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Temporal Fluctuations in Behavior, Perceived HIV Risk, and Willingness to Use Pre-Exposure Prophylaxis (PrEP)

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Abstract

Individual perceptions of HIV risk influence willingness to use pre-exposure prophylaxis (PrEP) for HIV prevention. Among men who have sex with men (MSM) and male sex workers (MSWs), temporal or episodic changes in risk behavior may influence perceived risk and PrEP acceptability over time. We investigated fluctuations in perceived HIV risk and PrEP acceptability, comparing MSWs against MSM who do not engage in sex work. We conducted 8 focus groups ($n = 38$) and 56 individual interviews among MSM and MSWs in Providence, RI. Perceived HIV risk shaped willingness to use PrEP among both MSWs and MSM who did not engage in sex work, and risk perceptions changed over time depending on behavior. For MSWs, perceived risk cycled according to patterns of substance use and sex work activity. These cycles yielded an “access-interest paradox”: an inverse relationship between willingness to use and ability to access PrEP. MSM who did not engage in sex work also reported temporal shifts in risk behavior, perceived risk and willingness to use PrEP, but changes were unrelated to access. MSM attributed fluctuations to seasonal changes, vacations, partnerships, behavioral “phases,” and episodic alcohol or drug use. Efforts to implement PrEP among MSM and street-based MSWs should address temporal changes in willingness to use PrEP, which are linked to perceived risk. Among MSWs, confronting the access-interest paradox may require intensive outreach during high-risk times, and efforts to address low perceived risk during times of reduced sex work.

Keywords

Pre-exposure prophylaxis; men who have sex with men; male sex work; HIV prevention; acceptability

Daily oral antiretroviral pre-exposure prophylaxis (PrEP) is a potent strategy for preventing HIV among men who have sex with men (MSM) (Anderson et al., 2012; Grant et al., 2010; McCormack et al., 2016), men and women who engage in heterosexual sex (Baeten et al., 2012; Donnell et al., 2014; Thigpen et al., 2012), and people who inject drugs (Choopanya et al., 2013). Daily use of tenofovir with emtricitabine has been FDA-approved for use as PrEP in the US since 2012 (FDA, 2012). On-demand PrEP has also proven efficacious and acceptable among MSM, with dosage before and after sex (Molina et al., 2015). A large body of research has now focused on PrEP acceptability—including studies of predicted and actual user behaviors such as PrEP uptake, adherence, and risk behavior (Amico & Stirratt, 2014; Carlo Hojilla et al., 2016; Cohen et al., 2015; Gilmore et al., 2013; Grant et al., 2014; King et al., 2014; A. Liu et al., 2014; A. Y. Liu et al., 2013; Marcus et al., 2013; Mugwanya et al., 2013; Peng et al., 2017; Young & McDaid, 2014). Much PrEP acceptability research to date in the US has focused on MSM, who experience the largest proportion of new US HIV diagnoses (CDC, 2017). Prior reviews have found individual characteristics linked to interest in using PrEP among MSM, including perceived HIV risk, younger age, higher socioeconomic status, and elevated levels of risk behaviors (Holt, 2014; Peng et al., 2017; Young & McDaid, 2014).

Despite the proliferation of PrEP-related research among MSM, however, PrEP acceptability among MSM who engage in sex work needs further study (Baral et al., 2015; McKinnon et al., 2014). Male sex workers (MSWs) are a compelling population for PrEP, with a higher HIV burden than the general population of MSM (Baral et al., 2015). Risk factors for HIV among MSWs include social and economic marginalization, sex with clients and non-client partners, substance use, limited access to HIV prevention and medical services, and isolation from social support (Baral et al., 2015; Cohan et al., 2006). Although male sex workers may be willing to use PrEP (Underhill et al., 2015), a recent US study has found lower awareness of PrEP among men engaging in transactional sex (Eaton, Driffin, Bauermeister, Smith, & Conway-Washington, 2015). Other studies of male sex workers have found high acceptability, but also barriers to access and adherence (Chakrapani et al., 2015; Escudero et al., 2014; Restar et al., 2017; Van der Elst et al., 2013). Further research is needed to understand PrEP acceptability and potential uses in MSW populations.

The present study focuses on several linked determinants of willingness to use PrEP: perception of risk and fluctuations in HIV risk behavior over time. Prior studies among MSM have consistently found that perceived HIV risk is a key determinant of willingness to use PrEP, and that individual perceptions often do not match clinical indications for PrEP prescription (Gallagher et al., 2014; Golub, Gamarel, Rendina, Surace, & Lelutiu-Weinberger, 2013; Holt, 2014; Krakower et al., 2012; Young & McDaid, 2014). Possible pathways for the effect of risk perceptions on actual PrEP uptake include not only the direct impact on willingness to use PrEP, but also the possibility that perceived risk may motivate individuals to seek preventive services and thereby learn about PrEP (Gallagher et al., 2014). Although risk perceptions may be shaped by many factors, an important driver of changes in perceived risk is changes in sexual behavior and drug use over time, including individuals' ability to predict future risk-taking (Rendina, Ventuneac, Grov, Mustanski, & Parsons, 2013; Volk et al., 2012). Several studies have documented fluctuations in risk behavior among

MSM, in increments ranging from days to months or years (Mustanski, 2007; Pines et al., 2014; Rendina et al., 2013). MSWs experience fluctuations in risk due to both transactional and non-transactional sex, and engagement in sex work may be informal or intermittent (Baral et al., 2015). Changes in behavior may affect risk perceptions, which in turn may shape PrEP acceptability over time.

Temporal shifts in *actual* risk and *perceived* risk have implications for PrEP uptake and implementation. Several studies have now suggested or investigated PrEP suspension and “seasonal” PrEP use for MSM and other groups (Carlo Hojilla et al., 2016; Cremin, Morales, Jewell, O'Reilly, & Hallett, 2015; Elsesser et al., 2016; Namey et al., 2016; Pines et al., 2014; Volk et al., 2012). We build on this work to understand how shifts in transactional and non-transactional sex may influence perceived HIV risk and willingness to use PrEP in a US population of MSM and MSWs. Little is known about how changes in risk-taking and risk perceptions may affect PrEP acceptability among MSWs as compared to MSM who do not engage in transactional sex. We used qualitative methods to understand the relationships between temporal changes in risk behavior, perceived HIV risk, and willingness to use daily oral PrEP among a population of MSWs compared to MSM.

Methods

Methods have been reported in detail elsewhere (Underhill et al., 2014; Underhill et al., 2015). We conducted two stages of data collection among MSM in Providence, RI, and we used qualitative methods (rather than alternatives, such as a survey design or longitudinal cohort study) in order to gain in-depth insights into acceptability. All participants in both stages were adults who had been assigned male gender at birth, who spoke English, and who self-reported negative or unknown HIV status, recent condomless anal sex with a man of positive or unknown HIV status, and no enrollment in a PrEP efficacy trial. Recruitment methods included direct outreach and advertising in clubs, bars, street-based sex work venues, community-based organizations, clinics, and local online and print media. Each participant received \$75 for time and travel costs. Focus groups explored a broad range of PrEP acceptability themes, followed by semi-structured interviews focusing on a narrower list of themes with in-depth narratives. Focus group participants were eligible for interviews. Based on feedback from the focus groups, we anonymized all data collection procedures for interviews to increase participants' comfort discussing sex work and substance use. We therefore could not match identifiers between focus groups and interviews to determine precisely how many participants enrolled in both stages. Participants' statements and interviewer recognition, however, suggest that approximately 10 participants enrolled in both stages.

During February–June 2012, we facilitated 8 focus groups among 38 participants. Focus group participants completed a written questionnaire reporting risk behaviors and demographics, then engaged in a 2-hour discussion with 2 facilitators (KU and another facilitator) in a private clinic room. Each group enrolled 4–6 MSM meeting inclusion criteria. Three groups (n = 16) sampled current street-based male sex workers, who disclosed recent sex work (i.e., in the past 6 months) verbally or on the questionnaire. Five groups sampled MSM from the general community (n = 22), and 5 men in these groups also

disclosed recent sex work on the questionnaire. We consider these 5 participants as male sex workers (MSWs) in analyses.

We conducted the interview stage of our study from April 2013–April 2014, which included 56 semi-structured individual interviews to gather in-depth narratives regarding willingness to use PrEP. Inclusion criteria, data collection setting, and recruitment methods were the same as for focus groups. Thirty-one interview participants disclosed recent sex work on the questionnaire and are analyzed as MSWs. Interview participants also completed a questionnaire, then engaged in a one-on-one 90-minute interview. Interviewers (KU or CC) identified themselves as non-physician researchers and provided participants with a description of tenofovir with emtricitabine for use as PrEP. The description described the iPrEx trial findings, side effects, adherence and HIV testing requirements, the possibility of developing drug resistance in the event of HIV infection, and FDA approval. There were some differences between the two stages; FDA approval was not yet granted during focus groups but was complete before interviews began, and PrEP had a larger evidence base and more popularity by 2013–2014. This may have led to some differences in PrEP awareness and willingness to use PrEP between the two stages, which we consider in our results and discussion.

Data collection in both stages followed written agendas investigating knowledge of PrEP, psychosocial and contextual factors informing willingness to use PrEP, attitudes and intentions regarding risk behavior associated with PrEP use, and comprehension and acceptability of PrEP education messages. Focus group facilitators and interviewers recorded verbal debriefings after each session summarizing expected and unexpected themes, and we transcribed and reviewed these debriefings to monitor for data saturation. During the interview stage, interviewers specifically probed for episodic and cyclical risk behavior, perceived HIV risk, and the impact of perceived risk on PrEP acceptability. As reported in Table 1, willingness to use PrEP was based on the interview question “If PrEP were available to you now, would you want to use it?”, along with any endorsements or anti-endorsements made during the interview (e.g., “I would never use PrEP,” or “I would definitely do it.”).

Sessions were audio-recorded, transcribed, and thematically coded using NVivo 9 (QSR International, 2012). Thematic coding structures were developed separately for each stage; we initially created question-based codes derived from interview and focus group agendas, then added emergent codes based on unanticipated findings. All focus group transcripts were double-coded by two trained coders (KU and CC or SC), who resolved discrepancies by discussion. Individual interview transcripts were coded by the principal investigator (KU), and a subset were double-coded by a trained research assistant to aid in the development of themes. We analyzed findings by reviewing coded text for each theme, noting areas of consensus or divergence. Comparative analyses between MSM and MSWs are generally descriptive and follow our deductive, question-based themes. We therefore used a positivist paradigm for this analysis, and we report findings based on the surface meaning of participants’ statements (Braun & Clarke, 2005; Denzin & Li, 2011; Ponterotto, 2005).

The Yale Human Subjects Committee and Miriam Hospital IRB approved study procedures. We obtained written informed consent for focus groups and verbal informed consent for interviews. Data were protected by a NIH Certificate of Confidentiality. Participants in both stages were also given a list of local health and social services resources, and participants in the interview phase received a referral to Rhode Island's newly opened PrEP clinic.

Results

Table 1 reports demographic and selected behavioral characteristics of the sample; some of these data have also been reported in prior papers (Underhill et al., 2014; Underhill et al., 2015). As reflected in this table, there were a number of demographic and behavioral differences between the samples of men who engaged in transactional sex and men who did not; MSWs reported lower incomes, less stable housing, lower employment, lower education, and less health insurance coverage. MSWs were also more likely to report substance use, injection drug use, and sharing of drug use equipment among injection drug users.

Several potentially unique contextual features shape the Rhode Island male sex work market, including a state legal regime that permitted indoor sex work until 2009 (Associated Press, 2009), the location of bathhouses and adult bookstores, the position of Providence on a large interstate highway used for trade in illicit drugs (National Drug Intelligence Center, 2003), and the establishment of a community-based organization serving the MSW population (Landers et al., 2014). In general, the MSW population in this study was street-based and experienced high rates of drug use (see below), and sex work venues included adult bookstores and areas around bathhouses. MSW participants reported primarily male clients and rarely or never used condoms for sex work; sex work included both oral and anal sex, and MSWs reported often being the insertive partner. Although MSWs did not use condoms during sex work, they reported trying to avoid partners known or suspected to have HIV, and they shared information with other MSWs about HIV-positive clients and their vehicles. Both MSM and MSWs reported condomless sex with a partner who was HIV positive or of unknown status as part of eligibility for the study; most reported "sometimes" or "never" using condoms with primary partners. A majority of MSWs reported recent sex with both men and women, and when these participants had a primary partner, most primary partners were female. MSM who did *not* report sex work were more likely to identify as gay and less likely to have female partners, and when they had primary partners, their partners were more likely to be male. Participants in interviews reported greater certainty about willingness or unwillingness to use PrEP, perhaps due to FDA approval and increasing PrEP awareness and popularity during the year between data collection stages. Willingness was generally higher among MSWs than among MSM who did not engage in sex work.

Quotes illustrating qualitative findings are included in text below. Speaker numbers embed whether the participant was enrolled in a focus group (FG) or individual interview (INT), and whether the participant had disclosed sex work in the past 6 months (MSW vs. MSM). This section will present initial findings on the relationship between perceived HIV risk and PrEP acceptability, followed by our findings on "seasonal" changes in risks due to transactional and non-transactional sex.

Perceived HIV Risk and PrEP Acceptability

Among both MSWs and other MSM, high perceived HIV risk was the most important and frequently mentioned driver of willingness to use PrEP. Participants explained their risk perceptions based on recent and predicted sexual behavior and/or drug use, as well as the results of any recent HIV testing. Participants in both subgroups often reasoned through PrEP acceptability as a cost-benefit calculation, considering PrEP's risk-reduction benefits in light of downsides (e.g., side effects, financial costs, stigma, adherence needs). When perceived HIV risk was high, participants gauged larger potential benefits from PrEP use, which were often sufficient to outweigh PrEP's downsides. MSWs reported particular interest in PrEP during times of sex work due to clients' refusal to pay for condom-protected sex, as well as the difficulty of predicting whether prospective clients were likely to have HIV.

INT127-MSW: The more at risk you put yourself ... is the more people [would] want [PrEP]... because otherwise the side effects aren't, it's not worth it.

INT132-MSW: I'd take [PrEP] 'cause I put myself at risk a million times a day.... I'll fucking use anybody's [needle to inject drugs]... Not only that, fucking anal sex and shit, that's brutal.

FG129-MSM: I've been lucky for 20 years, you know, not using rubbers and, you know, just having fun but, you know, I'm playing Russian roulette It's not cool doing it that way... and I'd rather be safe than sorry.... I'd take that pill in a heartbeat... FG121-MSM: Yes, I would do it in a heartbeat.

Conversely, low perceived HIV risk informed *unwillingness* to use PrEP. Among men who were unwilling to use PrEP, a majority cited low perceived risk as the primary deterrent, more than any other reason. Low perceived HIV risk was related to several factors, including monogamy, perceived low risk of partners, a recent negative HIV test result, reduced engagement in sex work, and a relative decrease in risk behavior compared to prior behavior (even if current behavior still included condomless sex).

INT150-MSM: I mean if you heard my lifestyle you would probably no way say that I was low risk, but for me the people that I, I fool around with are usually people who don't live the same lifestyle I lead ... I have a lot of different partners and they don't know that I shoot heroin every day... I don't ever share needles.... I wouldn't, I wouldn't take that pill because I don't feel I need it.

INT153-MSM: I don't think [I would use PrEP]. Me and my partner are pretty straightforward together, so I, I'd hope, you know, no cheating would go on.... I trust my partner and ... if I start not to trust him then I'd definitely take it.

Although the link between perceived risk and willingness to use PrEP was strong, it was neither universal nor wholly predictive. Some participants reported willingness to use PrEP even with low perceived risk due to the desire for peace of mind. Others described their day-to-day risk as low, but then noted that they would want PrEP in the event of unpredictable risks or potential infidelity by partners. Others reported *unwillingness* to use PrEP despite high perceived risk, due to concerns about side effects or a general unwillingness to take medications.

FG109-MSM: You know, it just takes that one slipup to give you the HIV virus. So even if you're with a monogamous partner...even one slipup could—could be detrimental. Facilitator: So even if you're monogamous with a negative guy, you would still want PrEP in case that happens? FG109-MSM: Right. Absolutely. Absolutely. FG129-MSM: I wouldn't miss—I wouldn't miss one day anyway. If that came on and I had a choice, I'd be taking it on a daily basis.

FG131-MSM: If the side effects are not bad... I think people would take it even if they weren't having sex.... I can only speak for myself but I know I would. FG128-MSM: Peace of mind. FG131-MSM: It's peace of mind, exactly.

Several participants in both subgroups also noted uncertainty about their ability to gauge their own risk. These participants would prefer an objective assessment of their risk, such as by asking a provider if their risk would warrant PrEP use.

INT107-MSW: If I was clean and stopped hustling I would... probably ask like some type of medical worker, medical person ... if I should still be taking [PrEP] because ideally if I got clean, I don't think I would be at risk for HIV or anything like that.

FG122-MSW: At least for me it would be a good conversation for me to have with my provider to really determine like, am I at risk? Like, is this a really necessary step for me?

These comments reflect fluctuation of risks and risk perceptions over time, as well as a general lack of interest in taking PrEP during low-risk periods. Moreover, men who are uncertain about their need for PrEP may not actively seek PrEP; instead, they may rely on provider recommendations and suggestions to consider PrEP use. These dynamics may pose barriers to access, depending on disclosure and supportive communication within provider-patient relationships. In general, however, these data provide narrative support for a strong relationship between perceived risk and PrEP interest.

“Seasons of Risk” Due to Transactional Sex

Among MSWs in our sample, changes in risk behavior and perceived HIV risk were primarily driven by cycles of substance use and sobriety that shaped engagement with transactional sex. A large majority of men in this subgroup were current substance users, which is characteristic of the street-based MSW population in this area of the US (Landers et al., 2014). Participants reported that times of severe substance use (e.g., relapses and escalation of dosage and frequency of use) were often unpredictable and lasted between several days and several years, stopping after events such as incarceration or receipt of rehabilitation services. Importantly, participants described high barriers to accessing other means of social and financial support during periods of heavy substance use, due to factors such as alienation from family and social networks, homelessness, and inability to maintain employment or health insurance. As many participants in this sample described, these cycles of drug use and alienation led to transactional sex for daily living needs and avoiding withdrawal, and sex work was a reliable source of income during these times.

Interviewer: When you were kind of in a riskier situation, what made that situation riskier? INT135-MSW: My drug use... Um it wasn't so much as the syringes as it was the having sex with guys who wanted to do anal sex... I needed to because I was broke and I had no money and I was using heroin and you know, you get, you get pretty sick if you don't have the shit ... It could be a couple of days things are bad. It could be all month You can't go to work because there is no work, and you know if you go out hustling that there might be a shot that there's gonna be a client who wants to have anal sex, and you know that, so it's a predictable thing.

INT130-MSW: [My risky times last] until I go to prison... when I get on like a hellish tear it usually lasts for at least six months, you know, before I just get totally stupid, locked up you know... not that I don't put myself at risk every day.

INT131-MSW: I have my two separate lives, my drug life and my other life, and, but I separate the two completely.... A couple months it's been [at high risk for HIV].... Drugs control you.... you need to make money to get more drugs, drugs.... As long as you're staying in the, on the streets doing drugs, you know you're gonna do whatever you're gonna do for the money.

As may be expected, most MSW participants reported that their perceived HIV risk increased in tandem with their transactional sex and drug use activities; men in this group tended to gauge their HIV risk largely from their sex work experiences, rather than their casual or romantic partnerships. As noted above, most also indicated that they would be more willing to use PrEP during periods of increased sex work.

INT135-MSW: If there's an opportunity where um there's a preventative medicine [PrEP] and I could stop on my way before I go to the [adult] bookstore to go have [transactional] sex, maybe it's a good idea If they were just giving [PrEP out] on the street... I would take a bottle ... and if I was going through my spurt of high risk behavior, I would, I would probably take them I would take, I would take 'em when I needed 'em. You know it'd be really nice to have them there.

As suggested here, participants were often receptive to PrEP to reduce the risks associated with sex work, but noted many barriers to PrEP access during these times; the following section will address this theme in depth.

Transactional Sex and the Access-Interest Paradox

Despite increased interest in PrEP during high-risk cycles, MSW participants also reported severely restricted ability to *obtain* PrEP during these times. We will refer to this as the “access-interest paradox.” MSWs reported several reasons for this paradox. First, during times of heavy substance use, financial resources are scarce, and participants reported a need to spend any excess income on survival needs or substances, rather than paying for PrEP or medical care.

FG115-MSW: When I'm out there chasing drugs and I'm putting myself at risk on a daily basis, not just daily, like an hourly basis because I'm committing sexual acts with—with multiple men and it's like in that case I probably wouldn't have the means to—to pay for the drug, do you know what I mean?... If I have an extra 300

bucks, it's not going to preventive medicine. It's goin' to the coke or something, you know what I mean? FG117-MSW: It's going to the dealer... FG119-MSW: It's a catch 22, you know what I mean?... Financially secure people don't put themselves in the situations that we put ourselves in.

FG138-MSW: If it comes down to the—to the morning I wake up and it's, "Okay [FG138], you can go get your—your anti-AIDS medication or you can go get that couple bags of dope to get you off E," then that medication's out the window, you know? That's just being a realist about it, you know? FG136-MSW: Of course you're gonna go get the dope, definitely. FG134-MSW: Dope is coming first. FG138-MSW: If I'm gonna go hustle some money, it's not gonna be to go get my preventative medicine. It's gonna be to get my immediate medicine. [Group laughter.] FG136-MSW: It's true.

Second, men suggested that periods of heavy substance use, particularly if they are a relapse from former sobriety, are associated with feelings of hopelessness, shame, HIV fatalism, and deprioritization of personal health. These factors may further limit participants' ability and desire to seek preventive care. Where care is sought, it is more likely to be for substance use treatment than for preventive health.

INT130-MSW: When you're at that point, you don't give a fuck. The last thing I give a shit about, [is that] down the road I'm gonna die of this disease [HIV], fuck you. 'Cause when you're in your addiction and it, and it's starting to get like that, that's it... There is no ten minutes from now.... [It's more important to ask if] you got some money for me or something, [or] can I sell this shit [PrEP], you know what I mean.... You're, you're in that grip you know.... I might say yes [to PrEP] to placate ya and then get, get a smile out of ya, but you know what, I'm not gonna take it. I'm gonna try to go out there and sell it, you know what I mean.

Third, participants reported structural difficulties with accessing medical services during times of severe substance use due to unemployment, lack of health insurance, difficulty navigating processes for accessing low-cost or free care, and logistical barriers such as homelessness or transportation. We have reported some of these findings in a separate paper (Underhill et al., 2014). Several participants also believed that adherence to PrEP would be difficult during these times.

INT102-MSW: If I thought I was in a higher risk, um, [PrEP] would pique my, my, my curiosity... however my actions would probably be of opposite... It's in your hands, it's up to you to take it... At some point there's a lapse of judgment, and just as well could be a lapse in taking the medication.... It would be a concern to me as whether or not I could follow through with the treatment as prescribed.

INT106-MSW: [People with addictions] don't get, we don't necessarily follow the rules... With an active addiction we neglect everything and even, you know, in the beginning of getting clean, getting through the post-acute withdrawal stuff ... we're too busy feeling, you know what I mean... So trying to do a daily pill is not the best.

Fourth, participants noted that high-risk times are unpredictable, which may pose problems for effective PrEP use at the time of need. MSWs generally noted that it was difficult to predict when high-risk times would occur, although several suggested that they could use warning signs such as loss of stable income, housing, or supportive relationships. Advance use of PrEP, as may be required for daily or intermittent use, may have limitations for this group, although these barriers may be surmountable with intensive outreach and preventive care during low-risk times.

Interviewer: Do you know those high risk times are coming? INT128-MSW: Um, no. No. Just until it's happened... I can't say, "Oh tomorrow I am going to screw it up and then I'll have to start all over again"... I can't predict it.... [Drug] occasions turn into regular, you know, like often... and then on a daily basis, you know, and then there goes all that, all that I worked for goes down to hell.

One way to address this difficulty would be for men to begin using PrEP during a time of diminished drug use and lower risk, and then to continue taking it during times of higher risk. But here, we found that the access-interest paradox runs in both directions. During times of greater addiction, access is challenging but interest is high. But during times of greater sobriety, PrEP is more accessible, but interest may wane. Periods of sobriety were indeed associated with accessing medical care (e.g., through substance use treatment or prison healthcare), as well as increased concern for personal health, self-care intentions, optimism, more stable housing, increased access to employment, and access to supportive social networks. But participants also reported that during times of sobriety, their perceived HIV risk is much lower, making them less interested in PrEP. Even participants with very recent sex work (e.g., in the past few days) emphasized that they planned to stop, and that their immediate HIV risk was therefore low.

INT131-MSW: I'm trying to change my life and fix it so, hopefully from here on, you know, here out, there won't be a problem anymore ... Whenever I get away from the situation that I'm in now, I wouldn't need [PrEP].... I'm in the process right now, literally, like as of maybe yesterday or today, of being done and changing this life.

A few participants also worried that taking PrEP could encourage relapse by insulating them from HIV risks associated with sex work. For these participants, PrEP seemed not only unnecessary, but actively harmful to their recovery.

INT135-MSW: I don't want an excuse to uh make it more convenient for me to, to get high, you know what I mean. I don't wanna get high no more. I'm at the end of my rope.

Although these fears were not universal, they suggest that promoting PrEP to male sex workers during times of greater sobriety may require different messaging, compared to promotion during times of greater risk.

“Seasons of Risk” Due to Non-Transactional Sex

Compared to the MSW subgroup, MSM who did not engage in transactional sex were more likely to report that their HIV risk was stable or consistent over time.

INT156-MSM: [My risk is] probably fairly consistent... I've been doing pretty much the same thing for the past two years.... [My risk is] medium ... because I do have a lot of sexual partners and I don't always use a condom.

Although risk was *more likely* to be consistent among MSM who were not sex workers, there were nonetheless fluctuations in risk. The most frequently mentioned cause of cyclical changes was seasonal variation. Many participants reported having more sex during the summer months and holidays, when they were more likely to travel, visit entertainment venues, and meet new partners. These experiences directly informed changes in risk perception, which affected willingness to use PrEP.

INT112-MSM: Um I think during the summertime I'm, I'm more of a higher risk.... I go up to [an MSM-friendly tourism destination] a lot, and that's kinda crazy... And you know the heat of the moment sometimes so to speak—I might, and I have actually, um, been at risk....

INT148-MSM: Summertime seems to bring out, I'm out more... I'm out and about doing things. There's parties, you know, things I go to.... The opportunities arise—fueled by the alcohol, so ... I'll create my own spring break right here.

Interviewer: So what would you say your risk for HIV is right now? Is it zero, low, medium, high? INT154-MSM: I can say it's uh, it's, it's zero, but the holidays are coming and you never know.... I wanted to use the word vulnerable because it's near Christmas... I know it's possible that I'm gonna see people. Go to a party and have someone you can talk to. You never know.

Although seasonal variation was the principal source of temporal changes in risk, risks of non-transactional sex also fluctuated due to changes in partnerships, passing through self-described developmental “stages” of sexual behavior, sex or drug addiction, or incarceration. Episodic risks were often described as less predictable, compared to seasonal, holiday-related, or travel-associated risks. Participants often said that they would have wanted PrEP during times of higher risk, but that these risks had since subsided. But although addiction and incarceration may pose PrEP access barriers, these issues were rarer in the MSM sample compared to the MSWs; we saw little evidence of an access-interest paradox among MSM who did not engage in transactional sex.

INT112-MSM: I feel like I've been acting out [by engaging in higher-risk behavior] I might just be looking for love in all the wrong places so to speak... or if I'm just looking for a, an outlet to um escape. Escape in general you know. Something else that might be bothering me or, um, reality, whatever, whatever it might be.

INT115-MSM: I think like when I'm in um, when I'm in emotional pain like I will turn to barebacking sex.... I'll turn to like, uh, things like cocaine sometimes.... I lost my job and so um I, I was feeling down on my luck, you know, and so I said, well, I need to feel better.... When I was on coke like I felt um more relaxed about you know condom use and that sorta thing.... It'll last maybe a week tops... maybe like once a month.

INT119-MSM: When I first came out, actually I was, oh my God [laughter], I was really like testing the waters like, really like sexually, I mean so sexually active

I was really just trying this, that and the other. Now ten years later I still have a sex life, but it's not to the [same] extent [My] amount of sex and the amount of different partners actually decreased... Back then ... I was versatile.... Now I'm more of a top ten years later and that also plays a role.

Seasonal changes in risk thus had many different causes—ranging from vacations, to partnership changes, to addiction or incarceration—and the predictability of these changes varied, which has implications for PrEP dosing and uptake. Comments on developmental stages of sexual activity also suggest the need for a broader life-course perspective on PrEP use, accommodating shifts in both risk and PrEP interest over long periods of time.

Episodic Risks Due to Non-Transactional Sex

Both MSM and MSWs also described episodic risks: isolated events that were often mediated by partnership dynamics or situational factors like alcohol use, substance use, or forgetting to use condoms. These events differed from cyclical fluctuations because they were perceived as one-time events or mistakes. Men in both groups reported episodic risks due to non-transactional sex.

FG131-MSM: Sometimes when I have too much to drink, you put yourself in that situation, you wake up that next morning saying damn it [bangs table] FG131], what did you do? And, you know, you got in the heat of the moment and you didn't have a condom but you still did what you had to do. [PrEP] would really be like an extra peace of mind, well at least I know I can't catch [HIV].... FG128-MSM: Oh, it's happened to everyone in their life... FG131-MSM: For me it doesn't even have to be a holiday [laughs]. FG130-MSM: Yeah, every few months.... FG133-MSW: At least you know [if] you had that pill [PrEP], at least you know you're not gonna catch [HIV].

We did not probe the frequency with which episodic risks occurred across the sample, but reports of “one-off” or “slip-up” risk events were common throughout both subgroups. Depending on the frequency and (un)predictability of such events, post-exposure prophylaxis (PEP) may be a useful complement or alternative to PrEP implementation.

Preferences for Continuous PrEP Use for Non-Transactional Sex Risks

Several men in the MSM sample preferred to use PrEP on a seasonal basis, rather than continuously, because their risks were primarily concentrated in the summer. But unlike the MSW subgroup, we found that many other MSM were more interested in continuous PrEP use across both low-risk and high-risk times. When we asked why they would prefer continuous use, many men in this group were concerned about unpredictable, episodic risk events with romantic and casual partners. MSM participants who preferred continuous use also worried about the time necessary for PrEP to build in their bloodstream, and some said that they would not want to wait for PrEP to become effective if they needed it for off-season use.

Interviewer: If you started taking PrEP, would you take it all year round or would you only take it during the [summer] times when you thought you might be risky?
INT112-MSM: No, I would take it all year round... I might get lucky.... Because

you never know... and I wouldn't want the um, the buildup [of PrEP], or whatever you wanna call it, to be diminished and put myself in a higher risk. [That would] defeat the whole purpose of taking it.

Some men in our MSW sample were also interested in continuous use, but this was comparatively rarer, as the access-interest paradox would suggest. Because many MSWs in our sample based their risk perceptions primarily on transactional sex, any non-transactional, episodic risks may have had lower salience for this group, making them less interested in continuous PrEP use during low-risk times.

Discussion

This two-stage qualitative study found narrative evidence of the link between perceived HIV risk and willingness to use PrEP among MSWs and other MSM, which echoes the findings of prior studies (Peng et al., 2017). Although this finding was not universal, even across our subject pool, high perceived risk was often necessary for the perceived benefits of PrEP to outweigh downsides like side effects or financial cost.

Of additional interest for this analysis was whether temporal changes in sexual risk behavior may shape perceived HIV risk and willingness to use PrEP. We found evidence of these links in both the MSW and MSM groups. Among MSWs, cyclical changes in risk responded to fluctuations in addiction severity, which gave rise to the “access-interest paradox.” Periods of intense addiction hampered participants’ access to social and economic resources, which then drove increased transactional sex—primarily condomless sex, including both oral and anal sex—for survival and drug use needs. Increased sex work led to greater interest in PrEP, but due to scarce resources, unemployment, lack of insurance, homelessness, and addiction severity, participants reported significant barriers to PrEP access during these times. During times of *reduced* drug use and transactional sex, participants had greater access to financial and social resources that would enable PrEP uptake. At these times, however, they had less interest in using PrEP for prevention. Many were in primary partnerships, most often with female partners, and believed their HIV risk was low when they were not participating in sex work; some also actively worried that using PrEP during a low-risk time could facilitate a return to sex work.

Among MSM who did not engage in sex work, temporal fluctuations in perceived HIV risk were generally unrelated to PrEP access. Like prior studies, we found that many variations corresponded with holidays, vacations, and seasonal changes in social activities. Participants also described temporal changes due to partnership dynamics, developmental stages or “phases” of risk, and episodic risks seen as isolated events. Prior studies with US MSM have suggested that men may be more accurate in predicting days of *no sex* compared to days when they have sex (Parsons, Rendina, Grov, Ventuneac, & Mustanski, 2015), and men in our study retrospectively reported that many episodes of risk were unforeseen. MSM in our study were often willing to take PrEP continuously during both low-risk and high-risk periods, particularly to guard against these unpredictable risks.

Our findings align with prior research, which has described “seasonal” risk (and correspondingly seasonal PrEP interest) among MSM due to partnership changes, substance

use, vacations and holidays, and summer social activities (Carlo Hojilla et al., 2016; Elsesser et al., 2016). We also join prior studies in suggesting that seasonal PrEP use may be acceptable to MSM and other populations with temporal fluctuations in risk (Cremin et al., 2015; Elsesser et al., 2016; Falcao et al., 2017). Our focus on temporal changes also follows prior modeling research considering brief periods of high-risk behavior linked to changes in drug use or partnership status (Alam et al., 2013; Zhang et al., 2012). We also expand on prior research documenting variability of risk behavior over time in MSM populations (Pines et al., 2014; Rendina et al., 2013; Volk et al., 2012), and we extend this focus to the MSW population as well. Like previous studies of MSWs in this area of the US, we document HIV risk and service needs arising from transactional sex, non-transactional sex, and injection drug use, and we echo the need for comprehensive services for this group (Landers et al., 2014).

Our data have important implications for PrEP delivery with MSWs. Given the inability of most participants to use condoms for either insertive or receptive sex with clients, PrEP would be a transformative addition to current risk-reduction practices, which generally consist of trying to avoid clients suspected of having HIV. Intensive outreach and financial support are needed to deliver PrEP to MSWs during times of heavy substance use, although these efforts may benefit from men's increased interest in PrEP. Models for outreach services may include in-person assistance navigating health systems (e.g., applying for health insurance, attending appointments), as well as peer-to-peer outreach (which may be acceptable, despite limitations of these types of interventions) (Geibel, King'ola, Temmerman, & Luchters, 2012; Landers et al., 2014; McCamish, Storer, & Carl, 2000; Reza-Paul et al., 2012; Ziersch, Gaffney, & Tomlinson, 2000). Because MSWs experience housing instability during cycles of risk, they may also need physical spaces to store and access medications, such as shelters or drop-in centers. Our findings may also raise concerns about medication diversion, which has been observed among HIV-positive MSM who engage in sex work in other settings (Kurtz, Buttram, & Surratt, 2014). PrEP delivery during high-risk times should also encompass settings where MSWs are likely to obtain healthcare, such as emergency rooms, correctional institutions, and homeless clinics (Underhill et al., 2014), as well as venues used for sex work, drug purchasing, and drug consumption. MSWs in our sample reported an inability or unwillingness to pay for PrEP during high-risk times; in order for PrEP to be feasible, this group may need help accessing medication assistance programs, free clinic visits, and other sources of financial support. We echo the suggestions of using economic incentives for participation in HIV risk-reduction activities, community-level anti-stigma interventions, comprehensive medical care, and services to address related care needs such as homelessness, legal needs, and substance use (Baral et al., 2015).

These findings also reflect psychosocial barriers to PrEP uptake among MSWs, such as HIV fatalism and deprioritization of personal health. Practitioners may address these barriers through strategies like motivational interviewing or brief interventions, which may be acceptable to MSWs (Williams, Bowen, Timpson, Ross, & Atkinson, 2006). PrEP would ideally be part of a comprehensive healthcare package, delivered in conjunction with substance use treatment, mental health services, primary care, and management of chronic conditions (Underhill et al., 2014). But where comprehensive care is not feasible, referrals to free treatment for substance use or mental health may build MSWs' capacity to access PrEP.

Research should also explore delivering PrEP in combination with post-exposure prophylaxis (PEP) after sex work reentry. MSWs who relapsed and reentered sex work reported shame, hopelessness, and a sense of losing control over HIV risk. Offering MSWs PEP after an unplanned exposure may help intervene in these dynamics, with a transition to PrEP for the duration of the higher-risk cycle.

During cycles of low risk and greater sobriety, MSWs may be less interested in PrEP, and many men in this study believed their risks were low with romantic and casual, non-transactional partners. But a few suggested that they would want to use PrEP continuously to guard against HIV infection in the event of a relapse, and many more noted that relapses are unpredictable. MSWs in low-risk cycles may find PrEP more acceptable if they consider possible recurrences of external factors that drive relapse (e.g., job loss or partnership changes), or if they identify the potential for HIV risk through non-transactional sex. MSWs in our sample reported engagement with healthcare and outreach services during low-risk times, including detox, substance use treatment, and 12-step support programs, and promoting PrEP in these venues may be helpful. Practitioners should also be aware of the potential worry among substance-using MSWs that using PrEP will reduce the psychological barriers to relapse. There is no evidence yet of this phenomenon, and providers should discuss this concern with PrEP users as part of initial and ongoing consultation.

Our study also has implications for PrEP implementation among MSM who do not engage in transactional sex. There is a greater need for research on uptake and implementation of seasonal PrEP, “epi-PrEP” (short-term episodic PrEP) and PrEP discontinuation or suspension over time (Elsesser et al., 2016). Scholarship in this area has noted that individual needs for PrEP may be intermittent or temporary, and the CDC guidelines for PrEP implementation note that patients may discontinue PrEP due to personal choice or “changed life situations resulting in lowered risk” (CDC, 2014). Where seasonal PrEP responds to men’s needs, providers should work with men to identify relevant usage and suspension periods. Seasonal PrEP would differ from on-demand or event-driven PrEP; while these dosing regimens rely on continuous use over time (on a dosing schedule less frequent than daily use) (Molina et al., 2015), short-term or seasonal use of daily oral PrEP could cover risk fluctuations lasting several weeks or months, followed by suspension. Our qualitative findings suggest that MSM perceive these risk cycles and may welcome the opportunity to use PrEP during these times, even if they ordinarily consider their risk to be too low to justify PrEP use.

Separately, MSM in our sample also reported unpredictable (non-seasonal) risk episodes with some frequency, which may benefit from PEP use or continuous PrEP use over time. Practitioners might assist PrEP decision-making by helping MSM patients to consider risks based not only on recent behavior, but also on past experiences with unpredictable risk occasions, and the possibility that unpredictable risks may arise in the future. Long-term providers might also encourage MSM patients to reconsider their PrEP preferences at multiple clinical visits over time, to accommodate temporal variations.

The primary strength of this study is our access to a hard-to-reach population of street-based male sex workers in the US, and the opportunity to compare two samples of higher-risk MSM based on engagement in transactional sex. Our sample of street-based sex workers was sizeable, and the in-depth nature of our findings provides a nuanced view of PrEP acceptability for this group. Our work expands on prior quantitative studies of episodic and cyclical risk behavior among MSM and MSWs, and we identify linkages between temporal changes in risk behavior, HIV risk perceptions, and PrEP acceptability. Our two-stage approach of focus groups and individual interviews allowed us to identify fluctuating risk as a central theme in the focus group stage, and then to probe specifically for data on risk fluctuations in the individual interviews.

Our methods also have limitations. We collected data at one point in time for each participant, so we did not observe actual temporal fluctuations in risk, risk perceptions, or PrEP acceptability. All data on risk behavior were self-reported, qualitative, and retrospective, and the study was not designed to detect correspondence (or lack thereof) between participants' *perceived* and *actual* risk. Given the expansion of PrEP uptake, changes in the PrEP evidence base, and FDA approval in 2012, the two stages of the study took place in different contexts, which may have affected overall willingness to use PrEP. As with all qualitative studies, our findings may lack generalizability to other MSM, MSWs, and other communities generally, although the broad questions of temporal fluctuations in risk, perceived risk, and PrEP acceptability may be widely relevant. The demographic characteristics, epidemiological settings, clients, and practices of male sex workers vary widely, as do definitions of "sex work" (Baral et al., 2015; Minichiello & Scott, 2014; Minichiello, Scott, & Callander, 2015). Data on street-based sex workers may have limited applicability to other populations of male sex workers, such as those who meet clients online or in brothels (Mimiaga, Reisner, Tinsley, Mayer, & Safren, 2009; Minichiello et al., 2015). Our sample was primarily white and non-Latino; participants often did not identify themselves as gay or bisexual; and the MSM sample was older, more likely to be disabled or unemployed, and had a lower incomes compared to other MSM populations and previous PrEP acceptability research. Rhode Island's HIV epidemic and policy setting may differ from that of other states and the US as a whole. The MSW and MSM subgroups also reflect many demographic and behavioral differences, as described in Table 1, which may shape both involvement in sex work and the HIV risk perceptions and PrEP use preferences reported here. Enrollment of a small number of focus group participants in the individual interview portion of this study means that we have fewer than 94 unique individuals, but this was an unavoidable consequence of anonymity in our interview phase, which enabled in-depth discussions about substance use and sex work.

As PrEP use becomes more widespread, we encourage further quantitative and longitudinal research to consider the correspondence between perceived HIV risk, actual risk, PrEP interest, and use over time. Other research priorities arising from this work include further exploring PrEP acceptability among populations experiencing substance use disorders; evaluating strategies for addressing the access-interest paradox in PrEP implementation for MSWs; and identifying ways to improve the assessment of risk behavior and the prediction of future risk during PrEP consultations in clinical care. At present, PrEP effectiveness trials have investigated daily use, on-demand and event-driven use, and twice-weekly dosing with

post-sex boosters (HIV Prevention Trials Network, 2017; Sivay et al., 2017). Along with several other studies, we have here identified a potential market for cyclical or seasonal PrEP use. If effective, seasonal PrEP may be another useful addition to the biomedical HIV prevention toolkit.

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References

- Alam SJ, Zhang X, Romero-Severson EO, Henry C, Zhong L, Volz EM, Koopman JS. Detectable signals of episodic risk effects on acute HIV transmission: strategies for analyzing transmission systems using genetic data. *Epidemics*. 2013; 5(1):44–55. [PubMed: 23438430]
- Amico KR, Stirratt MJ. Adherence to preexposure prophylaxis: current, emerging, and anticipated bases of evidence. *Clinical Infectious Diseases*. 2014; 59(Suppl 1):S55–60. [PubMed: 24926036]
- Anderson PL, Glidden DV, Liu A, Buchbinder S, Lama JR, Guanira JV, Grant RM. Emtricitabine-tenofovir concentrations and pre-exposure prophylaxis efficacy in men who have sex with men. *Science Translational Medicine*. 2012; 4(151):151ra125.
- Associated Press. Rhode Island: New prostitution law; The New York Times. 2009. Nov 3, A17 Retrieved from http://www.nytimes.com/2009/11/04/us/04brfs-NEWPROSTITUT_BRF.html?_r=0
- Baeten JM, Donnell D, Ndase P, Mugo NR, Campbell JD, Wangisi J, Partners Pr, E. P. S. T. Antiretroviral prophylaxis for HIV prevention in heterosexual men and women. *New England Journal of Medicine*. 2012; 367(5):399–410. [PubMed: 22784037]
- Baral SD, Friedman MR, Geibel S, Rebe K, Bozhinov B, Diouf D, Cáceres CF. Male sex workers: Practices, contexts, and vulnerabilities for HIV acquisition and transmission. *Lancet*. 2015; 385:260–273. [PubMed: 25059939]
- Braun V, Clarke V. Using thematic analysis in psychology. *Qualitative Research in Psychology*. 2005; 3(2):77–101.
- Carlo Hojilla J, Koester KA, Cohen SE, Buchbinder S, Ladzekpo D, Matheson T, Liu AY. Sexual behavior, risk compensation, and HIV prevention strategies among participants in the San Francisco PrEP demonstration project: a qualitative analysis of counseling notes. *AIDS and Behavior*. 2016; 20(7):1461–1469. [PubMed: 25835463]
- CDC. Preexposure Prophylaxis for the Prevention of HIV Infection in the United States 2014: A Clinical Practice Guideline. 2014. Retrieved from <http://www.cdc.gov/hiv/pdf/PrEPguidelines2014.pdf>
- CDC. HIV among gay and bisexual men. Atlanta, GA: 2017. Retrieved from: <https://www.cdc.gov/hiv/group/msm/index.html>
- Chakrapani V, Newman PA, Shunmugam M, Mengle S, Varghese J, Nelson R, Bharat S. Acceptability of HIV pre-exposure prophylaxis (PrEP) and implementation challenges among men who have sex with men in India: a qualitative investigation. *AIDS Patient Care and STDs*. 2015; 29(10):569–577. [PubMed: 26348459]
- Choopanya K, Martin M, Suntharasamai P, Sangkum U, Mock PA, Leethochawalit M, Vanichseni S. Antiretroviral prophylaxis for HIV infection in injecting drug users in Bangkok, Thailand (the

- Bangkok Tenofovir Study): a randomised, double-blind, placebo-controlled phase 3 trial. *Lancet*. 2013; 381(9883):2083–2090. [PubMed: 23769234]
- Cohan D, Lutnick A, Davidson P, Cloniger C, Herlyn A, Breyer J, Klausner J. Sex worker health: San Francisco style. *Sexually Transmitted Infections*. 2006; 82(5):418–422. [PubMed: 16854996]
- Cohen SE, Vittinghoff E, Bacon O, Doblecki-Lewis S, Postle BS, Feaster DJ, Liu Y. High interest in preexposure prophylaxis among men who have sex with men at risk for HIV infection: baseline data from the US PrEP demonstration project. *Journal of Acquired Immune Deficiency Syndromes*. 2015; 68(4):439–448. [PubMed: 25501614]
- Cremin I, Morales F, Jewell BL, O'Reilly KR, Hallett TB. Seasonal PrEP for partners of migrant miners in southern Mozambique: a highly focused PrEP intervention. *Journal of the International AIDS Society*. 2015; 18(4 Suppl 3):19946. [PubMed: 26198340]
- Denzin NK, Li YS. Introduction: The discipline and practice of qualitative research. In: Denzin NK, Li YS, editors *The SAGE Handbook of Qualitative Research*. 4. 2011. 1–20.
- Donnell D, Baeten JM, Bumpus NN, Brantley J, Bangsberg DR, Haberer JE, Celum C. HIV Protective Efficacy and Correlates of Tenofovir Blood Concentrations in a Clinical Trial of PrEP for HIV Prevention. *Journal of Acquired Immune Deficiency Syndromes*. 2014
- Eaton LA, Driffin DD, Bauermeister J, Smith H, Conway-Washington C. Minimal awareness and stalled uptake of pre-exposure prophylaxis (PrEP) among at risk, HIV-negative, black men who have sex with men. *AIDS Patient Care and STDs*. 2015; 29(8):423–429. [PubMed: 26083143]
- Elsesser SA, Oldenburg CE, Biello KB, Mimiaga MJ, Safren SA, Egan JE, Mayer KH. Seasons of Risk: Anticipated behavior on vacation and interest in episodic antiretroviral pre-exposure prophylaxis (PrEP) among a large national sample of U.S. men who have sex with men (MSM). *AIDS and Behavior*. 2016; 20(7):1400–1407. [PubMed: 26538056]
- Escudero DJ, Kerr T, Wood E, Nguyen P, Lurie MN, Sued O, Marshall BD. Acceptability of HIV pre-exposure prophylaxis (PREP) among people who inject drugs (PWID) in a Canadian setting. *AIDS and Behavior*. 2014
- Falcao J, Ahoua L, Zerbe A, di Mattei P, Baggaley R, Chivurre V, El-Sadr W. Willingness to use short-term oral pre-exposure prophylaxis (PrEP) by migrant miners and female partners of migrant miners in Mozambique. *Culture Health & Sexuality*. 2017:1–15.
- FDA. Truvada for PrEP fact sheet: Ensuring safe and proper use. 2012
- Gallagher T, Link L, Ramos M, Bottger E, Aberg J, Daskalakis D. Perception of HIV risk and candidacy for pre-exposure prophylaxis among men who have sex with men testing for HIV at commercial sex venues in New York City. *LGBT Health*. 2014; 1(3)
- Geibel S, King'ola N, Temmerman M, Luchters S. The impact of peer outreach on HIV knowledge and prevention behaviours of male sex workers in Mombasa, Kenya. *Sexually Transmitted Infections*. 2012; 88(5):357–362. [PubMed: 22332149]
- Gilmore HJ, Liu A, Koester KA, Amico KR, McMahan V, Goicochea P, Grant R. Participant experiences and facilitators and barriers to pill use among men who have sex with men in the iPrEx pre-exposure prophylaxis trial in San Francisco. *AIDS Patient Care and STDs*. 2013; 27(10):560–566. [PubMed: 24093809]
- Golub SA, Gamarel KE, Rendina HJ, Surace A, Lelutiu-Weinberger CL. From efficacy to effectiveness: facilitators and barriers to PrEP acceptability and motivations for adherence among MSM and transgender women in New York City. *AIDS Patient Care and STDs*. 2013; 27(4):248–254. [PubMed: 23565928]
- Grant RM, Anderson PL, McMahan V, Liu A, Amico KR, Mehrotra M, Glidden DV. Uptake of pre-exposure prophylaxis, sexual practices, and HIV incidence in men and transgender women who have sex with men: a cohort study. *Lancet Infectious Diseases*. 2014; 14(9):820–829. [PubMed: 25065857]
- Grant RM, Lama JR, Anderson PL, McMahan V, Liu AY, Vargas L, Glidden DV. Preexposure chemoprophylaxis for HIV prevention in men who have sex with men. *New England Journal of Medicine*. 2010; 363:2587–2599. [PubMed: 21091279]
- HIV Prevention Trials Network. HPTN 067: A phase II, randomized, open-label, pharmacokinetic and behavioral study of the use of intermittent oral emtricitabine/tenofovir disoproxil fumarate pre-exposure prophylaxis (PrEP). 2017. Retrieved from <https://www.hptn.org/research/studies/hptn067>

- Holt M. HIV pre-exposure prophylaxis and treatment as prevention: A review of awareness and acceptability among men who have sex with men in the Asia-Pacific region and the Americas. *Sexual Health*. 2014; 11(2):166–170. [PubMed: 23866853]
- King HL, Keller SB, Giancola MA, Rodriguez DA, Chau JJ, Young JA, Smith DM. Pre-exposure prophylaxis accessibility research and evaluation (PrEPARE Study). *AIDS and Behavior*. 2014; 18(9):1722–1725. [PubMed: 25017425]
- Krakower DS, Mimiaga MJ, Rosenberger JG, Novak DS, Mitty JA, White JM, Mayer KH. Limited awareness and low immediate uptake of pre-exposure prophylaxis among men who have sex with men using an internet social networking site. *Public Library of Science ONE*. 2012; 7(3):e33119. [PubMed: 22470438]
- Kurtz SP, Buttram ME, Surratt HL. Vulnerable infected populations and street markets for ARVs: Potential implications for PrEP rollout in the USA. *AIDS Care*. 2014; 26(4):411–415. [PubMed: 24033118]
- Landers S, Closson EF, Oldenburg CE, Holcomb R, Spurlock S, Mimiaga MJ. HIV prevention needs among street-based male sex workers in Providence, Rhode Island. *American Journal of Public Health*. 2014; 104(11):e100–102.
- Liu A, Cohen S, Follansbee S, Cohan D, Weber S, Sachdev D, Buchbinder S. Early experiences implementing pre-exposure prophylaxis (PrEP) for HIV prevention in San Francisco. *Public Library of Science Medicine*. 2014; 11(3):e1001613. [PubMed: 24595035]
- Liu AY, Vittinghoff E, Chillag K, Mayer K, Thompson M, Grohskopf L, Buchbinder SP. Sexual risk behavior among HIV-uninfected men who have sex with men participating in a tenofovir preexposure prophylaxis randomized trial in the United States. *Journal of Acquired Immune Deficiency Syndromes*. 2013; 64(1):87–94. [PubMed: 23481668]
- Marcus JL, Glidden DV, Mayer KH, Liu AY, Buchbinder SP, Amico KR, Grant RM. No evidence of sexual risk compensation in the iPrEx trial of daily oral HIV preexposure prophylaxis. *Public Library of Science ONE*. 2013; 8(12):e81997. [PubMed: 24367497]
- McCamish M, Storer G, Carl G. Refocusing HIV / AIDS interventions in Thailand: the case for male sex workers and other homosexually active men. *Culture Health & Sexuality*. 2000; 2(2):167–182.
- McCormack S, Dunn DT, Desai M, Dolling DI, Gafos M, Gilson R, Gill ON. Pre-exposure prophylaxis to prevent the acquisition of HIV-1 infection (PROUD): effectiveness results from the pilot phase of a pragmatic open-label randomised trial. *Lancet*. 2016; 387(10013):53–60. [PubMed: 26364263]
- McKinnon LR, Gakii G, Juno JA, Izulla P, Munyao J, Ireri N, Kimani J. High HIV risk in a cohort of male sex workers from Nairobi, Kenya. *Sexually Transmitted Infections*. 2014; 90(3):237–242. [PubMed: 24337729]
- Mimiaga MJ, Reisner SL, Tinsley JP, Mayer KH, Safren SA. Street workers and internet escorts: Contextual and psychosocial factors surrounding HIV risk behavior among men who engage in sex work with other men. *Journal of Urban Health*. 2009; 86(1):54–66. [PubMed: 18780186]
- Minichiello V, Scott J. *Male Sex Work and Society*. New York, NY: Harrington Park Press; 2014.
- Minichiello V, Scott J, Callander D. A new public health context to understand male sex work. *BMC Public Health*. 2015; 15:282. [PubMed: 25879716]
- Molina JM, Capitant C, Spire B, Pialoux G, Cotte L, Charreau I, Group AIS. On-Demand Preexposure Prophylaxis in Men at High Risk for HIV-1 Infection. *New England Journal of Medicine*. 2015; 373(23):2237–2246. [PubMed: 26624850]
- Mugwanya KK, Donnell D, Celum C, Thomas KK, Ndase P, Mugo N, Baeten JM. for the Partners PrEP Study Team. Sexual behavior of heterosexual men and women receiving antiretroviral pre-exposure prophylaxis for HIV prevention: a longitudinal analysis. *Lancet Infectious Diseases*. 2013; 13(2):1021–1028. [PubMed: 24139639]
- Mustanski B. The influence of state and trait affect on HIV risk behaviors: a daily diary study of MSM. *Health Psychology*. 2007; 26(5):618–626. [PubMed: 17845113]
- Namey E, Agot K, Ahmed K, Odhiambo J, Skhosana J, Guest G, Corneli A. When and why women might suspend PrEP use according to perceived seasons of risk: implications for PrEP-specific risk-reduction counselling. *Culture Health & Sexuality*. 2016; 18(9):1081–1091.
- National Drug Intelligence Center. Rhode Island Drug Threat Assessment. 2003

- Parsons JT, Rendina HJ, Grov C, Ventuneac A, Mustanski B. Accuracy of highly sexually active gay and bisexual men's predictions of their daily likelihood of anal sex and its relevance for intermittent event-driven HIV pre-exposure prophylaxis. *Journal of Acquired Immune Deficiency Syndromes*. 2015; 68(4):449–455. [PubMed: 25559594]
- Peng P, Su S, Fairley CK, Chu M, Jiang S, Zhuang X, Zhang L. A Global Estimate of the Acceptability of Pre-exposure Prophylaxis for HIV Among Men Who have Sex with Men: A Systematic Review and Meta-analysis. *AIDS and Behavior*. 2017
- Pines HA, Gorbach PM, Weiss RE, Shoptaw S, Landovitz RJ, Javanbakht M, Plankey M. Sexual risk trajectories among MSM in the United States: implications for pre-exposure prophylaxis delivery. *Journal of Acquired Immune Deficiency Syndromes*. 2014; 65(5):579–586. [PubMed: 24378726]
- Ponterotto JG. Qualitative research in counseling psychology: A primer on research paradigms and philosophy of science. *Journal of Counseling Psychology*. 2005; 52(2):126–136.
- QSR International. NVivo 9. Doncaster, Australia: 2012.
- Rendina J, Ventuneac A, Grov C, Mustanski B, Parsons J. Accuracy in Predicting Daily Anal Intercourse with Casual Partners and its Relevance for Intermittent PrEP: An Online Diary Analysis of Highly Sexually Active Gay and Bisexual Men; Paper presented at the 8th International Conference on HIV Treatment and Prevention Adherence; Miami, FL. 2013.
- Restar AJ, Tocco JU, Mantell JE, Lafort Y, Gichangi P, Masvawure TB, Sandfort TGM. Perspectives on HIV pre- and post-exposure prophylaxes (PrEP and PEP) among female and male sex workers in Mombasa, Kenya: implications for integrating biomedical prevention into sexual health services. *AIDS Education and Prevention*. 2017; 29(2):141–153. [PubMed: 28467163]
- Reza-Paul S, Lorway R, O'Brien N, Lazarus L, Jain J, Bhagya M, Steen R. Sex worker-led structural interventions in India: a case study on addressing violence in HIV prevention through the Ashodaya Samithi collective in Mysore. *Indian Journal of Medical Research*. 2012; 135:98–106. [PubMed: 22382190]
- Sivay MV, Li M, Piwowar-Manning E, Zhang Y, Hudelson SE, Marzinke MA, Team HAS. Characterization of HIV seroconverters in a TDF/FTC PrEP study: HPTN 067/ADAPT. *Journal of Acquired Immune Deficiency Syndromes*. 2017; 75(3):271–279. [PubMed: 28328548]
- Thigpen MC, Kebaabetswe PM, Paxton LA, Smith DK, Rose CE, Segolodi TM, Grp TDFS. Antiretroviral preexposure prophylaxis for heterosexual HIV transmission in Botswana. *New England Journal of Medicine*. 2012; 367(5):423–434. [PubMed: 22784038]
- Underhill K, Morrow K, Collieran C, Holcomb R, Calabrese SK, Operario D, Mayer KH. Access to healthcare, HIV/STI testing, and preferred pre-exposure prophylaxis providers among men who have sex with men and men who engage in street-based sex work in the US. *Public Library of Science ONE*. 2014; 9(11):e112425. [PubMed: 25386746]
- Underhill K, Morrow K, Collieran C, Holcomb R, Operario D, Calabrese SK, Mayer KH. A qualitative study of medical mistrust, perceived discrimination, and risk behavior disclosure to clinicians by US male sex workers and other men who have sex with men: implications for pre-exposure prophylaxis implementation. *Journal of Urban Health*. 2015; 92(4):667–686. [PubMed: 25930083]
- Van der Elst EM, Mbogua J, Operario D, Mutua G, Kuo C, Mugo P, Sanders EJ. High acceptability of HIV pre-exposure prophylaxis but challenges in adherence and use: qualitative insights from a phase I trial of intermittent and daily PrEP in at-risk populations in Kenya. *AIDS and Behavior*. 2013; 17(6):2162–2172. [PubMed: 23080358]
- Volk JE, Liu A, Vittinghoff E, Irvin R, Kroboth E, Krakower D, Buchbinder SP. Sexual frequency and planning among at-risk men who have sex with men in the United States: implications for event-based intermittent pre-exposure prophylaxis. *Journal of Acquired Immune Deficiency Syndromes*. 2012; 61(1):112–115. [PubMed: 22592590]
- Williams ML, Bowen AM, Timpson SC, Ross MW, Atkinson JS. HIV prevention and street-based male sex workers: An evaluation of brief interventions. *AIDS Education and Prevention*. 2006; 18(3):204–215. [PubMed: 16774463]
- Young I, McDaid L. How acceptable are antiretrovirals for the prevention of sexually transmitted HIV?: A review of research on the acceptability of oral pre-exposure prophylaxis and treatment as prevention. *AIDS and Behavior*. 2014; 18(2):195–216. [PubMed: 23897125]

- Zhang X, Zhong L, Romero-Severson E, Alam SJ, Henry CJ, Volz EM, Koopman JS. Episodic HIV risk behavior can greatly amplify HIV Prevalence and the fraction of transmissions from acute HIV infection. *Statistical Communications in Infectious Diseases*. 2012; 4(1)
- Ziersch A, Gaffney J, Tomlinson DR. STI prevention and the male sex industry in London: evaluating a pilot peer education programme. *Sexually Transmitted Infections*. 2000; 76(6):447–453. [PubMed: 11221127]

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Table 1

Demographic and Behavioral Characteristics (results also reported in Underhill et al., 2014)

	Number of FG Male Sex Workers (n=21)	Number of FG Other MSM (n=17)	Number of INT Male Sex Workers (n=31)	Number of INT Other MSM (n=25)
Median age (range)	38.5 (21–57)	39 (27–61)	32 (22–58)	33 (21–70)
Race				
White	17	12	24	19
African American	4	5	6	3
Native American	0	0	1	1
Asian	0	0	0	1
Refused	0	0	0	1
Hispanic or Latino *	2	2	3	6
Housing				
Homeless	4	0	9	1
Staying with friends/family	7	0	12	6
Renting or owns home/apt	10	17	10	18
Income <\$12,000 per year **	13	5	16	4
Employment				
Disabled	4	7	2	3
Unemployed	12	4	21	4
Full-time job	3	4	2	7
Part-time/seasonal job	2	2	6	7
Other	0	0	0	4
Health insurance				
None	11	5	21	8
Public insurance	8	7	4	9
Private insurance	2	5	6	8
Median total number of sex partners in past 6m (range)	13.5 (2–150)	10 (2–60)	9 (2–150)	10 (1–50)
Used drugs multiple times per week in past 6m	Did not collect data	Did not collect data	21	7
Injection drug use in the past 6m	8	1	16	1
Shared needles or works with others in the past 6m (among those who reported injection)	Did not collect data	Did not collect data	12 of 16	0 of 1
Willing to use PrEP				
Yes	10	9	20	12
Maybe	3	3	2	1

	Number of FG Male Sex Workers (n=21)	Number of FG Other MSM (n=17)	Number of INT Male Sex Workers (n=31)	Number of INT Other MSM (n=25)
No	8	5	9	12

FG = Focus Group. INT = Interview.

* Per NIH guidelines, we collected data on Hispanic/Latino ethnicity separately from race.

** The approximate Federal Poverty Line for an individual ranged from \$11,170 in 2012 to \$11,670 in 2014.