

# From Efficacy to Effectiveness: Facilitators and Barriers to PrEP Acceptability and Motivations for Adherence Among MSM and Transgender Women in New York City

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## Abstract

This study examined potential facilitators and barriers to pre-exposure prophylaxis (PrEP) use and their association with PrEP acceptability and motivations for adherence among 184 MSM and transgender women living in New York City. Participants were presented with educational information about PrEP and completed a computerized survey. Overall, 55.4% of participants reported willingness to take PrEP. The most highly endorsed barriers to PrEP use were health concerns, including both long-term impacts and short-term side effects, questions about PrEP's impact on future drug resistance, and concerns that PrEP does not provide complete protection against HIV. The most highly endorsed facilitator was free access to PrEP, followed by access to support services such as regular HIV testing, sexual health care/monitoring, and access to one-on-one counseling. Participants of color rated both barriers and facilitators as more important than their White counterparts. In multivariate models, barrier and facilitator scores significantly predicted not only PrEP acceptability, but also motivation for PrEP adherence among those who were likely to use PrEP. PrEP implementation programs should consider addressing these barriers and facilitators in protocol and policy development. Findings underscore the importance of support services, such as sexual health counseling, to the success of PrEP as a prevention strategy.

## Introduction

THE USE OF ORAL ANTIRETROVIRAL pre-exposure prophylaxis (PrEP) has been shown to be efficacious in preventing HIV among men who have sex with men (MSM), with the iPrEX study demonstrating a 44% reduction in the incidence of HIV with daily use of antiretroviral medications.<sup>1</sup> Two additional clinical trials, one among serodiscordant heterosexual couples in Kenya and Uganda and the other among sexually-active young men and women in Botswana, have also demonstrated promising results for the use of PrEP as a prevention strategy.<sup>2,3</sup> As a result, the U.S. Food and Drug Administration in July 2012 approved the use of Truvada (a combination of 300 mg of tenofovir and 200 mg emtricitabine) to reduce the risk of HIV acquisition. However, the effectiveness of PrEP is predicated on patients' willingness to accept it as a prevention strategy and their ability to adhere to a medication regimen. Without these two behavioral factors—

acceptability and adherence—the efficacy and availability of PrEP is meaningless to efforts to stem the tide of the epidemic. Thus, many important questions remain regarding the effectiveness of PrEP for groups at risk for HIV in real world settings.

As clinical trials continue to establish efficacy, researchers have been increasingly interested in awareness and acceptability among potential candidates of PrEP. Studies have found that overall knowledge of PrEP is low to modest,<sup>4,5</sup> with concerns relating to potential side effects, costs, drug resistance and accessibility.<sup>4,6–8</sup> Studies have also shown wide ranges of PrEP acceptability, with between 32% and 83% of community-based samples expressing willingness to take PrEP.<sup>1,9,10</sup> Motivations for PrEP use have included demographic characteristics such as older age, higher educational attainment, engaging in sexual risk behavior, and perceiving oneself as being at risk for HIV acquisition among MSM and heterosexual men and women.<sup>5,11</sup> Among gay and bisexual

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men in serodiscordant couples, interest in PrEP use has been associated with reduced anxiety about engaging in sexual behavior with their HIV-positive partner.<sup>12</sup> However, little is known about the specific barriers to PrEP use that are most important to potential users, or the extent to which such barriers distinguish between those who are willing to take PrEP and those who are not.

The efficacy of PrEP in clinical trials has been shown to rest on medication adherence. Supplemental analyses from the iPrEX study indicate that adherence on 90% of days or more was associated with 73% efficacy and detectable study-drug levels resulted in a relative risk reduction of 92%.<sup>13</sup> Differences in efficacy estimates across PrEP trials have been attributed, in part, to differences in patient adherence.<sup>14,15</sup> Despite advances in HIV medication adherence among those with access to treatment and care,<sup>16</sup> suboptimal adherence has been demonstrated among patients prescribed prophylactic regimens.<sup>17–20</sup> Several studies have examined social and structural influences on adherence within PrEP trials, including social expectations and norms, social context, and HIV stigma.<sup>21–23</sup> However, no published studies to date have examined the association between specific PrEP-related barriers and facilitators and motivation for adherence. A better understanding of these factors is critical to informing clinical guidelines for effectiveness in real world settings. Our objective for this study was to examine facilitators and barriers to PrEP acceptability and motivations for adherence among MSM and transgender women at risk for HIV acquisition.

## Materials and Methods

Data were drawn from an ongoing study examining the impact of PrEP messaging and communication strategies on PrEP acceptability. Participants were recruited in New York City using passive recruitment methods (i.e., flyers), active recruitment methods (i.e., outreach at bars, events, community-based organizations), and participant referral. Eligible individuals were born male (regardless of current gender identity), aged 18 years or older, self-reported an HIV-negative serostatus, and reported at least one act of unprotected anal sex with a male partner in the last 30 days. Data for this paper were collected between January and September, 2012.

All participants in the study completed an in-person interview at the research center and were presented with educational information about PrEP, including data on efficacy and side effects based on iPrEX study results.<sup>1</sup> Participants then completed a self-administered survey on computer. These analyses are focused on participants' perceptions of barriers to and facilitators of PrEP use, and the association between these barriers and facilitators and demographic factors, PrEP acceptability, motivation for adherence, and HIV risk perception. All procedures were reviewed and approved by the Human Research Protections Program at the City University of New York.

### Data and analysis

Participants answered questions related to demographics, PrEP acceptability, perceived barriers to and facilitators of PrEP adoption, likelihood of PrEP adherence, and HIV risk perception. To assess PrEP acceptability, participants were asked how likely they would be to take PrEP if it were available for free. Responses were gathered on a five-point

scale, and were dichotomized into "likely to take PrEP" (i.e., those who responded with a 4 or higher, indicating that they would "probably" or "definitely" take PrEP) and "not likely to take PrEP" (i.e., those who responded with a 3 or below on the scale, indicating that they "might," "probably would not" or "definitely would not" take PrEP). Participants were then presented with eleven potential barriers and eight potential facilitators of PrEP use, and were asked to rate the importance of each on a five-point scale. The list of barriers and facilitators was generated from a review of the research literature, and was then pilot tested in conversations with experts in the field. Next, participants were asked three questions about PrEP adherence: how motivated they would be to take PrEP medication, how tempted they would be to skip pills, and how likely they would be to take their PrEP medication as prescribed. Participants responded to each question on a 7-point Likert-type scale. Finally, participants were asked to rate their perceived likelihood being infected with HIV in their lifetime, on a scale from 0 to 100.

All statistical analyses were conducted using SPSS version 20.0 software. We began by examining descriptive statistics and bivariate associations among study variables using  $\chi^2$  and independent samples *t*-tests. Multivariable logistic regression and linear regression were used to examine the association between perceived barriers/facilitators and PrEP acceptability and adherence, respectively. For all analyses, the standard alpha value of 0.05 was considered evidence of statistical significance.

## Results

### Demographics

The sample included 177 men and 7 transgender women between 18–58 years of age ( $M=34.8$  years  $SD=10.2$ ). More than half of the sample were MSM and transgender women of color 60.3% ( $n=111$ ), including 38.6% ( $n=71$ ) who identified as Black and 21.7% ( $n=40$ ) who identified as Latino. Sixty-nine percent ( $n=126$ ) of the sample self-identified as gay, and 22% ( $n=40$ ) self-identified as bisexual. The sample was relatively diverse with regards to socioeconomic status, with 59.2% ( $n=109$ ) reporting less than a college education, and 67.4% ( $n=124$ ) reporting an annual income of less than \$30,000 per year. Nearly half (48.9%,  $n=90$ ) of the sample reported being in a relationship (i.e., being legally married or having commitment ceremony, having a partner/lover or boyfriend). Over 40% of the sample ( $n=74$ ) reported having an HIV-test in the past 3 months, an additional 26.6% ( $n=49$ ) reported having a test within the past 6 months, an additional 17.4% ( $n=32$ ) reported a test in the past year, and 15.8% ( $n=29$ ) reported testing more than a year ago. Over 40% ( $n=74$ ) of the sample reported having private insurance, 39.1% ( $n=72$ ) had public insurance (i.e., Medicaid, Medicare, Veterans Administration), and 20.7% ( $n=38$ ) were uninsured (i.e., reported attending free clinics or paying for health care out of pocket).

### PrEP acceptability

A total of 102 (55.4%) participants reported that they would definitely or probably take PrEP if it were available for free. In bivariate analyses, PrEP acceptability did not differ based on age, race/ethnicity, income, education level, or health insurance status. Single participants were marginally more likely to report willingness to take PrEP (56.9%) compared to those in a

TABLE 1. PERCENT OF PARTICIPANTS WHO CONSIDER PrEP BARRIERS “IMPORTANT” BY LIKELIHOOD OF TAKING PrEP (N=184)

	Overall n (%)	Likely to take PrEP	
		Yes (n=102) n (%)	No (n=82) n (%)
1. Concerns about the long-term effects of PrEP on my health	144 (78.3)	74 (72.5)	70 (85.5) <sup>b</sup>
2. Concerns about side effects	127 (69.0)	61 (59.8)	66 (80.5) <sup>c</sup>
3. Concerns that if I do become HIV+, certain medicines won't work because I was taking PrEP	119 (64.7)	64 (62.7)	55 (67.1)
4. Concerns that PrEP does not provide complete protection against HIV	115 (62.5)	58 (56.9)	57 (69.5) <sup>a</sup>
5. Having to take a pill everyday	101 (54.9)	52 (51.0)	49 (59.8)
6. Concerns that taking PrEP might make me more likely to have anal sex without a condom	82 (44.6)	44 (43.1)	38 (46.3)
7. Concerns that having to take PrEP means I am putting myself at risk for HIV	71 (38.6)	34 (33.3)	37 (45.1) <sup>a</sup>
8. Concerns that PrEP might make my partner(s) expect me to have anal sex without a condom	63 (34.2)	33 (32.4)	30 (36.6)
9. Concerns that people will see me taking medication and think I have HIV	53 (28.8)	29 (28.4)	24 (29.3)
10. Concerns that people will see me taking medication and will want to know why I am taking it	46 (25.0)	26 (25.5)	20 (24.4)
11. Having to talk to my doctor about my sex life	47 (25.5)	28 (27.5)	19 (23.2)

<sup>a</sup> $p < 0.10$ ; <sup>b</sup> $p < 0.05$ . <sup>c</sup> $p < 0.01$ .

relationship (43.1%),  $\chi^2(1)=3.06$ ,  $p=0.055$ . In addition, a higher proportion of those who self-identified as bisexual (72.5%) reported being willing to take PrEP compared to gay (50.0%) and other MSM (55.5%),  $\chi^2(2)=6.22$ ,  $p=0.045$ .

#### Barriers to PrEP use

Table 1 lists the eleven potential barriers to PrEP use presented to participants, and reports the percentage of participants who indicated that each barrier was “important” or “very important” to them. In addition, Table 1 compares whether the percentage of participants who consider the barrier important differs by expressed willingness to take PrEP. The barriers considered important by the greatest percentage of participants were concerns about the long-term effects of PrEP on health (78.3%), concerns about side effects (69%), concerns that PrEP will render antiretroviral medications ineffective in the event that the individual does become

infected (64.7%), and concerns that PrEP does not provide complete protection against HIV (62.5%). The top two concerns also significantly differentiated between individuals who reported being likely to take PrEP and those who did not, such that a greater percentage of those who said they were unlikely to take PrEP rated these barriers as important. Concerns about PrEP efficacy were marginally associated with unwillingness to take PrEP, as were concerns that having to take PrEP means that one is putting oneself at risk for HIV.

We next examined whether endorsement of specific barriers to PrEP use differed by age (18–29 vs. 30 and above) or race/ethnicity (white participants vs. participants of color). There were no differences in participants’ ratings of the importance of any barriers by age. There were, however, differences by race/ethnicity for seven of the eleven barriers, such that participants of color rated each barrier as significantly more important than their white counterparts. We then averaged scores on all eleven barriers, and overall,

TABLE 2. PERCENT OF PARTICIPANTS WHO CONSIDER PrEP FACILITATORS “IMPORTANT” BY LIKELIHOOD OF TAKING PrEP (N=184)

	Overall n (%)	Likely to take PrEP	
		Yes (n=102) n (%)	No (n=82) n (%)
1. Not having to pay for PrEP	148 (80.4)	93 (91.2)	55 (67.1) <sup>c</sup>
2. Access to free HIV testing	133 (72.3)	80 (78.4)	53 (64.6) <sup>b</sup>
3. Access to free sexual health care/monitoring while on PrEP	129 (70.1)	79 (77.5)	50 (61.0) <sup>b</sup>
4. Access to one-on-one counseling and support around PrEP use	127 (69.0)	80 (78.4)	47 (57.3) <sup>c</sup>
5. Access to text based support for PrEP use	101 (54.9)	65 (63.7)	36 (43.9) <sup>c</sup>
6. Access to support or counseling about my sex life	95 (51.6)	60 (58.8)	35 (42.7) <sup>b</sup>
7. Not having to go to my regular doctor to get PrEP	94 (51.1)	58 (56.9)	36 (43.9) <sup>a</sup>
8. Access to group-based adherence support for PrEP use	90 (48.9)	57 (55.9)	33 (40.2) <sup>b</sup>

<sup>a</sup> $p < 0.10$ , <sup>b</sup> $p < 0.05$ , <sup>c</sup> $p < 0.01$ .

participants of color had higher total barrier importance scores ( $M=3.34$ ,  $SD=0.76$ ), compared to whites ( $M=2.88$ ,  $SD=0.74$ ),  $t(182)=4.08$ ,  $p<0.001$ .

*Facilitators of PrEP use*

Table 2 lists the eight potential facilitators of PrEP use presented to participants, and reports the percentage of participants who indicated that each facilitator was “important” or “very important” to them. Table 2 also compares whether the percentage of participants who consider the facilitator important differs by expressed willingness to take PrEP. The facilitators considered important by the greatest percentage of participants were not having to pay for PrEP (80.4%), having access to free HIV testing (72.3%), having access to free sexual health care and monitoring while on PrEP (70.1%), and having access to one-on-one counseling and support around PrEP use (69.0%). All eight facilitators significantly differentiated between those who were likely to take PrEP and those who were not, such that a greater percentage of those who reported being likely to take PrEP rated each facilitator as important to them.

Similar to findings regarding PrEP barriers, there were no differences in participants’ ratings of the importance of facilitators by age. There were differences by race/ethnicity for seven of the eight facilitators, such that participants of color rated each facilitator as significantly more important than their white counterparts. The only facilitator that did not differ by race/ethnicity was not having to pay for PrEP. Facilitators scores were also averaged, and overall, participants of color had higher total facilitator importance scores ( $M=3.93$ ,  $SD=0.86$ ), compared to white participants ( $M=3.38$ ,  $SD=0.94$ ),  $t(182)=4.07$ ,  $p<0.001$ .

*Risk perception and PrEP adherence*

Participants were asked to rate on a scale from 0 to 100 how likely they are to get HIV in their lifetime. Scores ranged from 0 to 99, with an average of 32.8 ( $SD=26.0$ ) and a median of 25 (IQR 10–50). Risk perception scores were significantly higher among participants of color ( $p<0.01$ ), older participants ( $p<0.01$ ), and participants with less education ( $p<0.01$ ). There were no differences in risk perception scores by sexual identity, income, or relationships status. Risk perception scores were marginally higher among those who had been tested in the past 6 months, compared to those who had been tested more than 6 months ago,  $t(182)=1.98$ ,  $p=0.05$ . Risk perception scores were significantly higher among those who reported being likely to take PrEP compared to those who were not likely to take PrEP ( $M=39.1$  versus  $M=25.1$ , respectively),  $t(182)=3.75$ ,  $p<0.01$ .

Participants’ scores on the three adherence items were averaged to create a composite score for PrEP adherence (Cronbach’s  $\alpha=0.81$ ), with higher scores indicating more motivation for adherence. Adherence motivation was marginally higher among white participants ( $p=0.049$ ), but there were no other demographic differences. Not surprisingly, PrEP adherence motivation was higher among those who reported being likely to take PrEP ( $M=5.9$  versus  $M=5.1$ ),  $t(182)=3.80$ ,  $p<0.001$ .

*Impact of barriers and facilitators on PrEP acceptability and adherence*

A logistic regression model was run to examine the multivariate association between reported willingness to take PrEP and HIV risk perception, composite barrier scores, and composite facilitator scores. Results are presented in Table 3. All three predictors were significantly associated with willingness to take PrEP. Every 10-point increase in HIV risk perception scores was associated with a 23% increase in the odds of being willing to take PrEP. Every one-point increase in barriers scores was associated with a 59% decrease in the odds of being willing to take PrEP, and every one-point increase in facilitator scores was associated with more than a threefold increase in the odds of being willing to take PrEP.

A linear regression model was run to examine the multivariate association between PrEP adherence motivation and the same three indicators, adjusting for race/ethnicity. Analysis was restricted to the 102 participants who reported being willing to take PrEP. Results are presented in Table 3. In the multivariable model, neither the coefficients for race/ethnicity nor risk perception were significant. Barrier scores were significantly negatively associated with adherence motivation ( $p<0.01$ ), while facilitator scores were significantly positively associated with adherence motivation ( $p<0.05$ ).

**Discussion**

The effectiveness of PrEP in real world settings will depend on identifying key barriers to and facilitators of PrEP use and adherence among high-risk groups, especially MSM and transgender women who carry a large burden of new HIV infections in the U.S. This study of MSM and transgender women in New York City found that the two top-rated barriers to PrEP use were concerns about its health impact—both long-term consequences and short-term side effects. Although these concerns were important for all participants in the sample, they were particularly important for those who reported that they would not be willing to take PrEP. Educational information about PrEP should address such health concerns

TABLE 3. MULTIPLE LOGISTIC AND LINEAR REGRESSION ANALYSES PREDICTING PrEP ACCEPTABILITY AND ADHERENCE

Predictor variables	Willingness to take PrEP		Motivation for PrEP adherence <sup>1</sup>	
	Exp (B)	SE	$\beta$	SE
Risk perception	1.023 <sup>b</sup>	0.007	0.05	0.01
Barriers	0.413 <sup>a</sup>	0.254	-0.34 <sup>b</sup>	0.18
Facilitators	3.079 <sup>c</sup>	0.241	0.23 <sup>a</sup>	0.17
	Nagelkerke $R^2=0.29$ , $\chi^2(3)=45.52^c$		$R^2=0.11$ , $F(4, 97)=3.03^a$	

<sup>a</sup> $p\leq 0.05$ , <sup>b</sup> $p\leq 0.01$ , <sup>c</sup> $p\leq 0.001$ .

<sup>1</sup>Model restricted to those who reported being willing to take PrEP ( $n=102$ ) and adjusted for race/ethnicity.

directly, and provide potential PrEP users with information about side effects and their management. Results from the iPrEX trial were encouraging in terms of the time-limited nature of mild side effects such as nausea, which often resolved within the first 4 weeks and could be managed with over the counter medication.<sup>1</sup> A systematic meta-analysis suggests that tenofovir disoproxil fumarate (TDF) may be associated with significant, though modest, renal function problems,<sup>24</sup> and these findings seem supported by low rates of renal problems among participants across PrEP studies.<sup>1-3</sup> However, concerns remain about the impact of PrEP medication over more extended periods of time, and studies of provider attitudes have indicated similar concerns.<sup>25,26</sup> More research is needed to better elucidate both patient and provider concerns, and develop potential solutions to alleviate them.

It is important to note that the other two top-rated barriers had to do with participants' anxiety about future infection—concerns about drug resistance in the event that they did become HIV-positive after taking PrEP, and concerns that PrEP might not provide complete protection against HIV. Such findings underscore the role of risk perception in patients' decision-making around PrEP use, and raise important issues regarding risk compensation. Participants who perceived themselves to be at greater risk for HIV were more likely to say they would be willing to take PrEP, but barrier scores were independently associated with PrEP acceptability over and above the role of risk perception. In other words, regardless of the degree of HIV risk patients perceive, they remain concerned about the "partial efficacy" of PrEP, suggesting that they may be evaluating whether to use PrEP as an alternative to condom use. Such concerns may provide a perfect entre into discussing risk compensation and combination prevention strategies with potential (and ongoing) PrEP users, and underscore the extent to which this population takes HIV prevention seriously.

While the top-rated facilitator was provision of PrEP free of charge, it is important to note that access to PrEP support services—including HIV testing, sexual health care/monitoring, and one-on-one counseling—were rated as important facilitators to PrEP use by over 70% of the total sample. Endorsement of these facilitators was also significantly associated with greater willingness to take PrEP. Although the Centers for Disease Control and Prevention (CDC) interim guidelines on PrEP use advise ongoing adherence and condom counseling,<sup>27</sup> questions remain about the extent to which such support services will be deemed necessary, feasible, or cost-effective in real-world clinical settings.<sup>28-30</sup> These data suggest that investment in such counseling is important to potential PrEP users, and may be essential in facilitating adherence motivation in PrEP adopters.

Consistent with previous research,<sup>5</sup> HIV risk perception was significantly associated with willingness to use PrEP. However, barriers and facilitators to PrEP use predicted willingness to use PrEP, over and above the effect of risk perception. In this analysis, facilitators were almost three times more important than barriers in determining willingness to take PrEP. Often, public health campaigns focus primarily on reducing barriers to adoption of a new intervention; these findings suggest the importance of developing programs that provide patients with needed sexual health support services in the context of PrEP. Such a strategy might

increase PrEP acceptability, while simultaneously reaching a larger group of individuals who may not need PrEP, but can still benefit from counseling, testing, and other support.

Among those who were willing to use PrEP, motivation for adherence was negatively associated with barrier scores and positively associated with facilitator scores. It makes sense that concerns about PrEP efficacy or side effects may influence adherence behavior, but this is, to our knowledge, the first study to suggest that factors such as access to counseling, testing, or support services may impact adherence motivation. Once again, these findings underscore the importance of developing PrEP programs that include behavioral support and place PrEP use within the context of broader sexual health, as one of the available tools one can consider using, depending on their needs and lifestyle at any given moment.

In our sample, MSM and transgender women of color rated both PrEP barriers and facilitators as more important than their white counterparts. Across existing studies, awareness of PrEP has been consistently lower among men of color, those who are less highly educated, and those whose primary care providers are not aware of the fact that they have sex with men.<sup>31,32</sup> These differences mirror existing research on access to HIV testing, prevention services, and treatment.<sup>16</sup> Medical mistrust has been shown to be significantly higher among MSM of color,<sup>33-35</sup> and this mistrust—especially when associated with conspiracy beliefs related to the origin of the virus and its treatment—has been associated with mistrust and discomfort interacting with organizations that provide HIV treatment and care.<sup>36</sup> These findings suggest that the effectiveness of PrEP will necessitate considering social factors associated with disparities in access to prevention and care services among MSM and transgender women that might directly impact disparities in access to or acceptability of PrEP.

Our findings are subject to several limitations. The cross-sectional nature of the data does not allow us to infer causality. Importantly, participants were asked to respond to hypothetical scenarios, which may not be generalizable to their actual behavior. While our sample was diverse in terms of race/ethnicity, age, and socioeconomic status, the limited number of transgender women in our sample limits our findings for this group. Thus, future research is warranted with and for transgender women to understand attitudes towards PrEP to guide implementation efforts in these communities. Additionally, participants were not asked questions about other medications and adherence. As such, there is no way to make inferences between hypothetical reports of PrEP adherence and comparative adherence to other medications. Finally, the participants in this study resided in New York City where there are many LGBT sexual health services, which restrict our ability to generalize these results to other MSM and transgender women in different regions.

## Conclusions

PrEP continues to raise questions among researchers, policymakers, and practitioners about the best effective and ethical strategies to reduce HIV transmission among MSM and transgender women in real world settings. STI and sexual health clinics are likely to play a key role in the implementation and dissemination of PrEP to individuals in our most vulnerable communities. The findings from this study underscore the importance of implementing clinical guidelines

for the provision of PrEP, which would include monitoring side effects and adherence, as well as the provisions of ongoing HIV testing and sexual health counseling.

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### Author Disclosure Statement

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### References

- Grant RM, Lama JR, Anderson PL, McMahan V, Liu AY, et al. Preexposure chemoprophylaxis for HIV prevention in men who have sex with men. *New Eng J Med* 2010;363:2587–2599.
- Baeten JM, Donnell D, Ndase P, et al. Antiretroviral prophylaxis for HIV prevention in heterosexual men and women. *New Eng J Med* 2012;367:399–410.
- Thigpen MC, Kebaabetswe PM, Paxton LA, et al. Antiretroviral preexposure prophylaxis for heterosexual HIV transmission in Botswana. *New Eng J Med* 2012;367:423–434.
- Saberi P, Gamarel KE, Neilands TB, 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:e50061.
- Krakower DS, Mimiaga MJ, Rosenberger JG, et al. Limited awareness and low immediate uptake of pre-exposure prophylaxis among men who have sex with men using an Internet social networking site. *PLoS One* 2012;7:e33119.
- Brooks RA, Kaplan RL, Lieber E, Landovitz RJ, Lee SJ, Leibowitz AA. Motivators, concerns, and barriers to adoption of preexposure prophylaxis for HIV prevention among gay and bisexual men in HIV-serodiscordant male relationships. *AIDS Care* 23:1136–1145.
- Liu AY, Kittredge PV, Vittinghoff E, et al. Limited knowledge and use of HIV post- and pre-exposure prophylaxis among gay and bisexual men. *J Acq Immune Def Syndrome* 2008;47:241–247.
- Nodin N, Carballo-Dieguez A, Ventuneac AM, et al. Knowledge and acceptability of alternative HIV prevention bio-medical products among MSM who bareback. *AIDS Care* 2008;20:106–115.
- Calderon Y, Leider J, Cowan E, Brusalis C, Mantell J, Sandfort T. HIV pre-exposure prophylaxis (PrEP)-knowledge and attitudes among a New York City emergency department patient population. *Retrovirology* 2012;9:P94.
- Golub SA, Kowalczyk W, Weinberger CL, Parsons JT. Pre-exposure prophylaxis and predicted condom use among high-risk men who have sex with men. *J Acq Immune Def Syndromes* 2010;54:548.
- Khawcharoenporn T, Kendrick S, Smith K. HIV risk perception and preexposure prophylaxis interest among a heterosexual population visiting a sexual transmitted infection clinic. *AIDS Patient Care STDs*. 2012;26:222–223.
- Brooks RA, Landovitz RJ, Kaplan RL, Lee S, Barkley TW. Sexual risk behavior and acceptability of HIV pre-exposure prophylaxis among HIV-negative gay and bisexual men in serodiscordant relationships: A mixed methods study. *AIDS Patient Care STDs*. 2012;26:87–94.
- Anderson PL, Lama JR, Buchbinder S, et al. Expanded case-control analysis of drug detection in the global iPrEx trial. Sixth IAS Conference; 2011; Rome.
- Cohen MS, Muessig KE, Smith MK, Powers KA, Kashuba ADM. Antiviral agents and HIV prevention: Controversies, conflicts, and consensus. *AIDS* 2012;26:1585–1598.
- Baeten J, Celum C. Oral antiretroviral chemoprophylaxis: Current status. *Curr Opin HIV/AIDS* 2012;7:514–519.
- Millett GA, Peterson JL, Flores SA, et al. Comparisons of disparities and risks of HIV infection in black and other men who have sex with men in Canada, UK, and USA: A meta-analysis. *Lancet* 2012;380:341–348.
- Cohen J. AIDS research. Microbicide fails to protect against HIV. *Science* 2008;319:1026–1027.
- Watson-Jones D, Weiss HA, Rusizoka M, et al. Effect of herpes simplex suppression on incidence of HIV among women in Tanzania. *New Eng J Med* 2008;359:1560–1571.
- Okwundu C, Okoromah C. Antiretroviral pre-exposure prophylaxis (PrEP) for preventing HIV in high-risk individuals. *Cochrane Database Syst Rev* 2009;1.
- Peterson L, Taylor D, Roddy R, et al. Tenofovir disoproxil fumarate for prevention of HIV infection in women: A phase 2, double-blind, randomized, placebo-controlled trial. *PLoS Clin Trials* 2007;2:e27.
- Guest G, Shattuck D, Johnson L, et al. Acceptability of PrEP for HIV prevention among women at high risk for HIV. *J Women's Health* 2010;19:791–798.
- Ware NC, Wyatt MA, Haberer JE, et al. What's love got to do with it? Explaining adherence to oral antiretroviral pre-exposure prophylaxis for HIV-serodiscordant couples. *J Acq Immune Def Syndromes*. 2012;59:463.
- Amico K, McMahan V, Goicochea P, et al. Supporting study product use and accuracy in self-report in the iPrEx study: Next step counseling and neutral assessment. *AIDS Behav* 2012:1–17.
- Cooper RD, Wiebe N, Smith N, Keiser P, Naicker S, Tonelli M. Systematic review and meta-analysis: Renal safety of tenofovir disoproxil fumarate in HIV-infected patients. *Clin Infect Dis* 2010;51:496–505.
- Arnold EA, Hazelton P, Lane T, et al. A qualitative study of provider thoughts on implementing pre-exposure prophylaxis (PrEP) in clinical settings to prevent HIV infection. *PLoS One* 2012;7:e40603.
- White JM, Mimiaga MJ, Krakower DS, Mayer KH. Evolution of Massachusetts physicians attitudes, knowledge, and experience regarding the use of antiretrovirals for HIV prevention. *AIDS Patient Care STDs* 2012;26:395–405.
- Center for Disease Control (CDC). Interim guidance: Pre-exposure prophylaxis for the prevention of HIV infection in men who have Sex with men. *Morbidity Mortality Weekly Rep* 2011;60:65–68.
- Myers GM, Mayer K. Oral preexposure anti-HIV prophylaxis for high-risk U.S. populations: Current considerations in light of new findings. *AIDS Patient Care STDs* 2011;25:63–71.
- Underhill K, Operario D, Skeer M, Mimiaga M, Mayer K. Packaging PrEP to prevent HIV: An integrated framework

- to plan for pre-exposure prophylaxis implementation in clinical practice. *J Acquir Immune Defic Syndr* 2010;55:8–13.
30. Golub SA, Operario D, Gorbach PM. Pre-exposure prophylaxis state of the science: Empirical analogies for research and implementation. *Curr HIV/AIDS Rep* 2010;7:201–209.
  31. Barash EA, Golden M. Awareness and use of HIV pre-exposure prophylaxis among attendees of a seattle gay pride event and sexually transmitted disease clinic. *AIDS Patient Care STDS* 2010;24:689–691.
  32. Mimiaga MJ, Case P, Johnson CV, Safren SA, Mayer KH. Pre-exposure antiretroviral prophylaxis attitudes in high-risk Boston area men who report having sex with men: Limited knowledge and experience but potential for increased utilization after education. *J Acquir Immune Defic Syndr* 2009;50:77–83.
  33. Bird ST, Bogart L.M. Conspiracy beliefs about HIV/AIDS and birth control among African Americans: Implications for the prevention of HIV, other STIs, and unintended pregnancy. *J Social Issues* 2005;61:109–126.
  34. Halbert CH, Weathers B, Delmoor E, Mahler B, Coyne J, Thompson HS, Lee D. Racial differences in medical mistrust among men diagnosed with prostate cancer. *Cancer* 2009; 115:2553–2561.
  35. Thompson HS, Valdimarsdottir HB, Winkel G, Jandorf L, Redd W. The group-based medical mistrust scale: Psychometric properties and association with breast cancer screening. *Prev Med* 2004;38:209–218.
  36. Hoyt MA, Rubin LR, Nemeroff CJ, Lee J, Huebner DM, Proeschold-Bell R. HIV/AIDS-related institutional mistrust among multiethnic men who have sex with men: Effects of HIV testing and risk behaviors. *Health Psychol* 2012;31: 269–277.

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