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The influence of relationship dynamics and sexual agreements on perceived partner support and benefit of PrEP use among same-sex male couples in the U.S.

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Abstract

Introduction: Use of Pre-exposure prophylaxis (PrEP) for HIV prevention by men who have sex with men (MSM) may be impacted by relationship dynamics. We assessed perceived partner support of PrEP use and benefit of PrEP by relationship characteristics among male couples.

Methods: Baseline data from a randomized control trial of video-based HIV counseling and testing among male couples in the U.S. were used in adjusted multilevel regression models to assess individual and dyadic characteristics.

Results: Among 659 participants, 73.3% thought their partner would be supportive of their PrEP use; 26.7% reported their partner would not support PrEP use, which was significantly associated with intimate partner violence (IPV) ($p=0.008$). Most (57.7%) did not believe PrEP would be beneficial to them or their partner. Couples with a sexual agreement allowing outside partners were significantly associated with higher perceived support of partners for PrEP ($p<0.001$) and benefit of PrEP use ($p<0.001$).

Conclusions: Perceived partner support of PrEP was high but perceived benefit of PrEP was low, both shaped by relationship dynamics that highlight the need for tailored dyadic interventions. The association between perceived PrEP support and IPV points to the need to integrate relationship contexts in HIV prevention programs.

Keywords

HIV; pre-exposure prophylaxis; male couples; relationship dynamics

INTRODUCTION

Pre-exposure prophylaxis (PrEP) use for HIV prevention among men who have sex with men (MSM) is a promising biomedical strategy for reducing HIV incidence (1–3). Awareness of and use of PrEP in the United States (U.S.) has been steadily increasing since multiple clinical trials found PrEP to have high efficacy in preventing HIV acquisition across different populations (2–6). According to data from 8,000 interviews across the U.S.

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collected by the Centers for Disease Control and Prevention (CDC) in 2017, 90% of gay and bisexual men at risk for HIV were aware of PrEP and 35% had used PrEP at some point (6). However, knowledge about PrEP remains lower in higher risk populations, and only about 10% of MSM with highest risk of HIV acquisition currently use PrEP, with high risk defined by the CDC as past 12 month sex with 1) HIV positive male partner or 2 or more male sex partners, and 2) condomless anal sex or a bacterial STI (6). Further, many MSM who initiate PrEP discontinue use over time for multiple reasons, including cost, insurance status, side effects and access (7–9).

Decisions by MSM to start or continue using PrEP are also influenced by their perceptions of risk, relationship dynamics, and simply not believing that PrEP is a relevant strategy for them (10–12). MSM in committed relationships have been found to perceive themselves to be at lower risk for HIV and are less likely to HIV test, including MSM in open non-monogamous relationships, although this is moderated by their sexual agreements (13). However, data show that approximately one- to two-thirds of HIV transmissions among MSM in the U.S. occur between primary sex partners (14). While sexual agreements that may or may not allow for sex with outside partners are common (15, 16), less is known about whether agreements are associated with greater discussions and support for PrEP use.

Multiple studies assessing PrEP intentions within sero-discordant male couples, where one partner is HIV positive and the other is HIV negative, have found that PrEP use attitudes and intentions are driven by relationship characteristics, viral suppression of the HIV positive partner and use of other preventions strategies (12, 17–19). PrEP use has been found to reduce anxiety about HIV risk within sero-discordant partnerships, and data from qualitative studies of HIV concordant negative male couples point to similar findings (12, 20). However, less work has been done to examine how male couples view PrEP in the context of relationship factors, including how sexual agreement and relationship characteristics influence attitudes and perceptions of PrEP use. Relationship dynamics within concordant negative couples are important, because they inform engagement in health behavior that can impact decisions to use PrEP (21, 22). These decisions may be based on how individuals perceive their partner will support them in using PrEP and how beneficial they may feel PrEP would be to themselves, their partner and their relationship in the context of sexual agreements, relationship quality, and trust and communication in the relationship.

Both positive relationship factors, such as trust and communication, and negative factors, including intimate partner violence (IPV), may inform how individuals perceive their partners support of HIV prevention. Couples that report higher levels of trust and communication may be able to better navigate discussion around PrEP use. Conversely, men who report IPV may be less likely to use or stay on PrEP (23). However, few studies have examined how relationship dynamics shape perceptions of PrEP use and partner support for using PrEP among male couples. Thus, using data from a cohort of male couples in the U.S., we sought to assess associations between relationship characteristics and how individuals perceive their partner’s support of PrEP use, and the perceived benefit of PrEP for the individual and their partner.

METHODS

Study Population

This study used baseline data from a randomized control trial (RCT) of male couples recruited across the U.S. between April 2016 and June 2017 to evaluate the efficacy of a video-based couples HIV counseling and testing intervention and the impact on couples' management of HIV risk and prevention (ClinicalTrials.gov Identifier: NCT02335138). The protocol for the RCT has been previously described (24). Briefly, couples were randomized to either receive 1–2 home-based HIV test kits (one for sero-discordant couples and two for concordant negative couples) to self-test and report results to a study website (control arm) or to receive 1–2 home-based HIV test kits to self-test during a video-based counseling session with study staff (experimental arm). Participants for each couple were eligible for participation in the trial if they 1) were 18 years of age or older, 2) cisgender men, 3) in a sexual relationship with each other for more than 6 months, 4) had not had an HIV test in the last 3 months, 5) did not report intimate partner violence (IPV) or coercion within the past 12 months, 6) were willing to receive rapid home HIV test kits, 7) had internet access, and 8) self-reported being concordant HIV negative or HIV sero-discordant. Participants were recruited through online advertisements on general social media websites and mobile apps specifically targeted to MSM. Men who clicked on the banner advertisement were taken to the study website and provided study information. Those interested in participating were directed to the study consent form followed by a short eligibility screening questionnaire. Eligible, consented participants were asked to provide their contact information and partner's email address during a registration process. Upon confirming eligibility, obtaining consent and completing registration for both partners, each participant was asked to separately complete the baseline questionnaire. Among 13,592 individuals that accessed the study's webpage, 2,926 (21.5%) completed the eligibility screener of which 862 (29.5%) met the inclusion criteria. Of these, 848 (98.4%) eligible individuals, comprising 484 couples, completed the baseline questionnaire. Data presented in this manuscript are restricted to the baseline questionnaire, which assessed history of IPV as part of the eligibility determination for participation in the RCT. Based on their responses to the baseline questionnaire, couples where one or both partners reported experiences or perpetration of IPV were not randomized, but their baseline questionnaires were retained for analysis. All partners received information on local and national resources related to IPV. The RCT was reviewed and approved by the University of Michigan Institutional Review Board and a Data Safety Monitoring Board.

Key Covariates and Measures

HIV status and PrEP eligibility.—For the present analysis, we included couples that self-reported being HIV seronegative and couples that reported being serodiscordant HIV status. Participants were identified as HIV uninfected if they reported HIV negative status and reported an HIV test within the past 3 years. Participants that did not know their status or reported a negative status on their last HIV testing more than 3 years ago were categorized as unknown HIV status. We adapted CDC clinical practice guidelines to define HIV uninfected/unknown status participants as eligible for PrEP using the following criteria: 1) HIV positive primary partner, 2) condomless anal sex (CAS) with primary partner of

unknown HIV status, 3) any CAS with non-primary partners, or 4) 3 or more anal sex partners in past 3 months (25).

Sexual agreement.—Participants were asked if they currently had an agreement regarding whether or not they can have sex with people outside of the partnership. Among those that affirmatively responded to having a sexual agreement, they were asked to select the type of sexual agreement, including both cannot have sex with outside partners, both can have sex with outside partners, both can have sex with outside partners with restrictions, or some other type of agreement. For this analysis, we assessed sexual agreement as a dichotomous measure for allowing sex with outside partners regardless of restrictions.

Relationship dynamics.—We used the Dyadic Trust Scale (DTS) developed by Larzelere, et al. to assess interpersonal trust in intimate relationships (26). The 8-item scale includes questions on how the participant feels their partner is trustworthy, considerate, sincere and fair. DTS has been tested and validated for sexual minority populations, including men in same-sex relationship (27). The Communal Coping scale measures HIV prevention efficacy within the dyad using 3 subscales: joint effort, planning and decision-making, and communication (28). Higher communal coping scores indicate higher efficacy to reduce the threat of HIV and was specifically developed for validity among sexual minority male dyads. For our analyses, we assessed each subscale as a separate measure for consideration in the presented models. Data from the present study show excellent internal reliability for both DTS (Cronbach's alpha=0.87) and the Communal Coping scale (Cronbach's alpha=0.92).

Intimate partner violence.—IPV was assessed using the Intimate Partner Violence for Gay and Bisexual Men (IPV-GBM) scale which includes 23-items measurements of physical and sexual IPV, monitoring behaviors, controlling behaviors, HIV-related IPV, and emotional IPV (29). We did not include the items for HIV-related IPV in this analysis, because they were primarily related to disclosure or lying about HIV status, and the study sample included only participants that had disclosed their HIV status within their relationship. We used IPV-GBM to measure both IPV victimization and perpetration by each participant. We found good reliability of the IPV-GBM scale in our study cohort for victimization (Cronbach's alpha=0.75) and perpetration (Cronbach's alpha=0.75).

Drug and alcohol use.—The baseline survey included multiple measures for recent use of non-prescription drugs and alcohol in the past 3 months. For the present study, we defined drug use as any non-prescription drugs used, regardless of frequency, in the past 3 months. We did not specify any specific drug type. For alcohol use, our analysis only included binge drinking, defined as 6 or more drinks on one occasion at least monthly in the past 3 months.

Sexual minority related stigma.—Anticipated stigma was measured using the 10-item Likert scale (1=strongly disagree and 5=strongly agree) developed by Liu, et al. that includes questions on perceived acceptance and attitudes of sexual minority individuals in different settings (30). The anticipated stigma scale had excellent reliability in our cohort (Cronbach's alpha=0.83).

Experienced stigma was measured using a 14-item Heterosexist Harassment, Rejection, and Discrimination Scale (HHRDS) that assesses past-year experiences of harrassment, rejection and discrimination based on sexual minority status (31). The HHRDS uses a 6 point Likert scale to measure frequency of experiences (1=never happened and 6=happened almost all of the time) and had excellent reliability in our cohort (Cronbach's alpha=0.91).

Sociodemographic characteristics.—We assessed individual characteristics, including age, race/ethnicity (non-Hispanic black/African American, Hispanic, non-Hispanic white, Asian/Pacific Islander, other/multiple), geographic region of residence in the U.S. (Northeast, Midwest, South, West), college education (yes/no for any college), and employed (yes/no for any employment, including full or part time). Dyadic characteristics included reporting being married (yes/no), median age difference between partners (in years), relationship length (less than 1 year, 1–2 years, 3–5 years, 6–9 years, 10 or more years). We also calculated dyad level measures for age difference between partners and whether couples reported different race/ethnicity (interracial, yes/no).

We assessed two outcomes for the present study: 1) perceived partner support of PrEP use, and 2) perceived benefit of PrEP within the relationship. Participants that had heard of but were not currently using PrEP were asked if they thought their partner would support them using PrEP. We dichotomously categorized the responses as "yes" and "no/don't know" for our analysis. Participants were also asked to identify reasons their partner would not support PrEP use. The same participants were asked if they thought PrEP would be beneficial for themselves, their partner, both of them, or neither of them. For this study, we assessed each response as a separate category and as a dichotomous variable for any benefit (individual, partner or both) and no benefit for either.

Statistical analysis

We calculated the distribution of individual and dyad level characteristics using frequency and proportions for discrete variables, and medians with interquartile range (IQR) for continuous measures. For knowledge and use of PrEP, we calculated proportions for study participants that did not report HIV positive status and for participants meeting the criteria for PrEP eligibility. For the presented models, we included couples where at least one partner was HIV negative/unknown status, knew about PrEP and was not currently using PrEP. To assess perceived support of partners for PrEP use, we calculated the proportion of all participants and PrEP eligible participants that reported their partner would support PrEP use. Among those that did not think their partner would support PrEP use, we calculated the proportion for each reason specified by the participant. To measure perceived benefit of PrEP within the partnership, we assessed the proportion of responses and calculated the discordance in perception of benefit between the individual and partner.

For both outcomes, we used a multilevel generalized linear mixed model for individual participants nested within dyads to assess individual, partner and dyad level factors associated with each outcome (perceived support of partner for PrEP use and perceived benefit of PrEP). Independent variables included in the final models were based on lowest AIC model fit and associations of individual variables with the outcomes. Models were

adjusted for both participant and partner sociodemographic characteristics, including age, race, level of education and employment, and adjusted odds ratios (adjOR) are presented with 95% confidence intervals (95%CI). We also explored a multinomial model for perceived benefit to include all categorical responses, but due to the small number of responses for benefit to self or partner, we restricted our analysis to the dichotomous measure of benefit (any vs. none). All analyses were conducted using SAS v.9.4 (SAS Institute, Cary, N.C.).

RESULTS

Among the 848 participants (424 couples) that completed the baseline questionnaire, we excluded participants that had never heard of PrEP (143/848, 16.9%), those currently using PrEP (19/848, 2.2%), those reporting HIV positive status (15/848, 1.8%), and participants that did not respond to questions about partner support of PrEP (67/848, 7.9%). The final sample included 659 participants, comprising one or more partners in a total of 384 couples for the present study.

. Individual participant and dyadic characteristics are shown in Table I. The median age of participants was 28 years (IQR 24–34 years), and most couples (214/384, 55.7%) were of similar age with a median age difference of 3 years (IQR 1–6 years). The majority were non-Hispanic white, and nearly two-thirds (243/384, 63.3%) of couples were same race/ethnicity. Most of the participants had completed at least some college (579/659, 87.9%), and most participants were employed full or part time (613/659, 93.0%). Over half (52.1%) of the couples had been in a relationship for less than two years, and over a quarter (111/384, 28.9%) were married. Over a third (138/384, 34.9%) reported concordant HIV negative, 174/384 (45.3%) of couples had at least one partner with unknown status, and 9/384 (2.3%) were known HIV serodiscordant. 113/659 (17.1%) of participants reported at least one outside partner, with a median of 2 (IQR 1–4) outside partners in the previous 3 months; nearly a quarter (94/384, 24.5%) of couples had a sexual agreement that allowed for sex partners outside of the relationship. Among participants that reported anal sex with an outside partner, 40/111 (36.0%) had an unknown HIV status, and 37/111 (33.6%) did not have a sexual agreement with their primary partner that allowed for sex partners outside of the relationship. Among all participants, 144/659 (21.9%) met the criteria for PrEP.

When asked to select reasons why they had never used PrEP, the highest proportion of responses were that they had started a committed relationship (346/659, 52.5%), decided they did not need it (277/659, 43.03%), did not know where to get it (171/659, 26.0%) could not afford it (164/659, 24.9%), and were worried about side effects (152/659, 23.1%). Among participants meeting the criteria for PrEP, similar responses for never using PrEP were reported, including not knowing where to get it (58/144, 40.3%), not being able to afford it (54/144, 37.5%), deciding they didn’t need it (42/144, 29.2%), being worried about side effects (38/144, 26.4%), and starting a committed relationship (31/144, 21.5%).

Most participants thought their partner would support them using PrEP in the future (503/659, 73.3%), while 51/659 (7.7%) thought their partner would not support them and 105/659 (15.9%) did not know if their partner would support them. Among those that did

not think that or know if their partner would support their PrEP use, most thought their partner would not support them because they are in a monogamous relationship (124/156, 79.5%), their partner would think they are cheating or breaking their sexual agreement (70/156, 44.9%), or that their sexual agreement protects them from HIV (66/156, 42.2%). Participants were significantly less likely to think their partner would not support their PrEP use or not know if their partner would support their PrEP use if they had a sexual agreement that allows outside partnerships ($p<0.001$) and had a higher total score on the planning and decision-making communal coping subscale ($p=0.007$, Table II). Participants reporting experiences of IPV within their relationship had significantly higher odds of thinking their partner would not support their PrEP use or not know if their partner would support their PrEP use ($p=0.008$).

Most participants reported that PrEP would not be beneficial to them or their partner (380/659, 57.7%). Small proportions thought PrEP would only be beneficial to themselves (27/659, 4.1%) or only to their partner (10/659, 1.5%), and 36.4% (240/659) reported PrEP would be beneficial to both themselves and their partner. Among participants who met the criteria for PrEP, most participants reported that PrEP would be beneficial to both themselves and their partner (84/144, 58.3%), 11.1% (16/144) thought PrEP would be beneficial to either themselves or their partner, and 29.9% (43/144) thought PrEP would be beneficial to neither themselves nor their partner. Among couples where both partners knew about PrEP and were not currently taking PrEP (N=550), most (375/550, 68.0%) had concordant responses of the benefit of PrEP, and 55.3% (304/550) reported that at least one member of the partnership would benefit from PrEP. Any perceived PrEP benefit was significantly higher among participants that had a sexual agreement that allowed for outside partnerships ($p<0.001$) and reported non-prescription drug use ($p=0.01$, Table III). Participants that were eligible for PrEP were also significantly more likely to perceive PrEP benefits ($p=002$). Any perceived PrEP benefit was significantly lower among participants in longer relationships ($p<0.001$), and those who had a higher total score on the planning and decision-making communal coping subscale for both the participant (<0.001) and their partner (0.04). Participants that met the criteria for PrEP were not significantly more likely to report any PrEP benefit.

DISCUSSION

In our study, we found high awareness but low use of PrEP among HIV sero-discordant and concordant negative male couples. Men reported being in committed relationships and deciding they did not need PrEP as the top two reasons for not using PrEP Among men who had heard of PrEP but were not currently using it, perceived support of partner for PrEP use was high, although most felt that PrEP was not beneficial in their relationship. These findings suggest that decisions to use PrEP may be strongly influenced by relationship status, including sexual agreements allowing for outside partnerships. Additionally, couples with a sexual agreement that allowed for outside partnerships were generally more likely to think PrEP would benefit themselves and/or their partner and their partner would support PrEP use, pointing to relationship structure as another factor in decisions to use PrEP. Notably, we did find differences in the impact of relationships among men who met criteria for PrEP based on CDC recommendations compared to the full cohort. While partner

support remained high among PrEP eligible men, they were also more likely to think PrEP would be beneficial in their relationship, and a higher proportion cited structural factors for not using PrEP rather than relationship factors. Meeting the risk factors for recommended PrEP was a significant predictor of whether men believed PrEP would be beneficial in their relationship but not if they thought their partner would support them using PrEP.

Partner support, specifically in primary and committed relationships, is an important factor in HIV prevention that may extend to decisions to use PrEP. Studies have found positive relationship characteristics, including support and commitment, to be associated with reduced CAS with outside partners and related to increased HIV testing motivation (32–34). In a qualitative study of substance-using MSM, main partners were identified a source of support for PrEP use (35). However, perceptions of partner support may not directly influence decisions to use PrEP and may be dependent on relationship dynamics. We found that couples with a sexual agreement that allowed for outside partnerships was significantly associated with perceiving partner support of PrEP. In addition, individuals that identified high communal decision making to reduce the threat of HIV were also more likely to think their partner would support PrEP, although this factor was negatively associated with perceiving PrEP to be a benefit to either partner. These findings indicate that relationships that have communication about sexual behavior and risk may be more open to discussion about PrEP use. The behavioral skills of communication and establishing sexual agreements can be taught, and these results indicate the need for providing interventions that develop positive relationships skills among male couples as a pathway to increasing PrEP use. In non-monogamous relationships, PrEP use may be supported as a means to reduce anxiety related to HIV risk (12, 36). Likewise, individuals without sexual agreements or agreements allowing outside partnerships may not perceive partner support for PrEP if they feel their PrEP use would be viewed with suspicion of breaking agreements or cheating on their partner, consistent with our findings for reasons a partner would not support PrEP use.

MSM who met the CDC criteria for PrEP in our study were not more likely to perceive PrEP to be a benefit suggesting possible low perception of risk. However, the presence of sexual agreements allowing for outside partnerships was found to be significantly associated with both the perception of partner support for PrEP and perceiving PrEP to be beneficial within the relationship, either for the individual, partner or both. Individuals in open relationships or with sexual agreements allowing for outside partners may have more sex partners and are aware of increased HIV risk (37), and these couples may recognize the benefit PrEP may have in keeping themselves and their partner safe. MSM have cited sexual motivations and risk perception as significant factors in interest and intention to use PrEP (38), but decisions to use PrEP among men with primary partners may be more likely when couples have identified potential risk through communication about sexual agreements. Although sexual agreements are common among same-sex male couples, approaches to reduce the risk of HIV are not always discussed or included in the agreements (39). Incorporating HIV prevention, including PrEP, into sexual agreements could be an effective strategy for engaging couples in risk reduction (20).

Individuals reporting IPV victimization within the relationship were less likely to believe their partner would support their PrEP use. Results from studies of IPV among male couples

indicate that men reporting IPV may have less agency to negotiate HIV risk reduction and are less likely to participate in HIV prevention program stemming from lower self-efficacy related to power disparities within the relationship (40–42). IPV has been found to be associated with lower or interrupted PrEP use and should be addressed in strategies to increase PrEP use and retention (23, 43) However, our findings did not identify experiences of IPV as associated with perceiving a benefit to PrEP use which differs from much of the literature that has found an association between experiencing IPV and interest in using PrEP (23, 44). Studies of women who have experienced IPV have lower acceptance of and adherence to PrEP (45, 46).However, It should be noted that most of the small number of articles on IPV and PrEP use include only heterosexual women, and the relationship between IPV and PrEP use among same-sex male couples warrants further study.

Couples-based HIV prevention interventions have been found to be effective approaches to reducing HIV risk (47–49). Identifying relationship dynamics and working with couples to reduce risk within the relationship can enhance engagement in prevention, increase communication and support, and tailor risk reduction methods in the context of the relationship (49, 50). Further, addressing IPV in HIV prevention strategies is critical in reaching populations that may experience higher risk for HIV. Understanding that decisions to use PrEP may be influenced by the type and structure of relationships, as well as the level of perceived support and commitment, are important considerations that need to be integrated into strategies to increase PrEP use among MSM. Additionally, couples-based prevention allows opportunities to incorporate relationship counseling to increase communication and support and potentially identify areas of concern within the relationship.

We do note limitations with our study. First, the present study used baseline data from a cohort of male couples where both partners had to be enrolled, thus limiting our ability to assess relationship dynamics where one partner may be less engaged in discussions about their relationship and risk reduction. However, having both partners allowed for assessment individual and dyadic factors associated with support of PrEP. Second, our study population was highly educated and employed at the time of the survey, with lower representation by racial and ethnic minority populations. PrEP knowledge and uptake is lower among lower income and racial/ethnic minority MSM (51–53), and further research is needed to explore PrEP and relationships within these populations. Additionally, social desirability bias and stigma may lead to underreporting of certain behaviors, including IPV and drug use. Third, our study assessed perceived partner support of PrEP, but our data did not have information on whether partners actually support PrEP use. Perception of support is critical, but additional information would be useful in determining whether perception of partner's support matches reality and how that translates into PrEP use. Future studies should ask not only about how an individual perceives their partner support, but also ask the partner if they support PrEP use. Finally, ours is a convenience sample and limiting the ability to generalize our results to other male couples across the U.S. We included only cross-sectional baseline data in our analysis, thus limiting our ability to make causal assessments. Additional analyses using the follow-up data from the RCT may elucidate additional findings based on dynamics of relationship factors.

CONCLUSION

Relationship characteristics are important factors that influence HIV risk behavior and decisions to engage in HIV prevention. Intentions to use PrEP may be the result of relationship structure, partner support, perceived risk, and existing risk reduction strategies. HIV prevention programs that incorporate relationship skills, including trust and communication, have been shown to increase commitment to reducing risk (54). Implementation of PrEP programs for MSM in committed relationships could be more effective if integrated with couples-based approaches.

REFERENCES

1. Jenness SM, Goodreau SM, Rosenberg E, Beylerian EN, Hoover KW, Smith DK, et al. Impact of the Centers for Disease Control's HIV Preexposure Prophylaxis Guidelines for Men Who Have Sex With Men in the United States. J Infect Dis. 2016.
2. Grant RM, Lama JR, Anderson PL, McMahan V, Liu AY, Vargas L, et al. Preexposure chemoprophylaxis for HIV prevention in men who have sex with men. N Engl J Med. 2010;363(27):2587–99. [PubMed: 21091279]
3. Baeten JM, Donnell D, Ndase P, Mugo NR, Campbell JD, Wangisi J, et al. Antiretroviral prophylaxis for HIV prevention in heterosexual men and women. N Engl J Med. 2012;367(5):399–410. [PubMed: 22784037]
4. Thigpen MC, Kebaabetswe PM, Paxton LA, Smith DK, Rose CE, Segolodi TM, et al. Antiretroviral preexposure prophylaxis for heterosexual HIV transmission in Botswana. N Engl J Med. 2012;367(5):423–34. [PubMed: 22784038]
5. Kamitani E, Wichser ME, Adegbite AH, Mullins MM, Johnson WD, Crouch PC, et al. Increasing prevalence of self-reported HIV preexposure prophylaxis use in published surveys: a systematic review and meta-analysis. AIDS. 2018;32(17):2633–5. [PubMed: 30096073]
6. Finlayson T. Changes in HIV PrEP awareness and use among men who have sex with men, 2014 vs. 2017. Conference on Retroviruses and Opportunistic Infection; Seattle, WA. Mar 7, 2019 2019
7. Coy KC, Hazen RJ, Kirkham HS, Delpino A, Siegler AJ. Persistence on HIV preexposure prophylaxis medication over a 2-year period among a national sample of 7148 PrEP users, United States, 2015 to 2017. J Int AIDS Soc. 2019;22(2):e25252. [PubMed: 30775846]
8. Rao DW, Carr J, Naismith K, Hood JE, Hughes JP, Morris M, et al. Monitoring HIV Preexposure Prophylaxis Use Among Men Who Have Sex With Men in Washington State: Findings From an Internet-Based Survey. Sex Transm Dis. 2019;46(4):221–8. [PubMed: 30870322]
9. Chan PA, Mena L, Patel R, Oldenburg CE, Beauchamps L, Perez-Brumer AG, et al. Retention in care outcomes for HIV pre-exposure prophylaxis implementation programmes among men who have sex with men in three US cities. J Int AIDS Soc. 2016;19(1):20903. [PubMed: 27302837]
10. Biello KB, Edeza A, Montgomery MC, Almonte A, Chan PA. Risk Perception and Interest in HIV Pre-exposure Prophylaxis Among Men Who Have Sex with Men with Rectal Gonorrhea and Chlamydia Infection. Arch Sex Behav. 2018.
11. Rana J, Wilton J, Fowler S, Hart TA, Bayoumi AM, Tan DHS. Trends in the awareness, acceptability, and usage of HIV pre-exposure prophylaxis among at-risk men who have sex with men in Toronto. Can J Public Health. 2018;109(3):342–52. [PubMed: 29981088]
12. Starks TJ, Doyle KM, Shalhav O, John SA, Parsons JT. An Examination of Gay Couples' Motivations to Use (or Forego) Pre-exposure Prophylaxis Expressed During Couples HIV Testing and Counseling (CHTC) Sessions. Prev Sci. 2019;20(1):157–67. [PubMed: 29651646]
13. Stephenson R, White D, Darbes L, Hoff C, Sullivan P. HIV testing behaviors and perceptions of risk of HIV infection among MSM with main partners. AIDS and behavior. 2015;19(3):553–60. [PubMed: 25081599]
14. Sullivan PS, Salazar L, Buchbinder S, Sanchez TH. Estimating the proportion of HIV transmissions from main sex partners among men who have sex with men in five US cities. AIDS. 2009;23(9):1153–62. [PubMed: 19417579]

15. Cuervo M, Whyte Jt. The Effect of Relationship Characteristics on HIV Risk Behaviors and Prevention Strategies in Young Gay and Bisexual Men. J Assoc Nurses AIDS Care. 2015;26(4):399–410. [PubMed: 26066694]
16. Hoff CC, Beougher SC, Chakravarty D, Darbes LA, Neilands TB. Relationship characteristics and motivations behind agreements among gay male couples: differences by agreement type and couple serostatus. AIDS Care. 2010;22(7):827–35. [PubMed: 20635246]
17. Saberi P, Gamarel KE, Neilands TB, Comfort M, Sheon N, Darbes LA, et al. Ambiguity, ambivalence, and apprehensions of taking HIV-1 pre-exposure prophylaxis among male couples in San Francisco: a mixed methods study. PLoS One. 2012;7(11):e50061. [PubMed: 23166819]
18. Bavinton BR, Prestage GP, Jin F, Phanuphak N, Grinsztejn B, Fairley CK, et al. Strategies used by gay male HIV serodiscordant couples to reduce the risk of HIV transmission from anal intercourse in three countries. J Int AIDS Soc. 2019;22(4):e25277. [PubMed: 30983155]
19. Wall KM, Canary L, Workowski K, Lockard A, Jones J, Sullivan P, et al. Acceptability of Couples' Voluntary HIV Testing Among HIV-infected Patients in Care and Their HIV-negative Partners in the United States. Open AIDS J. 2016;10:1–13. [PubMed: 27014393]
20. Mitchell JW, Lee JY, Woodyatt C, Bauermeister J, Sullivan P, Stephenson R. HIV-negative male couples' attitudes about pre-exposure prophylaxis (PrEP) and using PrEP with a sexual agreement. AIDS Care. 2016;28(8):994–9. [PubMed: 27055001]
21. Bratcher AKE, Sullivan P, Hidalgo M, Mimiago M, Garofalo R, Pardee D, Hoehnle S, Thai J, Dana R, Stephenson R. Concordance in reported love, trust, and relationship quality among same-sex male relationships. Journal of Relationships Research. 2018;9(E20).
22. Marsack JKE, Suarez NA, Mimiaga MJ, Garofalo R, Brown E, Bratcher AM, Wimbly T, Hidalgo MA, Hoehnle S, Thai J, Sullivan P, Stephenson R. Relationship characteristics and dyadic approaches to HIV health-enhancing behaviors among a sample of same-sex male couples from three U.S. cities. Journal of Relationships Research. 2018;9.
23. Willie TC, Stockman JK, Overstreet NM, Kershaw TS. Examining the Impact of Intimate Partner Violence Type and Timing on Pre-exposure Prophylaxis Awareness, Interest, and Coercion. AIDS and behavior. 2018;22(4):1190–200. [PubMed: 28887703]
24. Stephenson R, Freeland R, Sullivan SP, Riley E, Johnson BA, Mitchell J, et al. Home-Based HIV Testing and Counseling for Male Couples (Project Nexus): A Protocol for a Randomized Controlled Trial. JMIR Res Protoc. 2017;6(5):e101. [PubMed: 28559225]
25. CDC. Preexposure prophylaxis for the prevention of HIV infection in the United States - 2017 update: a clinical practice guideline. Atlanta, GA: Centers for Disease Control and Prevention; 2017.
26. Larzelere RE, Huston TL. The Dyadic Trust Scale - toward Understanding Interpersonal-Trust in Close Relationships. Journal of Marriage and the Family. 1980;42(3):595–604.
27. Gabbay NLM, Bourque L. Factor structure and reliability assessment of the dyadic trust scale with individuals in same-sex romantic relationships. J GLBT Fam Studies. 2012;8(3):258–69.
28. Salazar LF, Stephenson RB, Sullivan PS, Tarver R. Development and validation of HIV-related dyadic measures for men who have sex with men. J Sex Res. 2013;50(2):164–77. [PubMed: 22206480]
29. Stephenson R, Finneran C. The IPV-GBM scale: a new scale to measure intimate partner violence among gay and bisexual men. PLoS One. 2013;8(6):e62592. [PubMed: 23755098]
30. Liu H, Feng T, Rhodes AG, Liu H. Assessment of the Chinese version of HIV and homosexuality related stigma scales. Sex Transm Infect. 2009;85(1):65–9. [PubMed: 18790858]
31. Szymanski DM. Does internalized heterosexism moderate the link between heterosexist events and lesbians' psychological distress? Sex Roles. 2006;54(3–4):227–34.
32. Hoff CC, Campbell CK, Chakravarty D, Darbes LA. Relationship-Based Predictors of Sexual Risk for HIV Among MSM Couples: A Systematic Review of the Literature. AIDS and behavior. 2016;20(12):2873–92. [PubMed: 27048237]
33. Hoff CC, Chakravarty D, Beougher SC, Neilands TB, Darbes LA. Relationship characteristics associated with sexual risk behavior among MSM in committed relationships. AIDS Patient Care STDS. 2012;26(12):738–45. [PubMed: 23199191]

34. Stephenson R, Sullivan PS, Salazar LF, Gratzer B, Allen S, Seelbach E. Attitudes towards couples-based HIV testing among MSM in three US cities. AIDS and behavior. 2011;15 Suppl 1:S80–7. [PubMed: 21336607]
35. Mimiaga MJ, Closson EF, Kothary V, Mitty JA. Sexual partnerships and considerations for HIV antiretroviral pre-exposure prophylaxis utilization among high-risk substance using men who have sex with men. Arch Sex Behav. 2014;43(1):99–106. [PubMed: 24243002]
36. Hannaford A, Lipshie-Williams M, Starrels JL, Arnsten JH, Rizzuto J, Cohen P, et al. The Use of Online Posts to Identify Barriers to and Facilitators of HIV Pre-exposure Prophylaxis (PrEP) Among Men Who Have Sex with Men: A Comparison to a Systematic Review of the Peer-Reviewed Literature. AIDS and behavior. 2018;22(4):1080–95. [PubMed: 29285638]
37. Stephenson R, White D, Mitchell JW. Sexual agreements and perception of HIV prevalence among an online sample of partnered men who have sex with men. Arch Sex Behav. 2015;44(7):1813–9. [PubMed: 26048482]
38. Gamarel KE, Golub SA. Intimacy motivations and pre-exposure prophylaxis (PrEP) adoption intentions among HIV-negative men who have sex with men (MSM) in romantic relationships. Ann Behav Med. 2015;49(2):177–86. [PubMed: 25124457]
39. Rios-Spicer R, Darbes L, Hoff C, Sullivan PS, Stephenson R. Sexual Agreements: A Scoping Review of Measurement, Prevalence and Links to Health Outcomes. AIDS and behavior. 2019;23(1):259–71. [PubMed: 29959719]
40. Safren SA, Blashill AJ, Lee JS, O'Cleirigh C, Tomassili J, Biello KB, et al. Condom-use self-efficacy as a mediator between syndemics and condomless sex in men who have sex with men (MSM). Health Psychol. 2018;37(9):820–7. [PubMed: 29927272]
41. Stephenson R, Finneran C. Receipt and Perpetration of Intimate Partner Violence and Condomless Anal Intercourse Among Gay and Bisexual Men in Atlanta. AIDS and behavior. 2017;21(8):2253–60. [PubMed: 28176169]
42. Stephenson R, Freeland R, Finneran C. Intimate partner violence and condom negotiation efficacy among gay and bisexual men in Atlanta. Sex Health. 2016.
43. Cabral A, MB J, Ngure K, Velloza J, Odoyo J, EH J, et al. Intimate Partner Violence and Self-Reported Pre-exposure Prophylaxis Interruptions Among HIV-Negative Partners in HIV Serodiscordant Couples in Kenya and Uganda. J Acquir Immune Defic Syndr. 2018;77(2):154–9. [PubMed: 29076883]
44. Braksmajer A, Leblanc NM, El-Bassel N, Urban MA, McMahon JM. Feasibility and acceptability of pre-exposure prophylaxis use among women in violent relationships. AIDS Care. 2019;31(4):475–80. [PubMed: 30045629]
45. Roberts ST, Haberer J, Celum C, Mugo N, Ware NC, Cohen CR, et al. Intimate Partner Violence and Adherence to HIV Pre-exposure Prophylaxis (PrEP) in African Women in HIV Serodiscordant Relationships: A Prospective Cohort Study. J Acquir Immune Defic Syndr. 2016;73(3):313–22. [PubMed: 27243900]
46. Garfinkel DB, Alexander KA, McDonald-Mosley R, Willie TC, Decker MR. Predictors of HIV-related risk perception and PrEP acceptability among young adult female family planning patients. AIDS Care. 2017;29(6):751–8. [PubMed: 27680304]
47. Crepaz N, Tungol-Ashmon MV, Vosburgh HW, Baack BN, Mullins MM. Are couple-based interventions more effective than interventions delivered to individuals in promoting HIV protective behaviors? A meta-analysis. AIDS Care. 2015;27(11):1361–6. [PubMed: 26608175]
48. El-Bassel N, Gilbert L, Witte S, Wu E, Hunt T, Remien RH. Couple-based HIV prevention in the United States: advantages, gaps, and future directions. J Acquir Immune Defic Syndr. 2010;55 Suppl 2:S98–101. [PubMed: 21406997]
49. Leblanc NM, Mitchell J. Providers' Perceptions of Couples' HIV Testing and Counseling (CHTC): Perspectives From a U.S. HIV Epicenter. Couple Family Psychol. 2018;7(1):22–33. [PubMed: 30319926]
50. Purcell DW, Mizuno Y, Smith DK, Grabbe K, Courtenay-Quick C, Tomlinson H, et al. Incorporating couples-based approaches into HIV prevention for gay and bisexual men: opportunities and challenges. Arch Sex Behav. 2014;43(1):35–46. [PubMed: 24233328]

51. Li J, Berg CJ, Kramer MR, Haardorfer R, Zlotorzynska M, Sanchez TH. An Integrated Examination of County- and Individual-Level Factors in Relation to HIV Pre-exposure Prophylaxis Awareness, Willingness to Use, and Uptake Among Men Who Have Sex with Men in the US. AIDS and behavior. 2018.

52. 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 STDS. 2015;29(8):423–9. [PubMed: 26083143]

53. Lelutiu-Weinberger C, Golub SA. Enhancing PrEP Access for Black and Latino Men Who Have Sex With Men. J Acquir Immune Defic Syndr. 2016;73(5):547–55. [PubMed: 27454250]

54. Philpot SP, Prestage G, Ellard J, Grulich AE, Bavinton BR, Opposites Attract study g. How Do Gay Serodiscordant Couples in Sydney, Australia Negotiate Undetectable Viral Load for HIV Prevention? AIDS and behavior. 2018;22(12):3981–90. [PubMed: 30105588]

Table I.

Individual and dyadic characteristics of male couples

		Total[1]	
		N/med	**%/IQR**
Individual characteristics (N=659)			
Age		28	24–34
Race			
	Asian/Pacific Islander	21	3.2
	Black/African American	36	5.5
	Hispanic	113	17.2
	White	444	67.4
	Other/multiple	40	6.1
Geographic region			
	Northeast	75	11.4
	Midwest	143	21.7
	South	295	44.8
	West	146	22.2
College education			
	Yes	579	87.9
	No	80	12.1
Employed			
	Yes	613	93.0
	No	46	7.0
HIV status			
	HIV negative	343	52.1
	Don’t know	314	47.7
Condomless anal sex			
	None	470	71.3
	Primary partner	84	12.8
	Outside partner	111	16.8
Number of outside sex partners, past 3 months			
	0	545	17.2
	1–2	64	9.7
	3 or more	49	7.4
Dyad characteristics (N=384 couples)			
Length of relationship			
	Less than 1 year	68	17.7
	1–2 years	132	34.4
	3–5 years	90	23.4

	6–9 years	51	13.3
	10 or more years	43	11.2
Married			
	Yes	111	28.9
	No	271	70.6
Age difference, years		3	1.5
Interracial			
	Yes	134	34.9
	No	243	63.3
HIV serodiscordant			
	Yes	9	2.3
	No/unknown	372	96.9
Sexual agreement allows outside partners			
	Yes	94	24.5
	No	289	75.3

[1]Percentages may not total 100% due to missing data

Table II.

Individual, partner and dyadic factors associated with partner NOT supportive of PrEP

		adjOR[1]	95%CI
Couple characteristics			
	Married	0.53	0.26–1.25
	Relationship length, years	1.21	0.28–1.08
	Sexual agreement allows for outside partnerships	**0.12**[4]	**0.05–0.28**
Individual characteristics			
	PrEP eligible	0.59	0.28–1.25
	Trust	0.99	0.94–1.05
	Communal planning and decision-making	**0.93**[3]	**0.88–0.98**
	Experienced intimate partner violence	**1.19**[3]	**1.05–1.36**
	Perpetrated intimate partner violence	0.90	0.79–1.04
	Non-prescription drug use	1.49	0.82–2.73
	Binge drinking	1.92	0.99–3.73
Partner characteristics			
	Binge drinking by partner	0.99	0.49–1.97
	Non-prescription drug use by partner	1.92	0.70–2.43

[1] adjOR=adjusted odds ratio; adjusted for participant and partner age, race and education

[2] $p<0.05$

[3] $p<0.01$

[4] $p<0.001$

Table III.

Individual, partner and dyadic characteristics associated with any perceived benefit of PrEP (self, partner or both)

		adjOR[1]	95%CI
Couple characteristics			
	Relationship length, years	**0.57**[4]	**0.43–0.77**
	Married	1.37	0.71–2.66
	Sexual agreement allows for outside partnerships	**10.14**[4]	**4.69–21.94**
Individual			
	PrEP eligible	**2.86**[2]	**1.17–6.99**
	Trust	0.95	0.90–1.01
	Communal planning and decision-making	**0.89**[4]	**0.85–0.94**
	Experienced intimate partner violence	0.97	0.85–1.10
	Perpetrated intimate partner violence	1.06	0.93–1.21
	Nonprescription drug use	**1.73**[2]	**1.00–2.98**
	Binge drinking	0.71	0.38–1.33
Partner			
	PrEP eligible	1.27	0.53–3.03
	Nonprescription drug use	0.69	0.40–1.21
	Binge drinking	0.82	0.44–1.53
	Trust	0.95	0.93–1.03
	Communal planning and decision-making	0.96	0.91–1.01

[1] adjOR=adjusted odds ratio; adjusted for participant and partner age, race and education

[2] $p<0.05$

[3] $p<0.01$

[4] $p<0.001$