex and be effective for up to 24 hours per dose and for multiple anal sex acts. For the *anal douche*, participants were shown a powder-like substance and enema/douching bottle and told that the user would mix the powder with water or a commercially available douching product. The mixed product would then be inserted in the anus or rectum and retained for about four minutes before releasing at least 30–60 minutes before anal sex. It would be effective for up to 24 hours per dose and for multiple anal sex acts. Participants were told that the *long-acting injectable* option would be injected into the muscle of the butt by a healthcare provider, but they would need to take an oral tablet version of the medication daily for five weeks before the first injection to monitor for any potential side effects. They were also told the first two injections would be four weeks apart, with subsequent injections every eight weeks. For the *skin implant* option, participants were told that it would be injected under the skin of the upper arm by a healthcare provider and be effective for up to six months, at which point it would have to be removed by a small incision or cut in the skin and replaced.

## Coding and Analysis

All IDIs and FGs were audio recorded, professionally transcribed verbatim, and deidentified for analysis. Qualitative data were systematically analyzed for themes using NVivo 11 (QSR International Pty Ltd, 2020). A common thematic coding structure across sites and respondent types was developed, allowing the team to: 1) examine systematic variations in responses both across and within respondent types (e.g., differences in attitudes by race/ethnicity, PrEP status); and 2) compare and contrast data gathered through IDIs and FGs both across and within respondent types. Preliminary IDI and FG coding structures were developed and subsequently refined through an iterative process as new or subtler patterns or thematic variations emerged during coder training, intercoder reliability (ICR) exercises, and independent coding.

ICR assessment was conducted to compare coder agreement using a coding comparison query tool and Cohen's formula for calculating agreement. ICR was assessed using pairwise comparisons between individual coders and the master coder. The common benchmark of 0.7 kappa was used to determine a "substantial degree of agreement" (Gwet, 2012; Landis & Koch, 1977); a kappa of 0.79 was reached before independent coding began. Coder disagreement was discussed until consensus was reached on how to resolve it (e.g., deleting a node, moving a coded excerpt, creating a new sub-node). Following coding, a team-based approach was used to thematically analyze IDI and FG data for common ideas, patterns, and themes. The most common participant ideas, experiences, insights, and opinions were collated, compared, contrasted, and summarized.

In the IDIs, after all products were described and discussed, respondents were then asked to identify which product(s) [one or more] they prefer to use and those that they reject using among the six emerging PrEP products including condoms and daily oral PrEP. They selected all that applied and the number of participants who said they preferred or rejected a product was summed. In the FGs, respondents were asked to rank the six emerging PrEP products along with daily oral PrEP and condoms from one (most preferred) to eight (least preferred) as a group in each session. Each FG came to a consensus on the rankings and the rank scores of each FG were averaged within PrEP aware and PrEP user groups.

## RESULTS

### Survey

**Sample characteristics**—From January to September 2021, 60 IDIs and 11 FGs were conducted (n=98) in the Atlanta, GA (n=32), Houston, TX (n=29), and Miami, FL (n=37) MSAs. Race/ethnicity for the sample was relatively evenly distributed across Black, Hispanic/Latino, and White MSM, and the sample was evenly split by PrEP status. However, there were more Hispanic/Latino MSM in the PrEP user group (39%) and more non-Hispanic Black MSM in the PrEP aware group (41%). Most participants (83%) indicated they were born in the U.S. Almost three-fourths (72%) of the sample had either some college, an associate's degree, technical degree, or a bachelor's degree. Over two-thirds (69%) of the sample identified as gay; notably, 80% of PrEP users identified as gay versus

59% of PrEP aware participants. PrEP users more often reported having health insurance (78%) compared to PrEP aware MSM (55%) (Table 1).

**History of and attitudes about PrEP use**—Forty-one percent of PrEP aware participants reported having been offered PrEP by a healthcare provider or counselor and 22% had taken it in the past. When asked about their thoughts about taking PrEP in the future, only two (4%) indicated they would never take PrEP. Notably, a few (22%) said they did not know enough about PrEP to answer the question (Table 2).

As for PrEP user participants, about a quarter (24%) reported having missed at least one dose of PrEP in the preceding seven days. Reasons included forgetting, being too busy, having run out of a prescription, having recently started PrEP, and simply not wanting to take it. Over a third (37%) had intentionally stopped taking PrEP in the past, most commonly due to a change in their relationship status. Other reasons included not being able to afford it, insurance not covering it, thinking they did not need it anymore, not liking the side effects, and worrying about the safety of PrEP. When asked about their thoughts on continuing to take PrEP in the future, a few (10%) said they planned to stop using PrEP in the coming weeks or months. The main reasons for stopping included change in relationship status, worries about safety, not being able to afford it, not liking the side effects, it being too difficult to take the pills, and not having anyone to prescribe it for them (Table 2).

### **In-depth interviews - preferred and rejected emerging PrEP products**

Table 3 shows the count of IDI participants' preferences and rejections of one or more of the six emerging PrEP products, including condoms, in summation. Of the emerging PrEP products, IDI participants most preferred the weekly oral pill. Both PrEP users and PrEP aware participants perceived the burden of the weekly oral pill as minimal and favored the ease and simplicity of the method. One participant stated, "I think that's going to be the biggest selling point. It's not something that I have to remember on a daily basis." However, most participants had no experience with a weekly oral pill and many voiced concerns about remembering doses and worried about how a missed dose may impact protective coverage.

Both the long-acting injectable and skin implant products were more preferred by PrEP users as compared to PrEP aware participants. PrEP users compared these new products with their current daily pill regimen and noted the benefit of longer duration of protection and less frequent dosing. Participants who were PrEP aware and/or Black tended to be less open to the long-acting injectable and skin implant, which they perceived as more invasive. Notably, the oral pill taking requirement for the long-acting injectable was strongly disliked, perceived as burdensome, and not well understood. More than half suggested eliminating the pill prerequisite for the injection. The suppository and anal douche were the least preferred methods overall. Some participants had concerns about inserting medication into their anus, the potential residue left by the product, and/or worried about user error with the insertion and absorption process.

When asked about which product they explicitly rejected, both PrEP aware and PrEP user participants selected the suppository, then the skin implant. For the skin implant, this may depict a split decision among PrEP users as some preferred it. During IDIs, PrEP aware

participants tended to waffle and were more ambivalent in their rationale for rejecting these methods, whereas PrEP users more explicitly said they would not prefer any of these methods to the daily oral pill.

One key reason the suppository (and anal douche) was so poorly received was because they are only protective for receptive anal sex partner. One PrEP user stated, “Nope. It’s just not for me, but I would be all for [it], shouting from the rooftops, like, ‘Hey bottoms, you got an option!’”

The event-driven pills were rejected primarily due to the complicated nature of the regimen and the lack of compatibility with spontaneous sex. One participant stated, “I just think it’s complicated.” Participants viewed the regimen with a strong potential for missed doses and/or user error. Some participants indicated that this regimen was a poor fit for their sexual behavior, both in terms of first dose timing (e.g., at least two hours before sex reportedly requires too much planning/reduces spontaneity) and the 24-hour duration of protection, which caused respondents to worry about protective coverage if participating in sexual activity on consecutive days. One participant stated, “I think it might be a good alternative for somebody who has infrequent sex or knows that they just don’t do it that often and it is more predictable. But, for me personally, this doesn’t make sense.” Some shared that they had heard of this method before, and even noted that providers had described this to them previously. However, most said that the description of its use was confusing and too complicated, leaving them with questions about the correct and appropriate use of this method (e.g., missing doses, how this method would work for an entire weekend/multiple day event).

### **Focus groups – rank choice selections of emerging PrEP products**

Following detailed discussions of each emerging PrEP product, FG participants ranked their preferences and those scores were averaged (Table 4). Notably, not every group reached a full consensus, so the results of each group’s final ranking scores represent decisions made by most participants in that group. Overall, and aligned with IDI participant preferences, the weekly oral pill was the most preferred emerging PrEP product for FG participants. PrEP aware groups preferred the weekly oral pill over daily oral PrEP, in favor of less frequent pill taking, although some expressed concern over missing doses. One participant stated, “I mean, it sounds good for once a week, but at the same time, I know my schedule [implying he may forget].” PrEP users noted concerns about the potential side effects of weekly oral PrEP, as they thought each dose may contain “more medicine” and cause side effects like what they may have experienced when first beginning to take daily oral PrEP. However, despite individual PrEP user group ranking differences, weekly and daily oral PrEP were ranked equally when averaged across all groups.

When analyzing by PrEP status, PrEP aware groups generally ranked the long-acting injectable and skin implant as their least preferred, while PrEP user groups ranked the long-acting injectable option as their most preferred method followed by the skin implant. PrEP user groups discussed how they already visit a doctor at least once every three months for their current regimen, so regular visits would not be an issue for long-acting injectable or skin implant. They also shared that the benefit of not having to take a daily pill was ideal.

Alternatively, PrEP aware group participants were more apprehensive, noting concerns about potential side effects and a general aversion to injections. Some indicated that healthcare engagement was an issue for them, in part due the potential cost of the injection if insurance would not cover it. Some also noted distrust in the medical system overall and felt that an injection was too invasive.

Both PrEP aware and PrEP user participants also discussed their aversion to the five-week pill regimen prior to the first injection. While current PrEP user group participants were more open to this method, they indicated that the regimen to begin the long-acting injectable option (including doctor visits, testing, and five weeks of pills) needed to be simplified for them to consider adopting it. PrEP aware group participants often saw this aspect as a deal breaker due to the five-week duration of daily pill consumption. One participant stated, “It’s the preparation up to the injection that seems like a lot.” However, some noted the convenience of the regimen and extended length of protection as primary reasons to use this method. The long-acting injectable option was also more preferred by Black participant FGs compared to the other racial/ethnic FGs; Hispanic/Latino participant FGs preferred it less than other race/ethnicity groups. Like the long-acting injectable option, acceptability of the skin implant varied across groups by both PrEP status and race/ethnicity. Across all groups, and in line with IDI findings, participants indicated that length of protection was a primary factor for their acceptance of this product. One PrEP user stated, “If it’s something like that every six months...I would do it immediately.” They discussed the added healthcare engagement and the requirement for a “surgical” procedure for inserting/removing the implant as deterrents to adoption and persistent use of this method. Current PrEP user groups were more accepting of this option than PrEP aware groups, ranking it as their second choice and noting the extended length of protection as a primary factor. PrEP users also indicated that the insertion procedure for the implant was generally not a concern, and they liked that this method did not require additional oral medication prior to implantation like the long-acting injectable option. Conversely, PrEP aware groups were largely opposed to this method. Like their opinions of the long-acting injectable option, they were concerned about increased healthcare engagement and possible side effects. Many also expressed concern about the procedure for implant insertion and worried about visibility, such as scarring or raised skin due to the implant. Participants across racial/ethnic groups were concerned with the insertion method, particularly the size of the device used for inserting the implant. Concern about visibility of the implant was greater among Black participant FGs; some participants worried it may move and, therefore, be rendered, potentially unbeknownst to them, ineffective.

The overall least preferred rankings in the FGs were for the anal douche and suppository. While many discussed the potential benefits of using a douching method, with most noting the convenience and familiarity of the douching process, they had questions about the effectiveness and potential for user error. Acceptability was also impacted by the perceived limitations on one’s spontaneity as the method requires prior planning for sexual encounters. As for racial/ethnic group differences, White participants preferred the douching product more than Black and Hispanic/Latino participants. Some discussed the benefits of integrating PrEP into their “routine” practice of douching in preparation for anal sex as well as the benefit of a 24-hour window of protection for multiple sexual encounters. However,

as with the suppository, many participants indicated the limitation of it being protective for the receptive anal sex partner only. Across groups, the primary concern affecting the acceptability of douching was potential user error, primarily related to correct use of the product (e.g., holding it in long enough to absorb the medication, inserting it far enough inside the rectum).

When analyzing differences among racial/ethnic groups for the suppository, concerns emerged more often among Black participant FGs who elicited the potential for user error as the major concern. Like Black IDI participants' concerns, some shared that they worried the medicine may not completely dissolve, leaving a residue in the rectum, and potentially providing less protection if not fully absorbed. They also had more concerns about potential side effects for this method, particularly whether continued or daily use of this method was safe for the rectum. Conversely, White participant FGs indicated they had more confidence in and willingness to use this method.

## DISCUSSION

Although uptake of PrEP among MSM needs expansion, findings from this study suggest that MSM are generally accepting of various modalities of PrEP as an effective HIV prevention tool. These data show a range of preferences for specific emerging PrEP products via ranking exercises whereby most participants preferred the weekly oral pill. These data also identify barriers and challenges that may need to be addressed by clinicians and researchers to increase initiation of and adherence to these products.

It is well documented that PrEP uptake has been impacted by concern about potential short- and long-term side effects, dislike of taking pills and a daily regimen, and perceived cost/access issues (Kota et al., 2021; Mansergh et al., 2022; Patel et al., 2018; Peng et al., 2018; Underhill et al., 2018). These attitudes related to daily oral PrEP translated to MSM participants' affective attitudes about the acceptability and adoptability of these emerging PrEP products.

MSM in this study continued to be concerned with potential side effects, both short- and long-term, as well as the perceived effectiveness, most likely due to a lack of familiarity with the new PrEP options. Many noted the desire to be presented with research on the safety and efficacy of the new modalities before they would be willing to adopt them, more so for less familiar PrEP options (e.g., suppository, skin implant) than those they may have heard about (e.g., event-driven pills, long-acting injectable) or even used before (e.g., daily oral PrEP). Notably, concerns about perceived effectiveness arose despite participants being asked to assume, for the purposes of this study, that the new modalities were as effective as the current daily oral PrEP. In totality, these concerns may be attributable to medical mistrust especially for Black and Hispanic/Latino MSM for whom they were more pronounced (Cahill et al., 2017; Kimball et al., 2020).

Dislike of taking pills and either perceived or experienced issues related to a daily regimen impacted our sample's acceptability of the new PrEP options, with many preferring to adopt the less frequent dosing weekly oral pill option or alternative options with greater

duration of protection (e.g., long-acting injectable) over more frequent pill options (e.g., daily oral PrEP, event-driven pills). Studies have shown that real and perceived issues with cost and access have also impacted uptake of PrEP (Kota et al., 2021; Peng et al., 2018). Our findings suggest that adoptability of new PrEP options, particularly non-pill options that would require engagement with a healthcare provider, may be of concern for some MSM if they do not believe that they could easily access these products. Other studies have found that an individual's perceived level of risk, primarily related to sexual activity (e.g., activity level, number of partners, preferred positioning), impacts PrEP uptake (Mayer et al., 2020; Yellin et al., 2023). A key consideration for product preference among MSM in this study was whether they felt their sexual activity matched the protective target and/or regimen of a particular product (e.g., receptive vs. insertive sex preferences, suitability of long-term protection option when in a monogamous relationship, short-term protection option when sexual activity is high/engaging with multiple partners, and the potential for reduced spontaneity).

Participants in this study provided numerous suggestions that may make the emerging PrEP products more acceptable and adoptable. These suggestions were largely related to two other aspects of acceptability: 1) increasing intervention coherence (i.e., increasing their understanding of how products work), and 2) decreasing burden (i.e., decreasing the perceived amount of effort required for them to use these products). For example, participants indicated that less strict dose timing (e.g., taking it within a few hours of the established time), for the weekly oral pill would increase the likelihood they would use and correctly adhere to the regimen of this product. Patient education on potential dosing flexibility, as well as guidance from their healthcare provider related to how to adjust after missing a dose, may address some of this confusion and concern. The event-driven product also led to confusion related to dose timing, particularly the potential need to restart the regimen dependent on duration of sexual activity (e.g., multiple consecutive days). Provision of clear guidance related to adherence to the regimen and dosing options for extended protection would likely increase acceptability of this method. Another product with issues related to intervention coherence and burden was the anal douche. Some participants were concerned about correctly mixing the product on their own, particularly the amount of fluid (i.e., commercially available douching solution, water) and measuring the PrEP powder (i.e., dose). These concerns also impacted the product's perceived effectiveness, not only due to concerns related to dosing but also whether they were able to hold in the solution long enough to fully absorb and protect them as indicated. To reduce burden and increase coherence and perceived effectiveness, medication doses could be pre-measured and mixed for users, and patient education on dosing and correct usage from their healthcare provider would be crucial.

It is also important to address medical mistrust and misinformation related to PrEP and these emerging PrEP products specifically as participants were not reassured that the products were as effective or safe as described. Based on our experience conducting this study, providers might benefit from being prepared to address questions/concerns and offer peer-based learning opportunities (e.g., PrEP navigators, community health workers, or influencers).

This study is subject to several limitations. It was conducted in three metropolitan areas in Southern United States. While some factors associated with acceptability of emerging PrEP products could be more widely applicable, generalizability of the findings are limited. Further, the study employed purposive sampling, relying heavily on community organizations to support recruitment of specific groups of MSM. However, the team recruited MSM of different PrEP status and racial/ethnic identity from numerous partners across study sites to minimize this effect. Although the study was cross sectional in nature, and acceptability and adoptability of interventions like these emerging PrEP products will evolve over time, we were able to capture participants' self-reported reasoning for their product preferences prior to the products being available to them, thereby contributing to the growing literature about MSM preferences and implications for emerging PrEP product rollout. Related to specific products, the anal suppository and douche options can only be used to protect a receptive partner from HIV. We did not explicitly inquire or group individuals based on their sexual positioning preferences; therefore, the level of acceptability of these products may have been affected by this factor. Additionally, this study was conducted prior to long-acting injectable PrEP being approved and publicly available for use. The currently available injectable product is reported as offering flexibility with the oral pill requirement now optional based on clinician recommendation. Based on these findings, this would likely have changed the acceptability of the proposed injectable option for MSM in this study.

## Conclusion

PrEP is a key part of the current strategy to eliminate HIV. It is crucial to understand attitudes and considerations related to PrEP to improve uptake of currently available options, including daily oral PrEP and the newly approved long-acting injectable PrEP, and acceptability and adoptability of new options prior to their availability, particularly among MSM. Addressing some of the key concerns and considerations raised by participants in this study may improve acceptability and adoptability of these emerging PrEP products and ultimately increase PrEP uptake.

## Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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## DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the U.S. CDC, but restrictions apply to the availability of these data, which were used under license for the current study, and so are not publicly available. Data are however available from the authors upon reasonable request and with permission of CDC.

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**Table 1.**

Sample characteristics of PrEP using and PrEP aware MSM in the Southern U.S. - 2021 (N=98)

	Total (n=98)	PrEP User (n=49)	PrEP Aware (n=49)
	n (%)	n (%)	n (%)
<b>Age (Range, Median)</b>	18–66, 31	19–62, 31	18–66, 30
<b>Age (years)</b>			
18 – 29	44 (45%)	22 (45%)	22 (45%)
30 – 39	32 (33%)	16 (33%)	16 (33%)
40 – 49	9 (9%)	7 (14%)	2 (4%)
>50	13 (13%)	4 (8%)	9 (18%)
<b>Race/Ethnicity</b>			
Non-Hispanic Black	35 (36%)	15 (31%)	20 (41%)
Hispanic or Latino	34 (35%)	19 (38%)	15 (31%)
Non-Hispanic White	29 (29%)	15 (31%)	14 (28%)
<b>Country of Birth</b>			
US born	81 (83%)	37 (76%)	44 (90%)
Non-US born	17 (17%)	12 (24%)	5 (10%)
<b>Education</b>			
Less than high school diploma	1 (1%)	0 (0%)	1 (2%)
High school diploma or GED	15 (15%)	7 (14%)	8 (16%)
Some college, associate degree, or technical degree	34 (35%)	12 (25%)	22 (45%)
Bachelor's/4-year college degree	36 (37%)	20 (41%)	16 (33%)
Any post-graduate degree	12 (12%)	10 (20%)	2 (4%)
<b>Sexual Orientation</b>			
Gay	68 (69%)	39 (80%)	29 (59%)
Bisexual	23 (24%)	7 (14%)	16 (33%)
Straight	1 (1%)	0 (0%)	1 (2%)
Something else	6 (6%)	3 (6%)	3 (6%)
<b>Health Insurance</b>			
Yes	65 (66%)	38 (78%)	27 (55%)
No	32 (33%)	11 (22%)	21 (43%)
Don't know	1 (1%)	0 (0%)	1 (2%)

**Table 2.**

PrEP Knowledge and Use among PrEP using and PrEP aware MSM in the Southern U.S. - 2021 (N=98)

	Total (n=98)		PrEP User (n=49)		PrEP Aware (n=49)	
	n (%)		n (%)		n (%)	
<b>Offered PrEP</b>						
No	-*	-	-	-	29	(59%)
Yes	-	-	-	-	20	(41%)
<b>Taken PrEP in past</b>						
No	-	-	-	-	38	(78%)
Yes	-	-	-	-	11	(22%)
<b>What the most important reason you aren't taking PrEP now?</b>						
I don't know enough about PrEP	-	-	-	-	11	(22%)
I am worried about possible side effects	-	-	-	-	8	(16%)
I don't like taking pills	-	-	-	-	6	(12%)
I rarely have anal sex	-	-	-	-	4	(8%)
I don't know how I could access PrEP	-	-	-	-	4	(8%)
I use condoms all the time	-	-	-	-	3	(6%)
I am worried about the cost of PrEP	-	-	-	-	3	(6%)
I am worried about what others may think	-	-	-	-	0	(0%)
I don't think PrEP works very well	-	-	-	-	0	(0%)
Other	-	-	-	-	10	(20%)
<i>Was in program that ended</i>	-	-	-	-	1	(2%)
<i>Currently on PEP</i>	-	-	-	-	1	(2%)
<i>In a committed relationship</i>	-	-	-	-	6	(12%)
<i>Not sexually promiscuous</i>	-	-	-	-	1	(2%)
<i>Follow-up appointments</i>	-	-	-	-	1	(2%)
<b>Where have you heard about PrEP the most?</b>						
Other social media (e.g., Facebook, Instagram, Snapchat)	17	(17%)	5	(11%)	12	(25%)
Advertisements around town	12	(12%)	3	(6%)	9	(19%)
Health providers or counselors	21	(21%)	13	(27%)	8	(16%)
Sex partners	6	(6%)	2	(4%)	4	(8%)
Friends or family	10	(10%)	6	(12%)	4	(8%)
Sex or dating websites (e.g., Grindr)	10	(10%)	6	(12%)	4	(8%)
News media	6	(6%)	3	(6%)	3	(6%)
Other	16	(16%)	11	(22%)	5	(10%)
<i>On the radio</i>	1	(1%)	0	(0%)	1	(2%)
<i>TV commercials</i>	1	(1%)	0	(0%)	1	(2%)
<i>Focus Group Studies</i>	1	(1%)	0	(0%)	1	(2%)
<i>Long term partner</i>	1	(1%)	0	(0%)	1	(2%)

	Total (n=98)		PrEP User (n=49)		PrEP Aware (n=49)	
	n (%)		n (%)		n (%)	
<i>Podcasts</i>	1	(1%)	0	(0%)	1	(2%)
<i>On buses/Mass transit</i>	1	(1%)	1	(2%)	0	(0%)
Not asked	10	(10%)	10	(20%)	0	(0%)
<b>Which one of the following statements best reflects your thoughts about taking PrEP in the future?</b>						
I am not sure	-	-	-	-	20	(41%)
I don't know enough about PrEP to answer	-	-	-	-	11	(23%)
I plan to take PrEP someday	-	-	-	-	9	(18%)
I plan to take PrEP in the next 1–5 months	-	-	-	-	3	(6%)
I plan to start PrEP in the coming weeks	-	-	-	-	3	(6%)
I plan to never take PrEP	-	-	-	-	2	(4%)
I plan to take PrEP in the next 6–12 months	-	-	-	-	1	(2%)
<b>Past 7 days taken PrEP (range, median)</b>	-	-	1–7, 7	-	-	-
<b>If you missed any PrEP doses in the past 7 days, why did you miss your PrEP dose? (all that apply)</b>						
I didn't miss any doses	-	-	32	(64%)	-	-
I was busy	-	-	6	(12%)	-	-
I forgot	-	-	2	(4%)	-	-
My prescription ran out	-	-	2	(4%)	-	-
I didn't want to take it	-	-	1	(2%)	-	-
Other	-	-	7	(14%)	-	-
<i>Started PrEP in last 7 days</i>	-	-	1	(2%)	-	-
<i>Not asked</i>	-	-	6	(12%)	-	-
<b>Have you ever stopped taking PrEP on purpose?</b>						
No	-	-	31	(63%)	-	-
Yes	-	-	18	(37%)	-	-
<b>Most important reason stopped taking PrEP on purpose?</b>						
My relationship status changed	-	-	8	(16%)	-	-
I didn't like the side effects	-	-	2	(4%)	-	-
I was worried about the safety of PrEP	-	-	2	(4%)	-	-
I decided I didn't need it for protection anymore	-	-	2	(4%)	-	-
My insurance wouldn't cover PrEP	-	-	1	(2%)	-	-
I couldn't afford it	-	-	1	(2%)	-	-
I don't think it worked very well to protect me	-	-	0	(0%)	-	-
It was too hard taking the pills	-	-	0	(0%)	-	-
My doctor decided to take me off it	-	-	0	(0%)	-	-
I don't have anybody to prescribe it to me	-	-	0	(0%)	-	-
Other	-	-	3	(6%)	-	-
<i>Was not sexually active</i>	-	-	1	(2%)	-	-

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	Total (n=98)		PrEP User (n=49)		PrEP Aware (n=49)	
	n (%)		n (%)		n (%)	
<i>Laziness</i>	-	-	2	(4%)	-	-
<i>Because of the pandemic I was not interacting with anyone</i>	-	-	1	(2%)	-	-
<b>Which one of the following statements best reflects your thoughts about taking PrEP in the future?</b>						
I am planning to continue to use it	-	-	36	(74%)	-	-
I am not sure	-	-	7	(14%)	-	-
I plan to stop taking PrEP in the next 1–5 months	-	-	3	(6%)	-	-
I plan to stop PrEP in the coming weeks	-	-	1	(2%)	-	-
I plan to stop taking PrEP in the next 6–12 months	-	-	1	(2%)	-	-
Not asked	-	-	1	(2%)	-	-
<b>If you plan to stop taking PrEP, what is the most important reason for stopping?</b>						
My relationship status has changed	-	-	4	(8%)	-	-
I am worried about the safety of PrEP	-	-	3	(6%)	-	-
I can't afford it	-	-	2	(4%)	-	-
I don't have anybody to prescribe it to me	-	-	1	(2%)	-	-
It is too hard taking the pills	-	-	1	(2%)	-	-
I don't like the side effects	-	-	1	(2%)	-	-
I don't think I need it for protection anymore	-	-	0	(0%)	-	-
My insurance doesn't cover it	-	-	0	(0%)	-	-
I don't think it works very well to protect me	-	-	0	(0%)	-	-
My doctor plans to take me off it	-	-	0	(0%)	-	-
Other	-	-	0	(0%)	-	-

\* All – are indicative of non-applicable questions/responses, not missing data

**Table 3.**

Count of in-depth interview participants from the Southern U.S. who preferred and rejected emerging PrEP products by PrEP status - 2021 (n=60)

	Condoms	Daily	Weekly	Event-driven	Suppository	Douche	Injection	Implant
<b>PrEP Products Preferred</b>								
<i>PrEP User (n=30)</i>								
African American or Black (n=6)	2	1	4	3	2	5	1	2
Hispanic or Latino (n=12)	4	2	6	3	2	1	6	5
White (n=12)	0	2	7	1	2	1	7	6
<b>Total</b>	<b>6</b>	<b>5</b>	<b>17</b>	<b>7</b>	<b>6</b>	<b>7</b>	<b>14</b>	<b>13</b>
<i>PrEP Aware (n=30)</i>								
African American or Black (n=14)	10	3	9	3	0	2	5	1
Hispanic or Latino (n=8)	4	3	6	3	2	1	1	4
White (n=8)	4	2	6	1	2	2	0	3
<b>Total</b>	<b>18</b>	<b>8</b>	<b>21</b>	<b>7</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>8</b>
<b>OVERALL</b>								
	<b>24</b>	<b>13</b>	<b>38</b>	<b>14</b>	<b>10</b>	<b>12</b>	<b>20</b>	<b>21</b>
<b>PrEP Products Rejected</b>								
<i>PrEP User (n=30)</i>								
African American or Black (n=6)	1	1	0	1	2	1	3	4
Hispanic or Latino (n=12)	0	0	0	5	5	4	3	4
White (n=12)	1	0	0	7	3	5	1	1
<b>Total</b>	<b>2</b>	<b>1</b>	<b>0</b>	<b>13</b>	<b>10</b>	<b>10</b>	<b>7</b>	<b>9</b>
<i>PrEP Aware (n=30)</i>								
African American or Black (n=14)	1	3	0	2	3	4	3	6
Hispanic or Latino (n=8)	0	0	0	2	1	4	4	2
White (n=8)	0	1	0	1	1	0	4	2
<b>Total</b>	<b>1</b>	<b>4</b>	<b>0</b>	<b>5</b>	<b>5</b>	<b>8</b>	<b>11</b>	<b>10</b>
<b>OVERALL</b>								
	<b>3</b>	<b>5</b>	<b>0</b>	<b>18</b>	<b>20</b>	<b>18</b>	<b>18</b>	<b>19</b>

**Table 4.**

Averages of overall product rankings\* for each group by PrEP status among MSM focus group participants from the Southern U.S. - 2021 (n=38)

	Condoms	Daily	Weekly	Event-driven	Douche	Suppository	Injectable	Implant
<b>PrEP Users (n=19)</b>								
African American or Black (n=5)	3	5	2	8	7	4	1	6
African American or Black (n=4)	5	2	4	3	8	7	1	6
Hispanic or Latino (n=3)	6	5	3	8	7	4	2	1
Hispanic or Latino (n=4)	3	2	4	6	8	5	7	1
White (n=3)	5	3	4	6	7	8	2	1
<b>Average</b>	<b>4.4</b>	<b>3.4</b>	<b>3.4</b>	<b>6.2</b>	<b>7.4</b>	<b>5.6</b>	<b>2.6</b>	<b>3.0</b>
<b>PrEP Aware (n=19)</b>								
African American or Black (n=3)	1	3	2	4	7	8	6	5
African American or Black (n=3)	2	4	3	7	6	8	5	1
Hispanic or Latino (n=3)	1	2	3	4	6	5	7	8
Hispanic or Latino (n=4)	2	3	1	4	5	7	6	8
White (n=3)	1	2	3	7	4	6	5	8
White (n=3)	8	3	1	4	5	2	7	6
<b>Average</b>	<b>2.5</b>	<b>2.8</b>	<b>2.2</b>	<b>5.0</b>	<b>5.5</b>	<b>6.0</b>	<b>6.0</b>	<b>6.0</b>
<b>OVERALL AVERAGE</b>	<b>3.4</b>	<b>3.1</b>	<b>2.7</b>	<b>5.5</b>	<b>6.4</b>	<b>5.8</b>	<b>4.5</b>	<b>4.6</b>

\* In each focus group, respondents were asked to rank the six emerging PrEP products along with daily oral PrEP and condoms from one (most preferred) to eight (least preferred) as a group in each session. Each FG came to a consensus on the rankings.