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Effects of messaging about multiple biomedical and behavioral HIV prevention methods on intentions to use among U.S. MSM: Results of an experimental messaging study

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Abstract

Combining multiple biomedical and behavioral HIV prevention approaches is a priority for at-risk populations such as men who have sex with men (MSM), and it is essential to understand how receiving messages about multiple approaches impacts attitudes and intentions for their use. We examined whether receiving combinations of different HIV prevention messages produced differences in perceived benefits and costs of condom use, and in intentions to use condoms and biomedical prevention approaches. MSM (N = 803) were recruited online and were randomly assigned to view informational messages about one, two, or four of the following prevention options: pre-exposure prophylaxis (PrEP), non-occupational post-exposure prophylaxis (nPEP), rectal microbicides, and condoms. The number of HIV prevention messages did not produce differential attitudes and intentions regarding condoms, nor did it produce changes in attitudes towards unprotected sex. Receiving multiple messages was associated with greater intentions to use PrEP and nPEP, but not rectal microbicides.

Keywords

HIV prevention; health communication; pre-exposure prophylaxis; condoms; Post-Exposure Prophylaxis; Rectal Microbicides

INTRODUCTION

New biomedical interventions, including pre-exposure prophylaxis (PrEP) and nonoccupational post-exposure prophylaxis (nPEP) have recently been approved and endorsed for use in preventing HIV transmission in high risk populations, especially among men who have sex with men (MSM)[1–4]. Other emerging biomedical primary prevention approaches, such as topical microbicides, have shown promise in clinical trials with female users[5], but have not yet been approved for rectal use in MSM who represent the majority of

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HIV infections in the U.S.[6]. In regards to secondary prevention, early antiretroviral therapy was found to substantially reduce transmissions to HIV negative partners among heterosexual couples in developing countries (i.e., "treatment as prevention" or TasP)[7], but significant challenges may remain for applying this model to U.S. MSM[8]. In spite of these challenges, MSM have been using information about viral suppression to negotiate and make decisions about condom use even before HPTN 052 results were published[9]. As we move into an era of HIV prevention that prioritizes the combination of multiple scientifically proven biomedical and behavioral approaches for high priority populations[10], it is essential to understand how receiving messages about multiple prevention approaches impact attitudes and intentions for use of the most widely available, protective, and cost-effective prevention approach available—condom use.

The need to understand how condom use interacts with the use of other prevention technologies is especially pressing because of the uncertainties about efficacy of some biomedical prevention approaches for MSM. Though PrEP and microbicides have been shown to reduce HIV transmission in research settings[5,11], the exact degree of effectiveness in practice for each among MSM remains largely unknown. The efficacy of nPEP has not been demonstrated by a randomized clinical trial, but it is recommended in the U.S. Public Health Service guidelines[12] based on case-control studies, animal studies, and other designs[13]. At current levels of effectiveness, biomedical interventions will never completely replace the use of barrier methods of risk reduction, but instead offer additional opportunities to provide packaged prevention services that might reduce the risk of transmission.

Risk Compensation

Risk compensation, or reductions in condom use based on beliefs that biomedical interventions offer equivalent protection from HIV infection, could offset the benefits of these new interventions[14]. Risk compensation theory most directly applies to the actual use of a biomedical prevention approach, but its postulates may generalize to the mere exposure to messages about biomedical prevention (i.e., learning about biomedical prevention may negatively alter attitudes towards condoms)[15]. If this is the case, mass communications about the availability of biomedical prevention could increase the prevalence of unprotected sex through perception of reduced risk of infection or less favorable attitudes towards condoms[16]. Although biomedical prevention technologies may reduce risk of HIV transmission, because they are not 100% effective, a concomitant decrease in condom use could lead to a net increase in transmission risk. Research has shown both support for the theory of risk compensation, with MSM more willing to reduce their condom use if they were to use PrEP[17,18], and against the theory of risk compensation, with participants showing no significant increases in risk behaviors after being administered nPEP[19–21] or PrEP[2,22,23].

Combining multiple prevention messages

Typical persuasive prevention messaging advocates for individuals to take a single action without the opportunity for alternative options, but combination prevention involves two or more prevention messages to be advocated[24]. Messaging about multiple prevention

strategies has been characterized as an approach with both "promise and potential pitfalls"[25]. The promise comes for the potential benefits of providing men with multiple choices for HIV prevention. If they decide not to use condoms or are unable to use condoms consistently, then alternative, though potentially less effective, methods may still decrease their overall risk of infection. These alternatives may also be a way to supplement their condom use to increase their protection against HIV transmission. However, there may be a major pitfall of this approach if these alternatives lead to decreased interest in the use of condoms— a highly effective and scalable means of prevention[10]. How receiving multiple prevention messages at once affects attitudes towards or intentions to use condoms has received only little research attention. One study reported that women exposed to a multiple prevention message condition that included male condoms, female condoms, and spermicides were less convinced of the effectiveness of the male condom than those women exposed to the male condom only message condition[25]. Other studies have produced similar results in terms of reduced male condom use with multiple messages, while at the same time finding a higher proportion of sex acts protected by some HIV prevention method (male condom, female condom, or spermicide) after the provision of combined prevention messages[26,27].

Understanding the decision making process behind modifying health behavior is critical in the development of effective prevention messaging interventions. Decisional balance[28,29] is a concept that emphasizes weighing the benefits versus costs of a particular action. Research has shown that an increase in perceived benefits to condom use rather than the decrease in perceived costs is more critical in promoting behavior change[30,31]. As such, the message recipients' attitudes about the benefits and costs of condom use may be altered when receiving a message about other prevention approaches that have fewer costs in terms of sexual pleasure or obtrusiveness. This cognitive comparison of these costs of condom use relative to biomedical approaches may produce a downward appraisal of the decisional balance related to condom use and a subsequent decrease in intentions for use, and in turn, potentially increase intentions to use the alternative approaches instead. However, to our knowledge no study has tested how receiving messages about multiple HIV prevention approaches affects decisional balance about condom use and intentions to use methods of HIV prevention.

Current Study

The aim of the current study was to understand how potential users make sense of their HIV prevention options among an assortment that vary in their efficacy, cost, impact on sexual satisfaction, and obtrusiveness. We sought to understand how receiving multiple messages about condoms, PrEP, nPEP, and rectal microbicides may change attitudes towards and likelihood of using condoms as well as likelihood of using the newer biomedical technologies which have uncertain levels of effectiveness. Because individuals' perceptions of and intentions to use these methods likely depends on their own perceived risk for becoming infected with HIV, these intentions and beliefs were compared between HIV-negative MSM who had high and low HIV risk behavioral profiles. To accomplish our aims, MSM who participated in an online survey were randomly assigned to one of eight groups that received messages about condoms, PrEP, nPEP, rectal microbicides, condoms plus each

biomedical strategy, or all four messages. We then examined post-messaging levels of condom decisional balance, intentions to use each HIV prevention method, and differences in these outcomes by HIV risk group.

METHODS

We recruited participants via banner advertisements placed on Facebook from June 6 to June 20, 2012 targeting men over the age of 18 living in the United States who indicated an interest in men on their profiles. Social networking sites, such as Facebook, have very high coverage of Americans: a recent Pew survey indicated that 83% of Americans under the age of 29 had a social networking account, such as Facebook[32]. This proportion is higher than the 51% of Americans ages 25–29 with a landline phone[33]. In a recent HIV/STI cohort study of MSM in Atlanta, men recruited through venue-based sampling were compared to participants recruited through Facebook; the investigators found no significant differences in education, socioeconomic status or HIV prevalence by recruitment method[34].

Potential respondents who clicked on the banner advertisements were taken to an eligibility screener administered online through Survey Gizmo (n = 3,167 clicks). Eligibility criteria included male sex, 18 years of age or older, and having had sex with a man in one's lifetime. Given the brief nature of the study (participation time M = 13.63 minutes), no compensation was provided. This study was considered anonymous and exempt from review by the Emory University and Northwestern University Institutional Review Boards.

Of all qualified men who began the survey (n=1,257), 69% (n=871) completed it. Since the purpose of these analyses were to examine HIV prevention strategies aimed at HIV-negative MSM, the 8% (n=68) of participants who self-reported an HIV-positive status were excluded. The final analytic sample used for subsequent analyses includes 803 HIV negative participants. Table 1 contains the demographic characteristics of the sample.

Four HIV prevention videos were developed whose sole focus was either about condoms, PrEP, nPEP, or rectal microbicides for HIV prevention. Each video conveyed the same information about each prevention approach: the financial costs, percent effectiveness based on available data, how to use, known side effects, and impact on sexual pleasure. See Appendix A for the script for each video. Respondents were randomly assigned into eight groups which viewed videos about the following HIV prevention strategies: (1) condoms (n=107), (2) PrEP (n=92), (3) nPEP (n=103), (4) rectal microbicides (n=102), (5) condoms and PrEP (n=105), (6) condoms and nPEP (n=96), (7) condoms and rectal microbicides (n=112), or (8) all four messages (n=86). Since the software randomized participants in this brief study prior to determination of eligibility, the percentage of respondents in each group ranged from 11% to 14%.

Measures

HIV-risk group designation—Participants who reported that they had engaged in unprotected anal sex with a casual male partner in the past 12 months were categorized as high-risk (n=182, 22.7%). All other participants who did not engage in unprotected anal sex with a casual male partner in the past 12 months were categorized as low-risk (n=600,

74.7%). Participants who did not complete the necessary information for determining if they did or did not engage in unprotected anal sex with a casual male partner were excluded from analyses (n=21, 2.6%).

Decisional balance—A 15-item questionnaire assessing the benefits of condom use (α=.57, 3 items), costs of condom use (α=.83, 5 items), benefits of unprotected sex (α=.85, 5 items), and costs of unprotected sex (α=.63, 2 items) developed by Parsons, Halkitis, Borkowski and Bimbi[35] was administered to all participants. All questions were measured on a 5-point Likert scale (1 = strongly disagree, to 5 = strongly agree). Examples of items include: “Compared to having sex with a condom, having sex without a condom is more responsible” and “Compared to having sex without a condom, having sex with a condom interrupts the spontaneity of sexual activity”. As scales with few items tend to produce lower reliability estimates, low alphas for the 2- and 3-item subscales were not unexpected[36].

Likelihood of using HIV prevention methods—Participants who were assigned to view the condom alone (n=107) or in combination with other methods (n = 399), PrEP (n=283), nPEP (n=285), or rectal microbicide (n=300) prevention messages were asked to report their likelihood of using each under certain conditions. Participants who solely viewed the PrEP, nPEP, or rectal microbicide videos were not administered the condom use item. The condom question asked: “If you were having anal sex with a partner in the next 12 months, how likely would you be to use a condom (if you were the top partner) or persuade your partner to use a condom (if you were the bottom partner)?” The PrEP question asked: “If a doctor were to prescribe PrEP to you in the next 12 months based on your pattern of sexual risk, how likely would you be to use PrEP to prevent HIV?” The nPEP question asked: “If you were to have an exposure to HIV in the 12 months, how likely would you be to use nPEP to prevent HIV?” The rectal microbicide question asked: “If you were having anal sex with a partner in the next 12 months, how likely would you be to use rectal microbicides (if you were the bottom partner) or persuade your partner to use rectal microbicides (if you were the top partner)?” The questions were measured on a 5-point Likert scale (1=very likely to 5=very unlikely). Response options were reverse coded so higher values represented a greater likelihood of use.

Multiple message categorizations—There were a total of 8 distinct messaging groups. However, to determine the effects of receiving multiple messages, these 8 groups were divided into sub-groups by the number of messages they received: one (n=404), two (n=313), or four (n=86).

Statistical Analysis

First, to evaluate the existence of possible bias in random assignment, differences in age and race across the separate types of prevention messages received were analyzed using analysis of variance (ANOVA), with Tukey’s post hoc test and Chi-square tests, respectively. Second, the differences in reported likelihood of using each HIV prevention method (condoms, PrEP, nPEP, and rectal microbicides) between the number of prevention messages received were explored using analysis of covariance (ANCOVA). Differences stratified by HIV risk group were also assessed. Next, ANCOVA was conducted to

determine if any differences in decisional balance scales existed depending on the number of prevention messages participants received or the specific messages or combination of messages.

RESULTS

Tests of Random Assignment

No significant difference in age was detected across messaging groups; however, differences in race (categorized into groups: White, Hispanic/Latino, and other) were detected. Specifically, a significantly lower percentage of Hispanic participants were assigned to the messaging group that viewed the condom plus rectal microbicide videos compared to all other messaging groups, except the group that viewed the condom plus PrEP videos where the difference was not significant. Hispanic participants were also significantly less likely to be assigned to the group that viewed the condom only video than the condom plus PrEP videos. Because the sample was predominantly White (77%) and each messaging group only had a limited number of non-White participants (range: 10 – 27%), significant differences were not surprising and race/ethnicity was controlled for in all further analyses.

Likelihood of Using HIV Prevention Methods

Table 2 shows the ANCOVA results for differences in likelihood of using each HIV prevention method across the number of messages received as well as stratified by HIV risk group, while controlling for age and race (White vs. Non-White). Across all participants, significant increases exist in the reported likelihood of using PrEP between the one message (M=2.86; SE=0.17) and two message (M=3.50; SE=0.16) groups and the one message and four message groups (M=3.65; SE=0.17). In addition, significant increases were found in the reported likelihood of using nPEP between the one message (M=4.11; SE=0.11) and the four message (M=4.72; SE=0.12) groups.

When the analysis was stratified by HIV risk group, similar findings amongst the low-risk group, compared to the entire sample, were discovered. In the low-risk group, significant increases were found in the reported likelihood of using PrEP between the one message (M=2.39; SE=0.21) and two message (M=3.45; SE=0.18) groups and the one message and four message groups (M=3.50; SE=0.19). Also, significant increases were found in the reported likelihood of using nPEP between the one message (M=4.25; SE=0.12) and the four message (M=4.70; SE=0.12) groups. In the high-risk group, similar results were found between the one message (M=3.85; SE=0.24) and the four message (M=4.79; SE=0.29) groups showing significant increases in the likelihood of using nPEP; however, no significant differences in the likelihood of using PrEP existed. The number of HIV prevention messages received showed no significant effect in the likelihood of using condoms or rectal microbicides in either the entire sample or when stratifying by HIV risk group.

Additional ANCOVA analyses were conducted to determine if the likelihood of using each HIV prevention method differed between the low-risk and high-risk groups stratified by the number of messages (one, two, or four) each participant received. Of the 12 separate

ANCOVA analyses conducted (4 prevention methods × 3 messaging groups), only one resulted in significant findings. In the one message group, the high-risk group (M=3.82; SE=0.28) showed a significantly increased likelihood of using PrEP compared to the low-risk group (M=2.45; SE=0.19; p<.01).

Decisional Balance

Table 3 shows the ANCOVA results for differences in benefits and costs of condom use and unprotected sex across the number of prevention messages received stratified by HIV risk group, while controlling for differences in age and race (White vs. Non-White). No significant difference in post-intervention reports of benefits or costs was found for any of the 4 subscales across these prevention messaging groups regardless of if analyses were stratified by HIV risk group or not. A separate ANCOVA tested for differences in benefits and costs of condom use and unprotected sex; however, instead of testing across the number of messages received, testing across the specific intervention message (8 groups) was performed to determine if there were effects of receiving messages about particular interventions or combinations of interventions. Similarly, there were no significant differences. In summary, there were no significant differences based on number of HIV prevention messages received, or the specific message combinations, in decisional balance scores.

To determine if the lack of significant differences in attitudes towards condoms were due to insufficient power to detect reasonable effect sizes, we performed a post-hoc power analysis. Given our sample, we had power to detect effect sizes of .11, .24, and .13 for testing differences among all participants, high-risk group, and low-risk group respectively, which are considered small effects sizes. Given the effect sizes produced for differences between messaging conditions in decisional balance, samples > 60,000 would be required for significance of $p < .05$. Therefore, we conclude that the lack of significant results stemmed from very small or no differences between randomly assigned conditions rather than low power.

DISCUSSION

As HIV prevention for MSM increasingly moves towards combining multiple, partially effective approaches[10], it is critical to understand how combination messages affect attitudes towards unprotected sex and condoms and intentions to use different prevention strategies. Our findings suggest that, among MSM, the number of different HIV prevention messages does not produce differential intentions regarding condoms or rectal microbicides, nor does it produce changes in attitudes towards condom use or unprotected sex. However, receiving multiple messages significantly increased intentions to use nPEP across both high- and low-risk groups of MSM, and intentions to use PrEP specifically among high-risk MSM, as defined by unprotected anal sex with a casual partner in the past 12 months. In addition, messages about specific prevention approaches (e.g., nPEP versus condoms; PrEP only versus PrEP, nPEP, condoms, and rectal microbicides) were also unrelated to decisional balance for condom use and unprotected sex. This lack of effect was consistent across low- and high-risk groups of MSM.

Our results are inconsistent with risk compensation theory, which posits that use of a biomedical prevention approach will lead to less positive attitudes, intentions, and use of condoms. In the current study, participants were not actually using these HIV prevention approaches, but rather received varying numbers of messages about different HIV prevention methods. If we had found that receiving messages about one or more biomedical prevention strategies produced significant differences in condom use attitudes or intentions, it would suggest the need for extreme caution in how messaging is handled about these multiple HIV prevention options in order to avoid increases in risk behaviors. In addition, because a combination of messages about condoms and biomedical prevention methods *increased* intentions to use PrEP and nPEP *without* a concomitant decrease in condom use attitudes or intentions, exposure to messages about both biomedical and behavioral methods may be optimal for encouraging the use of several HIV prevention strategies among MSM. Together, these findings have important implications for the design of messaging campaigns related to biomedical HIV prevention strategies as it suggests that exposure to messages about biomedical prevention do not alter condom use attitudes or intentions for use.

Our findings regarding MSM's intentions for PrEP and nPEP use are encouraging and indicate that messaging campaigns with information about condoms and multiple biomedical prevention approaches may improve uptake of biomedical strategies regardless of MSM's risk of HIV. In particular, this approach could encourage low-risk MSM to further reduce their risk by preparing to access nPEP if an exposure occurs in the future, and reinforce high-risk MSM with already strong intentions to use these strategies. In addition, after one message, high-risk MSM had stronger intentions for PrEP use than low-risk MSM. This finding could reflect greater knowledge about PrEP among high-risk MSM, who may be more aware about or have more experience with using biomedical prevention strategies[37], rather than a function of number or type of message received. However, we did not assess for preexisting use or information about the various methods, or baseline intentions for their use, which would be important to examine in future messaging research. The pattern could also be due to high risk MSM recognizing their level of risk and therefore being more receptive to messages about multiple prevention options. It is also worth noting that prior studies of PrEP have all included extensive condom promotion education[11,38,39], and our results suggest this education likely increased interest and therefore possibly adherence to PrEP use beyond what would have occurred if condom education had not been provided.

The results from our messaging study are consistent with previous research findings of no increased risk behavior subsequent to nPEP usage[19–21]. Studies of risk compensation in regards to PrEP have been more inconsistent depending on their design[2,17,18]. A major difference between our studies and these other studies of nPEP and PrEP is that ours focused on differences based on message exposure rather than behavioral change under usage. Our results are not consistent with an earlier messaging study of African-American and Mexican young adult women, which found that women who received multiple hierarchically ordered messages (i.e., use male condoms; if not, use female condoms; if not, use spermicide) were significantly less likely to rate male condoms as highly effective against HIV[25]. Our study differed in that messages were not hierarchical, the sample consisted of MSM, and there

have been substantial developments in HIV prevention since the early 2000s. Further messaging research on the effects of multiple prevention messages is needed to resolve these differences in results.

Future research in this area should consider the public health and clinical context in which health communication about HIV prevention occurs, and that such messages may be delivered using multiple methods. First, clients might receive a relatively simplistic multiple message format where all options are made available to all potential users. This is the approach utilized in the current study for those participants who received multiple messages. It is similar to the way most health communication occurs online, where comprehensive information is provided about multiple options and site visitors can browse the available information. Second, clients might be provided messages in a hierarchical format, in which messages are prioritized and delivered sequentially with messages about less effective approaches being delivered only if a more effective approach is refused (e.g., PrEP is refused so then nPEP is offered). This is the approach used in the study by Miller and colleagues[25], and to implement this approach in the current context of combination behavioral-biomedical prevention would require the development of a ranking of the effectiveness of prevention approaches. Third, a tailored approach might be provided, where clients are matched to particular messages based on their risk profile and other metrics of likelihood of adherence to a particular approach. If the best matching approach is refused, then subsequent prevention strategies could be messaged hierarchically. The development of a tailored approach may be the most desirable of these three methods, as it would help potential users identify the best prevention approaches for them, as well as have options if their match was not appealing to them due to some characteristic that was not included in the algorithm, or because of preference. More research is needed to help understand how the delivery of multiple messages across these formats influence decision making about HIV prevention and how to optimize decision making for potential users.

The current study had a number of limitations. First, the sample was recruited through an online social networking site and therefore does not represent individuals who do not use the Internet, social networking sites, or do not respond to advertisements on such sites. Clearly, African-Americans are underrepresented in the sample. Second, we only tested one approach to messaging where participants were randomly assigned to messaging groups; other messaging approaches may produce different results (i.e., hierarchical, targeted). Third, participants who solely viewed the PreP, nPEP, and rectal microbicide videos were not asked to report their condom use intentions; thus, it is not clear whether receiving these messages alone affected participants' condom use intentions. Fourth, the cross-sectional nature of the study did not allow us to explore how messaging approaches influence behavior over time. Instead, this study focused on attitudes and intentions. Despite its cross-sectional nature, the randomized experimental design did allow us to make conclusions about causal effects. Fifth, we did not explore all prevention methods of interest, including HIV treatment as prevention. Finally, we did not measure what exposure participants had to information about condoms and biomedical prevention strategies in advance of receiving the study messages. Doing so in future studies would allow for estimations between interactions of existing knowledge with new information from messages.

In summary, our results suggest no differences in attitudes and intentions towards condom use or unprotected sex when MSM received brief messages about condoms and multiple biomedical prevention approaches. Additionally, our findings indicate that a combination messaging strategy actually increases intentions to use certain biomedical prevention approaches including PrEP and nPEP, particularly among higher-risk MSM. This is preliminarily positive news for efforts associated with disseminating information about biomedical prevention options because it suggests learning about these options does not worsen attitudes and intentions for condom use, and may serve to encourage more widespread use of biomedical HIV prevention strategies.

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Appendix A: Scripts for HIV prevention messages

Note: Where the script indicates a bullet, the core information from that sentence was shown as text on the screen next to the speaker.

Condoms

Condoms can really reduce your chances of contracting HIV and other sexually transmitted infections, like gonorrhea and chlamydia. Each condom costs about $1 (cost bullet), although there are a lot of places you can get them for free. Condoms work by placing a barrier between two people during sex to prevent exchange of body fluids, like cum, which can transmit infections like HIV and other sexually transmitted infections. To use a condom (how bullet), you just pinch the tip and roll down your or your partner's penis while it is hard. Be sure that the ring on the condom is on the outside, so it's easy to roll the condom on. Condoms have been proven to be about 98% effective (how effective bullet) at preventing the spread of disease when used properly, so be sure to place the condom on correctly, check the expiration date before each use, and use lots of condom-safe lube! There are generally no side effects so using a condom; but, sex with a condom may feel different than sex without a condom (impact on sex bullet) and some people are sensitive to the material it is made from (side effect condom). This has been solved by making condoms from a variety of materials including latex and polyurethane.

Pre-Exposure Prophylaxis (PrEP)

Oral pre-exposure prophylaxis, or PrEP, is a relatively new way of preventing the spread of HIV. Guys taking Truvada, a medication that is normally used to treat HIV, were 44% less likely to get infected with HIV (how effective bullet). To prevent HIV infection, you would need to take this medication every day, whether you plan to have sex that day or not (how bullet). Skipping a dose would make it less effective. The medication would also have to be prescribed by a doctor who would need to see you at least every 3 months for tests. The cost of Truvada right now is a little less than $1200 per month (cost bullet). It is possible that the cost may come down a bit if this prevention method becomes more commonly used, and some insurance companies may help cover the cost. However, it is possible that you might

have to pay for it yourself. Just like most medications, there are side effects to taking Truvada for extended periods of time. Some people have nausea and fatigue that typically goes away after the first month or so (side effects bullet). In very rare instances there has been liver or kidney damage or a weakening of the bones. Since this involves taking a pill once a day, it doesn't change what it feels like to have sex (impact on sex bullet).

Non-Occupational Post-Exposure Prophylaxis (nPEP)

nPEP, or non-occupational post-exposure prophylaxis, means taking drugs that are normally used to treat HIV/AIDS after you have had a potential exposure to reduce your likelihood of becoming infected. For instance, if you have unprotected sex with someone who is HIV positive, taking these drugs afterwards can significantly reduce your chance of actually becoming infected with the virus. In order to work properly, the drugs must be taken every day for 28 days after exposure (how bullet), and the pills must be started no later than 3 days after the incident – but the sooner the better! When used properly, has been shown to be an 80% reduction in transmission (how effective bullet). The drugs cost around $400 to $600 dollars per cycle (cost bullet), and insurance may help cover the cost. Since this prevention method involves taking a pill, there are really no impacts on sexual pleasure (impact on sex bullet). However, some people do experience nausea, fatigue or weight loss while taking the pills (side effects bullet).

Rectal Microbicides

Although they are still being researched and are not currently available to the public, rectal microbicides may be a great way to reduce the transmission of HIV in the future. Only costing about $2 per use (show cost bullet), the microbicides come in a gel form that is squeezed into the rectum using an applicator (how bullet). The gel can even be used like lube, and may even enhance the sexual experience (impact on sex bullet). Microbicide gel contains chemicals that are commonly used to treat HIV in order to kill the virus in your rectum before it has a chance to infect you. Researchers are still working on testing how effective the gels are for rectal use, but they have been show to reducing the risk of HIV transmission by about 40% when used vaginally (how effective bullet). It is expected that the rectal use of the microbicides will also be protective against HIV infection. Researchers reformulated the gel made for vaginal use to make it safer for rectal use with very few side effects. Side effects do include possible stomach problems and bruising from improper use of the applicator for the bottom partner (side effects bullet). No side effects were reported for when a penis is exposed to the gel during vaginal use, which means little or no side effects for the top partner.

References

1. U.S. Food and Drug Administration. FDA approves first drug for reducing the risk of sexually acquired HIV infection. U.S. Department of Health and Human Services; 2012.
2. Celum C, Baeten JM. Tenofovir-based pre-exposure prophylaxis for HIV prevention: Evolving evidence. Curr Opin Infect Dis. 2012; 25:51–57. [PubMed: 22156901]

3. CDC. Pre-exposure prophylaxis (PrEP) for HIV prevention promoting safe and effectiveness use in the United States: New tool to reduce the risk of HIV infection among gay and bisexual men. 2011. http://www.cdc.gov/hiv/prep/pdf/PrEPfactsheet.pdf. Accessed May 15, 2012
4. CDC. Antiretroviral postexposure prophylaxis after sexual, injection-drug use, or other nonoccupational exposure to HIV in the United States. MMWR. 2005; 54:1–20.
5. Abdool Karim Q, Abdool Karim SS, Frohlich JA, et al. Effectiveness and safety of tenofovir gel, an antiretroviral microbicide, for the prevention of HIV infection in women. Science. 2010; 329:1168–1174. [PubMed: 20643915]
6. Prejean J, Song R, Hernandez A, et al. Estimated HIV incidence in the United States, 2006–2009. PLoS ONE. 2011; 6:e17502. [PubMed: 21826193]
7. Cohen MS, Chen YQ, McCauley M, et al. Prevention of HIV-1 infection with early antiretroviral therapy. N Engl J Med. 2011; 365:493–505. [PubMed: 21767103]
8. Fallon SJ, Forrest DW. Unexamined challenges to applying the treatment as prevention model among men who have sex with men in the United States: A community public health perspective. AIDS Behav. 2012; 16:1739–1742. [PubMed: 22797929]
9. Prestage G, Mao L, Kippax S, et al. Use of viral load to negotiate condom use among gay men in Sydney, Australia. AIDS Behav. 2009; 13:645–651. [PubMed: 19199021]
10. Sullivan PS, Carballo-Dieguez A, Coates T, et al. Successes and challenges of HIV prevention in men who have sex with men. Lancet. 2012; 380:388–399. [PubMed: 22819659]
11. Grant RM, Lama JR, Anderson PL, et al. Preexposure chemoprophylaxis for HIV prevention in men who have sex with men. N Engl J Med. 2010; 363:2587–2599. [PubMed: 21091279]
12. Smith DK, Grohskopf LA, Black RJ, et al. Antiretroviral postexposure prophylaxis after sexual, injection-drug use, or other nonoccupational exposure to HIV in the United States: Recommendations from the U.S. Department of Health and Human Services. MMWR Recomm Rep. 2005; 54:1–20. [PubMed: 15660015]
13. Landovitz RJ. Occupational and nonoccupational postexposure prophylaxis for HIV in 2009. Topics in HIV medicine : a publication of the International AIDS Society, USA. 2009; 17:104–108.
14. Eaton LA, Kalichman S. Risk compensation in HIV prevention: implications for vaccines, microbicides, and other biomedical HIV prevention technologies. Curr HIV/AIDS Rep. 2007; 4:165–172. [PubMed: 18366947]
15. Zajonc RB. Mere exposure: A gateway to the subliminal. Curr Dir Psychol Sci. 2001; 10:224–228.
16. Cassell MM, Halperin DT, Shelton JD, Stanton D. Risk compensation: The Achilles' heel of innovations in HIV prevention? BMJ. 2006; 332:605–607. [PubMed: 16528088]
17. Golub SA, Kowalczyk W, Weinberger CL, Parson JT. Preexposure prophylaxis and predicted condom use among high-risk men who have sex with men. J Acquir Immune Defic Syndr. 2010; 54:548–555. [PubMed: 20512046]
18. Holt M, Murphy DA, Callander D, et al. Willingness to use HIV pre-exposure prophylaxis and the likelihood of decreased condom use are both associated with unprotected anal intercourse and the perceived likelihood of becoming HIV positive among Australian gay and bisexual men. Sex Transm Infect. 2012; 88:258–263. [PubMed: 22290327]
19. Martin JN, Roland ME, Neilands TB, et al. Use of postexposure prophylaxis against HIV infection following sexual exposure does not lead to increases in high-risk behavior. AIDS. 2004; 18:787–792. [PubMed: 15075514]
20. Korner H, Hendry O, Kippax S. Safe sex after post-exposure prophylaxis for HIV: Intentions, challenges and ambivalences in narratives of gay men. AIDS Care. 2006; 18:879–887. [PubMed: 17012076]
21. Schechter M, do Lage RF, Mendelsohn AB, Moreira RI, Moulton LH, Harrison LH. Behavioral impact, acceptability, and HIV incidence among homosexual men with access to postexposure chemoprophylaxis for HIV. JAIDS. 2004; 35:519–525. [PubMed: 15021317]
22. Bartholow BN, Buchbinder S, Celum C, et al. HIV sexual risk behavior over 36 months of follow-up in the world's first HIV vaccine efficacy trial. J Acquir Immune Defic Syndr. 2005; 39:90–101. [PubMed: 15851919]

23. Liu AY, Vittinghoff E, Chillag K, et al. Sexual Risk Behavior Among HIV-Uninfected Men Who Have Sex With Men Participating in a Tenofovir Preexposure Prophylaxis Randomized Trial in the United States. J Acquir Immune Defic Syndr. 2013; 64:87–94. [PubMed: 23481668]
24. Padian NS, McCoy SI, Karim SS, et al. HIV prevention transformed: the new prevention research agenda. Lancet. 2011; 378:269–278. [PubMed: 21763938]
25. Miller LC, Murphy ST, Clark LF, Hamburger M, Moore J. Hierarchical messages for introducing multiple HIV prevention options: Promise and pitfalls. AIDS Education and Prevention. 2004; 16:509–525. [PubMed: 15585428]
26. Farr G, Castro LAA, Disantostefano R, Classen EBJ, Olguin F. Use of spermicide and impact of prophylactic condom use among sex workers in Santa Fe de Bogota, Colombia. Sex Transm Dis. 1996; 23:206–212. [PubMed: 8724510]
27. Fontanet AL, Saba J, Chandelying V, et al. Protection against sexually transmitted diseases by granting sex workers in Thailand the choice of using the male or female condom: results from a randomized controlled trial. Aids. 1998; 12:1851–1859. [PubMed: 9792386]
28. Janis, IL.; Mann, L. A conflict theory approach to attitude and decision making. In: Greenwald, AG.; Brock, TC.; Ostrom, TM., editors. Psychological foundations of attitudes. New York, NY: Academic Press; 1968.
29. Janis, IL.; Mann, L. Decision making: A psychological analysis of conflict, choice, and commitment. New York, NY: The Free Press; 1977.
30. Prochaska JO, Redding CA, Harlow LL, Rossi JS, Velicer WF. The transtheoretical model of change and HIV prevention: A review. Health education & behavior : the official publication of the Society for Public Health Education. 1994; 21:471–486.
31. Prochaska JO, Velicer WF, Rossi JS, et al. Stages of change and decisional balance for 12 problem behaviors. Health Psychol. 1994; 13:39–46. [PubMed: 8168470]
32. Madden, M.; Zickuhr, K. 65% of Online Adults Use Social Networking Sites. Pew Internet and American Life Project. 2011. http://www.pewinternet.org/reports/2011/social-networking-sites.aspx. Accessed August 26, 2011
33. Leah, C.; Keeter, S.; Purcell, K.; Smith, A.; Pew Research Center. Assessing the cell phone challenge. 2010. http://www.pewresearch.org/2010/05/20/assessing-the-cell-phone-challenge/. Accessed 24 February 2014
34. Sullivan PS, Peterson J, Rosenberg E, Kelley CF, Cooper H, Vaughan A. Understanding Racial HIV/STI Disparities in Black and White Men who have Sex with Men: A Multilevel Approach. PLoS ONE. 2014 In Press.
35. Parsons JT, Halkitis PN, Borkowski T, Bimbi D. Perceptions of the benefits and costs associated with condom use and unprotected sex among late adolescent college students. Journal of Adolescence. 2000; 23:377–391. [PubMed: 10936012]
36. Cortina JM. What is coefficient alpha? An examination of theory and applications. J Appl Psychol. 1993; 78:98–104.
37. 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. [PubMed: 22470438]
38. Baeten JM, Donnell D, Ndase P, et al. Antiretroviral prophylaxis for HIV prevention in heterosexual men and women. N Engl J Med. 2012; 367:399–410. [PubMed: 22784037]
39. Thigpen MC, Kebaabetswe PM, Paxton LA, et al. Antiretroviral preexposure prophylaxis for heterosexual HIV transmission in Botswana. N Engl J Med. 2012; 367:423–434. [PubMed: 22784038]

Table 1

Sample Characteristics (n=803)

	N	%
Race		
White	622	77.5
Hispanic/Latino	119	14.8
Black	9	1.1
Other	48	6.0
Refused	5	0.6
Education		
Less than HS graduate	22	2.7
HS graduate or GED	165	20.5
Some college or technical school	349	43.5
College graduate or higher	259	32.3
Missing	8	1.0
Sexual Orientation		
Homosexual/Gay	764	95.1
Bisexual	24	3.0
Unsure	4	0.5
Other	7	0.9
Missing	4	0.5
	Median	IQR
Age	23	13

Note: IQR = interquartile range; HS = high school

Table 2

ANCOVA results for differences in likelihood of using HIV prevention methods by number of intervention messages received

	F-Statistic	One Message M[a] (SE)	Two Messages M[a] (SE)	Four Messages M[a] (SE)
All Risk Categories				
Condoms	F(2,482)=0.93, p=.40	3.72 (.15)	3.95 (.09)	3.87 (.17)
PrEP *b**, *c***	F(2,267)=6.36, p<.01	2.86 (.17)	3.50 (.16)	3.65 (.17)
nPEP *c***	F(2,273)=7.71, p<.01	4.11 (.11)	4.41 (.11)	4.72 (.12)
Rectal Microbicides	F(2,278)=0.52, p=.59	3.44 (.14)	3.39 (.14)	3.59 (.15)
High-Risk HIV Group				
Condoms	F(2,102)=0.88, p=.42	3.58 (.28)	3.87 (.18)	3.38 (.35)
PrEP	F(2,56)=0.96, p=.39	3.86 (.26)	3.60 (.33)	4.26 (.33)
nPEP *c**	F(2,59)=3.38, p=.04	3.85 (.24)	3.98 (.26)	4.79 (.29)
Rectal Microbicides	F(2,54)=0.19, p=.83	3.51 (.35)	3.78 (.30)	3.57 (.37)
Low-Risk HIV Group				
Condoms	F(2,364)=0.50, p=.60	3.77 (.18)	3.97 (.10)	3.98 (.19)
PrEP *b***, *c***	F(2,202)=9.71, p<.01	2.39 (.21)	3.45 (.18)	3.50 (.19)
nPEP *c**	F(2,204)=3.58, p=.03	4.25 (.12)	4.52 (.12)	4.70 (.12)
Rectal Microbicides	F(2,216)=0.81, p=.45	3.41 (.15)	3.28 (.15)	3.56 (.16)

[a] The means reported have been adjusted for age and race.

[b] Mean difference between one message and two message groups are significant

[c] Mean difference between one message and four message groups are significant

* p<.05

** p<.01

Table 3

ANCOVA results for differences in decisional balance scales by number of intervention messages received

	F-Statistic	One Message M[a] (SE)	Two Messages M[a] (SE)	Four Messages M[a] (SE)
All Risk Categories				
Benefits of Unprotected Sex	F(2,744)=0.34, p=.71	3.57 (.05)	3.50 (.06)	3.56 (.12)
Costs of Unprotected Sex	F(2,763)=0.18, p=.84	4.57 (.04)	4.59 (.04)	4.62 (.08)
Benefits of Condom Use	F(2,746)=0.44, p=.64	4.09 (.04)	4.04 (.05)	4.12 (.09)
Costs of Condom Use	F(2,745)=1.42, p=.24	2.96 (.05)	2.83 (.06)	2.87 (.11)
High-Risk HIV Group				
Benefits of Unprotected Sex	F(2,166)=0.78, p=.46	3.84 (.10)	3.86 (.12)	4.17 (.24)
Costs of Unprotected Sex	F(2,170)=0.16, p=.85	4.53 (.08)	4.47 (.10)	4.55 (.20)
Benefits of Condom Use	F(2,167)=0.75, p=.47	4.01 (.08)	3.91 (.09)	3.79 (.19)
Costs of Condom Use	F(2,168)=0.55, p=.58	3.01 (.10)	3.11 (.13)	3.27 (.26)
Low-Risk HIV Group				
Benefits of Unprotected Sex	F(2,555)=0.49, p=.62	3.48 (.06)	3.39 (.07)	3.39 (.13)
Costs of Unprotected Sex	F(2,569)=0.28, p=.75	4.58 (.04)	4.62 (.05)	4.63 (.08)
Benefits of Condom Use	F(2,556)=0.40, p=.67	4.12 (.05)	4.09 (.05)	4.19 (.09)
Costs of Condom Use	F(2,554)=2.23, p=.11	2.93 (.06)	2.75 (.07)	2.78 (.12)

[a]The means reported have been adjusted for age and race.