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ORIGINAL PAPER

Attitudes and Perceptions of Biomedical HIV Prevention Methods: Voices from Young Men Who Have Sex with Men

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Abstract In the third decade of the HIV/AIDS epidemic in the United States, the prevalence rates of new HIV infections among young men who have sex with men (YMSM) continue to increase. As new and emerging HIV prevention methods are developed, it is important to understand the perceptions of this vulnerable population—as they may be an ideal target for these intervention methods. This pilot study provides an overview of YMSM of color's awareness and perceptions of pre-exposure prophylaxis (PrEP) and rectal microbicides (RM). A total of 6 focus groups were convened with 53 YMSM (23 Latino/Hispanic and 30 Black/African American). Findings indicate a lack of knowledge of biomedical interventions and high perceived acceptability. Concerns regarding PrEP included potential side effects, potential for misinterpretation of its use and cost. RMs were perceived to be more acceptable than PrEP, but the limited knowledge about their potential was emphasized by YMSM. Results are discussed in relation to the need for providers to continue to provide general health education about safe sexual practices. As PrEP and other biomedical interventions are introduced into community settings, caution should be taken with regards to determining the appropriate target user and sufficient education.

Keywords Pre-exposure prophylaxis (PrEP) · Rectal microbicides · HIV · Sexual orientation · Young men who have sex with men

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Introduction

We are currently in the third decade of the HIV/AIDS epidemic, and continue to see increasing rates of new HIV infections (Centers for Disease Control and Prevention, 2009, 2010). According to the 2008 LA Men's Survey (the most recent CDC surveillance data among men who have sex with men), young men who have sex with men (YMSM), aged 13–29 years, was the group most frequently diagnosed with HIV in Los Angeles, driven by high infection rates among YMSM of color. The HIV infection rate for Black YMSM, aged 18–29 years, was 37 %; 71 % were unaware they were HIV positive (Bingham, 2005). While Black YMSM represent the group most impacted by HIV, Latino YMSM are also impacted. Analyses of county surveillance data indicate that Latino YMSM represent the largest number of new diagnoses among YMSM.

The field of HIV prevention is increasingly shifting from one of behavioral interventions to a focus on biomedical methods. As new and more effective HIV medications have been developed and made available, it has become apparent that new prevention models are needed. However, caution should be taken in using a singular focus of biomedical interventions to the exclusion of behavioral ones. As Kippax, Reis, and de Wit (2011) have described, the separation of biomedical from behavior change interventions may have little impact on the trend of HIV rates in this country. Whether interventions are designed around the use of condoms, clean needles and syringes, microbicides or pre-exposure and post-exposure prophylaxis (PrEP and PEP), all require behavioral changes. Furthermore, most biomedical approaches (e.g., prevention as treatment, test and treat, PrEP, microbicides), all require changes that have to be sustained over time. Such changes in behavior (or practice) require changes for both the providers and users. Addressing these changes requires better data on the facilitators of and barriers to intervention uptake.

Thus, as new and emerging HIV prevention methods are developed, it is important to understand the perceptions of target populations. Without these perceptions, successful dissemination and implementation of new interventions is questionable. Given the limited data available from those populations at highest risk for HIV infection, more research is needed with these communities. This article attempts to address this need by describing the perceptions of PrEP and rectal microbicides, two emerging biomedical interventions, among YMSM of color—the population at highest risk for HIV infection in the United States.

Pre-exposure Prophylaxis (PrEP)

PrEP is among an emerging group of promising biomedical interventions aimed to reduce the risk of HIV infection. PrEP is an intervention method in which an individual uninfected with HIV takes a daily antiretroviral medication (Thigpen et al., 2012). Based on clinical studies, the Food and Drug Administration (FDA) in 2012 approved tenofovir disoproxil fumarate (TDF) in fixed dose combination with emtricitabine (TDF-FTC, called Truvada) as a pill for adults at risk for HIV infection (Centers for Disease Control and Prevention, 2013).

PrEP has had varying results from several different clinical trials. For example, the Partners for PrEP trial with serodiscordant couples in Uganda and Kenya yielded a 68 % reduction point estimate for HIV infection, and the iPrex trial with MSM yielded a 44 % reduction point estimate (Grant et al., 2010); among men who took PrEP on 90 % or more of the days during the study, the reduction rate increased to 73 %. However, both the FEM-PrEP and MTN VOICE, both trials involving African women, were discontinued when it was found that the intervention was not effectively protecting women from HIV. Numerous reasons for these inconsistencies have been considered, such as variability in drug adherence, drug concentration at the site of exposure, integrity of cervical or vaginal epithelium (for topical gels), and HIV infection state of the index partner (van der Straten, Van Damme, Haberer, & Bangsberg, 2012).

Rectal Microbicides

Microbicides have also garnered attention in the research community in the last several years. Microbicides are administered inside the vagina or rectum prior to sexual intercourse to help prevent HIV and other infections (Mantella et al., 2005). To date, vaginal microbicides are still under clinical investigation; the safety of rectal microbicides (RM) is still unclear, and thus, their development is several years behind that of vaginal methods.

There are numerous contextual factors that shape the use of RMs. For example, research shows that men who engage in anal intercourse are likely to utilize lubricants at a higher rate than condoms. In a cross-sectional, international study, over 5,000 males were surveyed to examine the feasibility of RM usage. Most participants responded positively to the idea of utilizing RMs as an HIV prevention method and believed they would be easier to use if developed as lubricants (Carballo-Dieguez et al., 2008; Javanbakht, Murphy, Gorbach, LeBlanc, & Pickett, 2010).

There are still a number of challenges associated with the development of microbicides that need to be addressed for the development of effective rectal-specific microbicides. RMs are currently undergoing trials, with recent developments including a rectal applicator to maximize comfort and dispense the right amount of gel, and looking at parallel use of RMs with PrEP. Efficacy studies should be taking place within the next several years with the goal of introducing RM usage to the populations at highest risk for HIV transmission (McGowan, 2011).

Costs

Cost for PrEP may vary depending on whether one includes care such as testing, counseling, and diagnosis. Overall program costs were consistent among numerous studies and ranged from a high in the United States of about $10,000 a year to a low in South Africa (between $80 and $250) (Gomez et al., 2013). This creates a significant barrier for many of those who would benefit from taking PrEP, despite research showing PrEP would save money that would otherwise be spent on HIV care when delivered to key populations at highest risk of HIV exposure. The Affordable Care Act, which has greatly expanded access to insurance coverage for many uninsured Americans, will provide a potential platform for PrEP benefit coverage (Horberg & Raymond, 2013). In addition, Gilead Sciences, the manufacturer of Truvada, has demonstrated a willingness to consider offering PrEP to low-income individuals at reduced or no cost (Gilead Sciences, 2011).

Given that RM development is still in its infancy, information on consumer cost is currently lacking. However, a hypothetical cost-effectiveness model for vaginal microbicides has been produced, using data from South Africa (18.8 % male HIV prevalence) and the US (.72 % prevalence rate). When inputting a population of 250,000 women into the model and a 30 % usage rate of vaginal microbicides, the study found that in South Africa, vaginal microbicide usage could prevent 1,908 infections over a 1-year period with savings of nearly $13 million. In the US, it would prevent 21 infections over 1 year, amounting to a net cost per infection averted of $405,077. However, in Washington, DC, which contains a higher HIV prevalence, the same intervention would prevent 93 infections and save $91,176 per infection averted. This indicates that a microbicide intervention can be cost-effective, if it targets higher-risk populations in which the HIV epidemic is centered (Verguet & Walsh, 2010).

Attitudes Among the General Population

There is still limited information about how different populations may perceive PrEP and other biomedical HIV interventions. There are also challenges in comparing results across studies as a recent review of the literature reported a lack of consistency in operationalizing acceptability and willingness to use PrEP (Young & McDaid, 2014). A recent survey assessing willingness to use PrEP was conducted in seven countries (Eisingerich et al., 2012). This study found that participants who: (1) reported adherence to past medication; (2) were female; (3) were of younger age; (4), had fewer children; (5) had higher condom usage; (6) tested for HIV in the past; (7) never injected drugs; and (8) currently do not inject drugs were more likely to use PrEP and willing to adopt it once it becomes available. In eight mixed-gender, non-MSM focus groups conducted with African-American youth (aged 18–24), substantial interest in and willingness to utilize PrEP was reported. Perceived challenges included cost, effectiveness, and ease of accessing services and/or medication near their homes or by public transportation (Smith, Toledo, Smith, Adams, & Rothenberg, 2012).

Challenges related to adherence and disinhibition regarding condom use are also of concern for users of PrEP. In a study on attitudes about using PrEP among 405 sexually transmitted disease clinic patients, males were less likely to report both using condoms and taking a daily medication to prevent HIV infection than females (Whiteside, Harris, Scanlon, Clarkson, & Duffus, 2011). In another study with STD clinic attendees in Chicago, there was significant interest in PrEP (84 % of the sample). When asked if PrEP would change their sexual behaviors, about one quarter reported they would use condoms less frequently and/or discontinue their use entirely; over half reported they would have the same number of sexual partners (Khawcharoenporn, Kendrick, & Smith, 2012).

Attitudes Among Men Who Have Sex with Men

A recent review of the literature found limited research of MSM's perceptions of PrEP; data from YMSM was particularly limited (Young & McDaid, 2014). Recent research with adult MSM has found relatively low levels of awareness about PrEP, with about one-third reporting having some awareness of it. Awareness was associated with high educational attainment, gay identity, identifying as White, and having a recent HIV test (Rucinski et al., 2013). Similarly, a study in Boston with adult MSM found low levels of awareness of PrEP (19 %) but high intent to use (74 %) after being educated about its use. This study also found that intent to use was associated with less education, moderate income, no perceived side effects, and having no out of pocket costs (Mimiaga, Case, Johnson, Safren, & Mayer, 2009). A survey of MSM and transgender women found that among the biggest perceived barriers to taking PrEP were concerns about long-term side effects, effectiveness of ART medications should one seroconvert, effectiveness of PrEP, daily use of a pill, and concerns about condom use (Golub, Gamarel, Rendina, Surace, & Lelutiu-Weinberger, 2013). This same study found that participants of color were more likely to find these barriers as significantly more important than their White counterparts. Logistic regression analyses revealed that as more barriers were identified while also being viewed as important, the less likely one would be willing to take PrEP. In addition, men of color were more likely to find support services such as counseling about PrEP, financial assistance, and free health care monitoring while on PrEP to be important if taking PrEP.

Preliminary data on the feasibility and acceptability of PrEP among YMSM enrolled in a clinical trial found that in general, young men found most aspects of the study (e.g., size of the pill, risk reduction counseling, monthly HIV tests, group interventions) to be acceptable; taking a daily pill was the only component of the intervention a majority reported they "did not like" (Hosek et al., 2013b). This same study reported low adherence to PrEP and poor concordance between self-report and objective measures of adherence.

A mixed method study with HIV-negative men in serodiscordant relationships found high acceptability of PrEP, with men associating potential adoption of PrEP with the opportunity to engage in sex without condoms and less anxiety about having sex with an HIV-positive partner. Men in this study also reported a high likelihood of increasing their sexual risk behaviors when using PrEP, with over half reporting they would likely decrease condom use (Brooks et al., 2012). While these initial studies are important in understanding the issues, these studies did not focus on men of color or young men—thereby limiting the results for the populations most susceptible to HIV infection.

This brief overview highlights what is currently known about perceived acceptability and perceptions of PrEP and other biomedical interventions. Young and McDaid's (2014) recent review recommended that to move the field forward, research should focus on five areas including: (1) examining motivations for taking PrEP; and (2) the role of social and structural influences in PrEP uptake. In addition, the field currently lacks an understanding of YMSM of color's perceptions and beliefs about biomedical HIV prevention approaches. Studies focusing on this vulnerable population have not been published, and their perceptions and beliefs are important to consider as biomedical interventions are increasingly made available in community settings. Given that YMSM represent one of the only populations whose HIV rates continue to increase, this is a critical research gap. The present study seeks to begin to fill this gap by presenting qualitative data from YMSM of

color on the perceived acceptability and utility of biomedical HIV interventions.

Method

This study was designed to better understand YMSM of color's perceptions about biomedical HIV prevention methods. Given the nature of this study, a qualitative, inductive approach is likely to be the most appropriate given the limited research and understanding of this issue (Patton, 2002). A total of 6 focus groups were convened between November 2012 and February 2013 with 53 total participants (23 Latino/Hispanic and 30 Black/African American); each focus group had between 6 and 8 participants. Focus group discussions focused on several domains, including: knowledge of PrEP and RMs; perceptions of biomedical prevention methods; and how these biomedical interventions may affect other methods of HIV prevention such as condom use. In order to qualify, potential participants needed to: (1) be 18–25 years of age; (2) be male; (3) identify as either Latino/Hispanic or Black/African American; and (4) identify as gay/bisexual or report having sex with a man. Participants were recruited using purposive sampling techniques from gay-identified venues including service agencies, bars, clubs, and community events.

Focus groups were facilitated by two team members (one Latino male and one African-American female) and were held in project offices or at partnering social service agencies. Focus groups were stratified by race/ethnicity as well as participants' involvement in HIV prevention services (e.g., Mpowerment or similar groups). Respondents were provided a $25 incentive for completing the focus group. Each focus group lasted 1.5–2 h and was digitally recorded and professionally transcribed; detailed notes of each focus group were also taken to facilitate the analysis process. All research protocols received approval from the Institutional Review Board of Children's Hospital Los Angeles.

The qualitative analysis for this article utilized a ''constant comparative'' approach, an aspect of grounded theory that entails the simultaneous process of data collection, analysis, and description. In this process, data were analyzed for patterns and themes to discover the most salient categories, as well as any emergent theoretical implications (Glaser, 1992; Strauss & Corbin, 1990). As the data were collected, they were immediately analyzed for patterns and themes, with a primary objective of discovering theory implicit in the data. A written summary of each focus group discussion was completed immediately after each group. Research team members reviewed these summaries and subsequent transcripts to assess whether theoretical saturation had been reached. After completing 6 groups, no new themes were emerging from the discussions, indicating saturation had been reached.

Given the focused nature of the data collection, an initial set of codes were developed to capture these data (e.g., PrEP/RM perceptions, PrEP/RM knowledge, condom use, HIV prevention preferences), and this formed the initial project codebook. The codebook was modified as needed, and once finalized, two members of the research team were responsible for coding the transcripts. The final step in this process was axial coding, which involved a process of relating codes to each other, via a combination of inductive and deductive thinking. This produced a basic framework to understand the relationships between codes. Inter-rater reliability was assessed through regular discussions between the two coders; differences in coding were discussed and resolved by the team. This process led to the structure of the present study which provides a description of YMSM's perceptions of biomedical HIV prevention methods, and how they might be integrated into their current HIV prevention regimen.

Results

Young Men's Knowledge of PrEP and Rectal Microbicides

In general, when first asked about their knowledge of PrEP, most of the focus group participants had not heard of this relatively new HIV prevention method. In particular, those who were not affiliated with a service agency or receiving services from an HIV service organization were more likely not to have heard of PrEP.

While general knowledge was low, the limited information that respondents had about PrEP was related to its overall purpose—in that it is not a cure for HIV, but if taken properly, carries a high rate of effectiveness. For those who had heard of PrEP, the regimen was often compared to birth control, with young men describing it as a daily pill that one needed to take in order to protect themselves. One respondent reported that an HIV provider in a mobile unit had also referred to it as such:

> I heard it from one of the vans. The lady called it the man pill. She was like "It's this pill that, you know, it just prevents you"…She's all "just consider it as like a male birth control pill."

There was also the perception that PrEP was very difficult to obtain and designed for very high-risk populations. Participants believed that one could obtain a prescription only after a stringent screening process. One focus group discussion felt that a prescription for PrEP would only be granted if someone is determined to be "at the appropriate level of risk." When asked to clarify what that might include, answers generally focused on more high-risk behaviors.

> You know, sex workers or people that are…drug users, people that are not having sex with condoms, they're, you know, doing all kind of crazy stuff. These are like, very high risk, you know?

While most young men were uninformed, for those who had heard of PrEP, there were many misconceptions about it. This led to some potentially dangerous perceptions about how to effectively take PrEP. For example, in one focus group, a few respondents reported that different clinics provide different instructions on how to use PrEP. Specifically, one respondent reported that some agencies recommend taking it every day while other providers recommend taking it only when you are planning to have sex. Another respondent reported that he was told that PrEP was analogous to antibiotics. He explained that if one takes antibiotics when one does not need them, the body builds up immunity to them and in subsequent instances, one's body reacts slower and slower to the antibiotics. This was extended to PrEP, with the respondent reporting:

> I know like if you don't stop taking that HIV [medication] after a while like the, I guess the body starts to get used to it and like, they stop being as effective as they were.

When asked about their knowledge of RMs, respondents had even less information. In fact, no participants had heard of this potential intervention strategy. Initial assumptions about RM included that it was something that may be related to spermicides or something that may be used to treat yeast infections for women. When a basic explanation of RMs was provided, respondents had a number of questions about how frequently it would need to be used, side effects, whether it would work in conjunction with a lubricant, and how it would be applied.

Attitudes and Perceptions Toward PrEP

After hearing participants' initial thoughts about PrEP, the focus group facilitator provided the group with a brief description of PrEP which included information about its recent approval by the FDA and the need to take the medication on a daily basis and its effectiveness as found in the iPrex trial. Upon hearing this basic description, participants discussed in what situations PrEP may be most beneficial as well as the potential drawbacks of using PrEP as an HIV prevention method. In general, first impressions of PrEP were positive but cautious in their assessments, as indicated by this exchange in one focus group: "R1: Right… but just the image of it sounds good. R3: You know, you can't always look at what sounds good." After general discussions about PrEP and how it might be used, most young men felt that PrEP would be most beneficial for those individuals in serodiscordant relationships, "PrEP is a great thing for them."

> Of course I would [take PrEP] if I loved that person. It's like, I would want to live the best quality lifestyle. So if that's going to guarantee me that, then I think I would probably do it. Like, you know if you were with somebody, I think you would take a pill and risk the whole three months of like the side effects.

Other common themes identified by many of the young men focused on being with a serodiscordant partner, and that taking PrEP when with an HIV-positive partner may serve to strengthen the bond between partners.

> People who are positive, they take medication every day and the thought of being negative and having to take a medication with your partner that is positive…it's like, it's adding to your lifestyle…I don't want to say like oh now you guys are the same because now you can both take medication every day, that person doesn't have to feel left out. But in a way it kind of works, you know.

A less common but still important situation in which PrEP would be beneficial is for those men who are highly sexually active. While there were drawbacks to this association, this idea indicates that young men may be considering risk profiles when thinking about the situations in which PrEP may be most advantageous.

> Well, if you want to mess with somebody that has the disease you, you want to go have sex with that person, I guess it's good because you can then just take the pill and then you know that you'll be okay and just still mess around with whoever you want.

There was no real agreement on how participants' partners might react or feel if they knew the participant was taking PrEP as an HIV prevention method. Some men felt that their partner might be "scared" if they saw their partner taking PrEP, and "they could think they're giving you HIV." And, some men felt they would have to hide the medication because their partner may assume they are HIV positive if they saw the bottle in the house. However, there was no real consensus on this topic, as indicated by this focus group excerpt:

> R3: I mean how would I know that my partner wouldn't be offended that I'm taking the pills to prevent it. You know what I mean? Like that would, I would see that as you are scared of me you know what I mean? You're in love with me, you're not supposed to be scared of me. So…
> R2: [TALKS OVER] How can you say that? Why would they be scared if you're taking something?
> R6: [TALKS OVER] Yeah, it's your body.
> R3: Well I mean I don't know I'm just, I'm overanalyzing it.

Conversely, some respondents felt that PrEP offered the user some privacy and ability to ensure his own safety, regardless of what one's partner wanted in the way of HIV prevention.

> Yeah, the pills might be worth the money a little bit more, not only because of the effectiveness of it but…like on the convenience of the fact that you can take the pill every day and you don't have to take it in front of your partner

> you know what I mean? With your partner you have to have the condom or the, you know what I mean. You have to show it to them. They don't have to agree with me to take the pill. You can take the pill whenever you want and even without them knowing, you know what I mean?

When discussing negative perceptions of PrEP, overwhelmingly the men in our sample spoke about the possible physical side effects. Respondents were quick to point out that given the relatively new FDA approval for PrEP, there is very little known about how taking PrEP on a daily basis for years may affect one's body. Respondents were concerned about the short-term effects "throwing up to dizziness to discoloring of your skin" as well as long-term effects, which were more of an unknown, "nobody knows the long-term side effects. So if something happens, as far as your sperm count or something, along the road, you know, I don't know."

Another issue young men identified is the challenge of adherence to the daily routine of taking a pill. Several young men were dealing with chronic health conditions such as high blood pressure and diabetes, and they explained how it was quite easy for them to forget their medication, "I forget sometimes at night and then in the morning when I get the headache, that's when I remember." Young men also identified that the promise of PrEP and its effectiveness were contingent on the individual, essentially differentiating between efficacy and effectiveness:

> It seems like it's a great idea, but it depends on the responsibility of the person, like how responsible they are. Taking it every day, how they go about the rest of their life…I mean 'cause I'm pretty sure it's not 100 %. So if you're still having sex with someone with AIDS and you think this is going to protect you every single time, it's not a guarantee.

Finally, respondents seemed to agree that at this point in their lives, PrEP may be too much of a burden for general HIV prevention. One young man reported that "taking a pill makes me feel like I'm already sick. So I wouldn't want to take a pill." The idea of taking a pill every day for the rest of their lives was something hard to get a handle on for many of the young men, with one stating, "it just makes no sense to me."

> There's so many other options to prevent HIV, for instance condoms, making sure you don't have unprotected sex, and to, to decide to take a pill twice a day for the rest of your life just so that the, the one time that you have unprotected sex, you don't get HIV versus…first of all, I don't have sex every single day. I don't have sex as often as many people that I know. And so I would not feel the need to take a pill, put something into my body every single day for the rest of my life to prevent that. I just think that the demand is different.

However, they acknowledged that some people cannot or will not use condoms. PrEP was seen as "an alternative to condoms" and important to have as another resource for people to protect themselves

Attitudes Toward and Perceptions of Rectal Microbicides

As mentioned above, young men were not aware of RMs before participating in the focus groups. When provided a brief description of what their potential could be in HIV prevention efforts, they had very positive initial reactions. RMs were described as something that would be used, like anal lubrication, at the time of sexual intercourse and could be applied in a similar fashion as the anal lubricant. Most respondents appreciated the fact that this was a method that would be used exclusively at the time of the sexual activity, "I just feel like the lube is a lot easier. Just one time you're gonna have sex and you forget it." In particular, young men immediately connected the use of RMs with lubricants, because lubricants were a part of the "sexual routine." Thus, the use of a RM would not be disruptive and could easily become a part of their sexual behavior and their use was like "injecting people with prevention." The connection between lubricants and RMs was important to the appeal of RMs, with one respondent simply stating it was "the sexual nature" of RMs that appealed to him:

> I don't know. When you're using something like that, I mean it sounds good. It's like lube, you know what I mean and it's go-, it's going in, it's something you do on a regular basis. So it's, it'll be something you'll use every time.

However, similar to the discussion of PrEP focused on how it may be most useful for serodiscordant couples or those who are highly sexually active, some young men also felt that RMs would be most beneficial to monogamous couples. When asked to explain this further, it became clear that most young men were not seeing RMs as a replacement for condoms.

> But more like a…couple like a monogamous couple that wants to you know, have sex without a condom, I think that would be a good thing, though. Because usually with a one-night stand, most, well, most people are not going to not use a condom still, you know what I mean? But with somebody in a relationship, with at least you want to take a chance with somebody you are in like with or in love with or whatever, you know…who believes in love, but, yeah.

PrEP vs. Rectal Microbicides

Given that RMs are still in development, there are clearly a lot of unanswered questions concerning how they would work, how much product is needed in order to be effective, potential side effects, and the level of effectiveness. These unanswered questions were pointed out by respondents, who stated that in

theory RMs sound like a great idea, but until those questions were answered, it would be hard to say to what extent they would use them. However, when asked to consider which biomedical intervention, PREP or RMs, was most appealing to them, respondents seemed to be more positive about RMs.

> I think if both of them were 100 %, I'd rather do the, the rectal microbicide. Just 'cause with the pill you're saying it's a daily thing and I, uh, have to agree with [Name 1] that I am really, really bad at taking my medicine every day. Um, I can't even take my vitamins every day. I'm like oh, crap, I missed yesterday. Oh, I'll just take two or something… So, I feel like if I use lube I'd be able to be like oh wait, hold on. Let me get that 'cause you sort of sometimes need that so.

One of the primary reasons for RMs seeming to be a better option than PrEP was the prescribed use of RMs would not necessitate daily use. Given that this was one of the primary drawbacks of PrEP, this is not surprising.

> R3: It's not a life-changing drug. You know, just like everybody's heard of lube, straight or gay. So, you know, that's why I feel like it's less sketchier, or less, um, it doesn't sound so weird to me. Um, using the lube than taking the pill every day.
> R7: I think you made a good point. Not life-changing. I think that's how I would sum it up.

Of interest, another theme that focused on the daily use of PrEP was related to issues of guilt over one's sexual activity.

> R1: You know, I think I know why you might feel that way. Maybe I'm wrong. But I think it's because if you take a pill every day, you feel like you really are living your day every single day with the intent of, of like, I could have sex tomorrow and I have no problem. But if you have, you know, lube handy it's more of a like, just when I have sex I'm going to take this one thing. But it's more of a, that feeling of less guilt you want.
> R4: [TALKS OVER] Maybe.
> R1: You feel less guilty about it because you already use lube. It feels less dirty overall, less sinful in a sense. But I think, that's how I kind of see it in my head too. 'Cause I thought of all this, it does seem a little bit less wrong to, you know, take that route.

A smaller proportion of young men felt that PrEP would be a better option. This seemed to be related to the perception that a pill was somehow "better" than a gel, with its pharmaceutical nature appearing to be more powerful.

> But the PrEP seems like you are taking that every day and it's fight and fight and fight. And I feel like rectal microbicides are just this second, right now, let's try and fight some stuff. The pill, you're taking that every day. You know it's working.

Condom Use with Biomedical Interventions

The majority of respondents believed it would still be necessary to utilize condoms even if one was using PrEP or RMs as directed. Some felt that PrEP would be an "added protection" to be used in conjunction with condoms or as a "back-up" plan in case the condom broke during sex. While a small proportion of respondents admitted that if they were taking PrEP, they may use condoms less, which garnered some negative reactions from others in the focus group, the primary concern was with how people in general would perceive PrEP. Young men felt that PrEP and other biomedical interventions may give users a false sense of being "invincible" to HIV, "Some people, they'll automatically think 'I'm immune from everything 'cause I'm taking one pill. I'm super, I'm Superman'." Several focused group discussions underscored that PrEP would not protect individuals from other sexually transmitted infections, for example, "I hope they still know to use condoms 'cause like it's only going to help with the HIV, the PrEP, and there's so many other STDs out there."

When discussing the possibility that many people may have this sense of invincibility, participants also reported that information and education can be easily misconstrued. Respondents felt that information about PrEP or RMs may actually create more challenges in the area of HIV prevention by watering down the message of safe sex that young men in this age group have grown up hearing. Given the misinformation that these participants had already heard about PrEP, this may be a real concern for HIV providers and health educators. The discussion below highlights some of these concerns as well as hinting at a distinction between effectiveness and efficacy when PrEP is used in real world settings.

> R4: People are just, they misinterpret things. And they'd like to believe what they want to believe.
> R5: [TALKING OVER] I know, not only is it encouraging them not to use condoms but I mean people are going to get so much misinformation because by the time it gets to the community, our community, it's going to be so much misinformation and misconstrued–
> R2: That's why people should read the facts.
> R5: [TALKING OVER] –and then it's just like, oh, I took my PrEP two weeks ago so I'm good. You know, and people are going to be lying to themselves.
> R2: No it doesn't work like that. You have to take it every day.
> R5: Right. But we know that but I mean how many people are really going to do that?
> R4: I mean you're going to get people who are out there just be like, oh, I took it this week so I'm good…Or, oh, I had this special lube but it, and it's s-, it just don't last that long. It's like, it's just going to make, I think a bad problem worse.

Access to and Ability to Pay for Biomedical Interventions

An important consideration for the use of PrEP and RMs in community settings and in the larger population is how much potential users would be willing to pay for the prescriptions. Currently, most insurance companies do not cover the cost of PrEP (although some states now include it on their Medicaid formularies); average out of pocket expenses are more than $800 per month. With this in mind, we asked respondents how much they would be willing to pay for PrEP or RMs, given what they know about these interventions.

In general, young men felt that PrEP in particular should be covered by insurance so that no one is really paying out of pocket. A few of the young men (those involved with service agencies) had heard that PrEP was free—referencing a clinical trial that was currently being conducted. Because they had heard it was free, they were only willing to spend about $20 per month for the medication. In this instance, some young men extended their comparison of PrEP to birth control pills, stating that PrEP and birth control were both "preemptive" drugs so a "fair price" for PrEP would be similar to birth control pills. However, in the case of co-payments for prescriptions and how much they would be willing to pay, respondents most commonly stated that $50 per month for PrEP would be reasonable, with responses ranging from $30-$100.

> I mean just for a month's supply it'd be nice if it wouldn't go over $50. From like, for whether it's one pill a day or two pills a day. It'd be nice if it wasn't over $50 for a month's supply.

All respondents were in agreement that RMs should cost less than PrEP and not much more than a personal lubricant. In general, it seemed young men would be willing to pay more for PrEP than RMs, mainly because pills seemed more "clinical", and they would likely require a prescription. After averaging the varying responses, we found that respondents thought that RMs should cost about $20 for a month's supply. Interestingly, while respondents had overall better perceptions of RMs and seemed to prefer them to PrEP, they also felt that RMs may not be as effective. It was due to this perception of effectiveness that young men seemed to be willing to pay a little more for the PrEP pills.

> Any topical, any topical thing or anything that you stick inside of you that, that is a, an ointment or a lube or anything like that is not going to be as effective with a real virus than, than oral medication or vaccination.

Discussion

The data reported here provide a description of YMSM's perceptions of biomedical HIV prevention interventions. These interventions hold some promise in addressing the HIV epidemic which has disproportionately affected the MSM communities. HIV prevention approaches have changed considerably from what they were at the beginning of the epidemic, which focused more on primary prevention efforts and promoted condoms, testing and monogamy as the most effective strategies. As medications and treatments became more widely available, prevention efforts have turned to focusing on treatment as prevention, lowering community viral loads, and curbing reinfection from different strains of HIV.

Providing alternatives to the use of condoms for every sexual experience is important as young men develop long-term intimate relationships in which unprotected sex with a trusted partner is a natural progression in young men's relationships (Kubicek et al., 2008). In addition, given that the United States has been engaged in the fight against HIV/AIDS for over thirty years, and HIV rates have remained relatively stable over the last ten years, it is clear that additional prevention methods are needed. Thus, further research in developing new intervention modalities is important. Equally important is working with the communities for whom those interventions are designed to better understand how and in what contexts these interventions may be adopted.

This study began this discussion by bringing together groups of YMSM of color to describe their perceptions of these biomedical interventions and to get a sense of how they might use them. YMSM in this study identified that adherence to PrEP may pose a challenge. This has been documented in research with HIV-positive adolescents and young adults using antiretroviral treatments, which has identified adherence as a major challenge (Belzer, Fuchs, Luftman, & Tucker, 1999; Murphy, Wilson, Durako, Muenz, & Belzer, 2001). In general, younger populations may experience greater challenges adhering to medication regimens, as documented in a feasibility of PrEP use among YMSM which found relatively low adherence based on self-report and confirmatory biological data (Hosek et al., 2013b). Thus, as PrEP and other biomedical interventions are developed and implemented in community settings, health educators and providers should be aware of this potential challenge and develop effective methods for supporting YMSM's adherence to their medication, again highlighting the need to integrate behavioral change models into the implementation of biomedical methods.

Based on young men's perceptions in this study, it is clear that a great deal of education and outreach needs to be done in order to address some of the concerns young men may have. In addition, it remains important to assess for whom PrEP and other biomedical interventions are best suited. Issues that health educators and HIV providers should consider in these outreach efforts are those voiced by young men in this study. For example, many of the young men did not see the need to take a daily pill as a prevention method. Concerns about side effects and the lack of long-term research with this medication were also identified by men in our sample. Respondents felt that PrEP may be most appropriate for those who they considered to be at highest risk such as men with multiple sex

partners, sex workers, substance users, and those in serodiscordant relationships. Additionally, some of these higher-risk populations may have additional challenges with adherence, so careful consideration of these obstacles should be taken when considering PrEP with these populations.

While not as prevalent as other themes, a small but important minority of young men in this study also felt that there would be some stigma attached to using PrEP—that it would mean you were "living every day" with the intent of having sex. This suggests that some young men may have some internalized guilt about their sexual behavior which may limit their use and adherence to PrEP. These young men felt that RMs would be a more appropriate method of protection given one used them during sexual activity, and there are no premeditated thoughts about RMs as a prevention method.

In general, YMSM were more receptive to the idea of RMs when compared to PrEP. This was primarily due to the comparison of RMs to lubricants, which are often a regular part of anal intercourse. Given that some research indicates lubricant use may be more common than condoms during anal intercourse (Carballo-Dieguez et al., 2000), young men's perceptions and preferences should be examined closely as we think about design and acceptability of RMs. While trials are currently being conducted for vaginal microbicides, less work has been devoted to manufacturing and testing the effectiveness of RMs for YMSM. Currently, a phase 2 trial is being conducted to test the safety of an RM among men and transgender women (Cranston & Lama, 2012); thus, there is a long way to go before RMs are available in larger clinical trials for the purpose of HIV prevention. Given the perceived high acceptability of RMs for this population, additional advocacy should be considered to promote research into the development of RMs for YMSM.

Respondents were also concerned that young men may abstain from condom use if they or their partner are using PrEP. They felt that this could be potentially dangerous in light of the adherence challenges they already outlined, the potential for transmission of other STIs and the fact that PrEP is not 100 % effective in preventing HIV transmission. They also felt there was a high potential for misinformation about PrEP's effectiveness and use. This was validated with their descriptions of their own confusion about how and when to use it. Reviewing the apparent confusion that many of the participants seemed to have about PrEP, this may have been more related to a misunderstanding between the use of PrEP and the use of PEP or post-exposure prophylaxis. This confusion may also be the result of different clinics testing the effectiveness of PrEP under different indications such as daily, before sex, or weekly. Thus, continuing to educate YMSM and other populations at risk for HIV transmission about the importance of safer sexual practices remains critical. In particular, as community-based interventions testing the effectiveness of PrEP continue, better education on the difference between being a clinical trial participant and being prescribed PrEP by one's physician should be developed.

Perceptions and ideas such as those described here are important to note when disseminating and implementing efficacious prevention strategies into real world settings. These potential challenges may or may not play out in the real world. However, considering that preventionists and providers have struggled for 30 years to implement behavior change interventions to address the HIV epidemic, it is highly likely that biomedical interventions will face similar hurdles considering they too require a certain degree of behavior change. Although efficacious vaccines or other biomedical interventions are needed, it is unlikely that the perceived failure of prior HIV prevention efforts is simply a function of "disappointing" approaches and tools; condoms are 80-94 % efficacious when properly used (Pinkerton & Abramson, 1997), and clean needles and syringes transmit HIV to no one. Rather it is likely that the failure is in large part a function of the social, economic, and political barriers to the provision, acceptance, adoption, and sustained use of these tools and technologies (Parsons, Grov, & Golub, 2012).

In order to maximize the effectiveness of new and innovative methods, these interventions should not be developed and implemented by biomedical scientists alone. Social scientists should be involved in the dissemination of these interventions as their training is more focused on understanding what is involved in effectiveness. Together, social and biomedical science can work to ensure that the treatments and technologies used to treat and prevent HIV are not only efficacious but also effective. One example of this is an ongoing trial of PrEP among YMSM sponsored by the Adolescent Trials Network (Hosek et al., 2013a). In this trial, the research team adapted 3MV, an evidence-based, group-level, behavioral HIV intervention designed for African-American men, for a younger population. Participants participate in a weekend-long workshop that addresses some of the sociocultural drivers of HIV infection (e.g., discrimination, mental health); it is believed that this approach can play a significant role in sustaining behavioral change over time. After completing the behavioral intervention, young men were introduced to PrEP and were asked to take it as directed. While data are not yet available on the effectiveness of this approach, it is an important model for others to consider when designing biomedical trials and interventions (Hosek et al., 2013a, b).

Finally, young men in this study identified that they would likely not be willing to spend more than $50 per month for PrEP and about half that much for RMs. Given that currently PrEP is not covered by most insurance companies, this is a major hurdle. Medicaid in some states, including California, New York, and Florida, now covers PrEP (marketed as Truvada); however, this is not universal, and access is still limited. Without sufficient insurance coverage, the current cost is not feasible for most high-risk populations. Thus, additional advocacy with drug companies to subsidize PrEP and other HIV medications should continue. Currently, substantial subsidies are available in highly impacted regions such as sub-Saharan African countries (Gomez et al., 2013). HIV advocates should continue the dialog with pharmaceutical companies to make PrEP equally affordable here.

There were a number of study limitations that should be acknowledged. First, this was a pilot, exploratory study to identify perceptions and knowledge of a small sample of YMSM of color in Los Angeles. As such, these findings cannot be generalized to the larger population. Further investigation is needed to identify associations with some of the challenges identified here such as adherence and perceived risk. In addition, the YMSM involved in this study were recruited from gay-identified venues including bars and clubs and social service agencies, some of which were designed specifically for men of color. YMSM who are not as well connected to gay communities may have different perspectives and sexual identities. In particular, young men who do not identify as gay, yet have sex with men may be less inclined to visit such venues; their views should also be an area for future research.

In spite of these limitations, the results presented here have implications for providers as PrEP and other biomedical interventions, are introduced into community settings. First, one of the most common motivations identified by YMSM for using PrEP was in situations where individuals were in a serodiscordant relationship. As such, it is important for providers to assess young men's relationship status on a regular basis. Prescribing PrEP may be important for young men in these relationships to protect each other and have a fulfilling intimate relationship. Young men also expressed concern about the potential for information to be misconstrued about PrEP which could result in a possible risk of disinhibition and lower levels of condom use when using biomedical intervention methods. While this may or may not occur in reality, these concerns should be considered and providers should continue to promote safe sexual practices, as PrEP and other potential biomedical interventions do not protect against other STIs. As these new developments are tested and translated into community settings, it is important to assess and understand the potential target population's perceptions and understanding of these interventions, in order to ensure that the efficacy of biomedical interventions found in clinical trials are equally effective in community settings. Without this understanding, the potential impact of new interventions may be limited. Therefore, studies such as the current one, in which the voices of YMSM are examined are important to be considered when implementing new intervention methods for educational and awareness purposes.

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