Published in final edited form as:

AIDS Educ Prev. 2017 August ; 29(4): 289–301. doi:10.1521/aeap.2017.29.4.289.

HIV prevention fatigue and HIV treatment optimism among young men who have sex with men

Kathryn Macapagal, Ph.D.^{1,2}, Michelle Birkett, Ph.D.^{1,2}, Patrick Janulis, Ph.D.^{1,2,3}, Robert Garofalo, MD, MPH³, and Brian Mustanski, Ph.D.^{1,2,3}

¹Department of Medical Social Sciences Northwestern University Feinberg School of Medicine, Ann and Robert H. Lurie Children's Hospital of Chicago

²Institute for Sexual and Gender Minority Health and Wellbeing, Northwestern University, Ann and Robert H. Lurie Children's Hospital of Chicago

³Third Coast Center for AIDS Research, Northwestern University

⁴Department of Pediatrics, Northwestern University Feinberg School of Medicine & Division of Adolescent Medicine, Ann and Robert H. Lurie Children's Hospital of Chicago

Abstract

HIV prevention fatigue (the sense that prevention messages are tiresome) and being overly optimistic about HIV treatments are hypothesized to increase HIV risk behavior. Little research has examined these constructs and their correlates among young men who have sex with men (YMSM), who are at high risk for HIV. YMSM (N = 352; M age = 20; 50% Black) completed measures of prevention fatigue, treatment optimism, HIV risk behaviors, and HIV-related knowledge and attitudes during a longitudinal study. Overall, YMSM reported low levels of HIV prevention fatigue and treatment optimism. Path analysis (n = 307) indicated that greater prevention fatigue and treatment optimism predicted higher rates of condomless sex, but condomless sex did not predict later increases in prevention fatigue or treatment optimism. Results are inconsistent with the hypothesis of high prevention fatigue and treatment optimism among YMSM and point to potential causal relationships among these variables and condomless sex.

Keywords

HIV; HIV prevention fatigue; young men who have sex with men; HIV treatment optimism; safer sex fatigue

Young men who have sex with men (YMSM) in the United States are disproportionately affected by HIV and account for over 80% of HIV diagnoses among adolescents and young adults (CDC, 2016a; Mustanski, Newcomb, Du Bois, Garcia, & Grov, 2011b). Young men of color are especially vulnerable, representing over 75% of these new diagnoses (CDC,

Correspondence: Kathryn Macapagal, Department of Medical Social Sciences, Institute for Sexual and Gender Minority Health and Wellbeing, Northwestern University Feinberg School of Medicine, 625 N Michigan Avenue, Suite 1400, Chicago, IL 60611, kathryn.macapagal@northwestern.edu, phone: 312-503-3605 fax: 312-503-6700.

The authors have no conflicts of interest to disclose.

2016a). Given the alarming prevalence of HIV among diverse YMSM, investigating psychosocial factors that can pose challenges to the effectiveness of HIV prevention interventions in this group remains critical.

HIV prevention fatigue, or a sense of boredom, weariness, and lack of interest in HIV prevention messages and programs (Stockman et al., 2004) and the closely-related concept of safe sex fatigue, or difficulty maintaining safe sex behaviors like condom use (Ostrow et al., 2002; Stolte et al., 2006), are attitudinal and behavioral factors that may impact YMSM's receptivity to HIV risk reduction interventions. Higher levels of prevention fatigue are believed to result from persistent exposure to prevention messages and sustained adherence to safe sex practices (Ostrow et al., 2002; Stockman et al., 2004; Stolte et al., 2006) which in turn may lead to condomless sex (Cox, Beauchemin, & Allard, 2004; Ostrow et al., 2008; Stolte et al., 2006; Tun, Celentano, Vlahov, & Strathdee, 2003). Moreover, HIV treatment optimism, or confidence in the availability and effectiveness of HIV treatments, is another construct that has been studied in tandem with prevention fatigue (Hanif et al., 2014; Huebner, Rebchook, & Kegeles, 2004; Stockman et al., 2004). While some treatment optimism may be adaptive and could promote engagement in care or treatment adherence among HIV positive individuals, higher levels may lead one to downplay the likelihood of HIV transmission or seriousness of infection. Indeed, high levels of treatment optimism have been linked with greater prevention fatigue and higher rates of HIV risk behaviors (Hanif et al., 2014; Huebner et al., 2004; Stockman et al., 2004).

HIV prevention fatigue and HIV treatment optimism primarily have been studied in MSM (e.g., Cox et al., 2004; Flowers, Knussen, & Duncan, 2001; Hart, James, Hagan, & Boucher; Huebner & Gerend, 2001; Huebner et al., 2004; Ostrow et al., 2002; Ostrow et al., 2008; Stockman et al., 2004; Stolte et al., 2006; Stolte, Dukers, Geskus, Coutinho, & de Wit, 2004), who historically have been targets of community HIV prevention and safer sex campaigns, and as such may have been more likely to be exposed to prevention messages than heterosexual people. As these studies have largely focused on MSM with an average age over 30, however, our knowledge about YMSM's experiences of these attitudes and beliefs, and how fatigue and optimism are linked with condomless sex in this population, is limited.

It is possible that YMSM may be *less* vulnerable to prevention fatigue and treatment optimism, given some research showing favorable social norms regarding condom use among YMSM (Peterson, Rothenberg, Kraft, Beeker, & Trotter, 2009). Alternatively, prevention fatigue and treatment optimism may be low in YMSM, but might increase over time with greater accumulated exposure to HIV prevention programs and messaging. To date, one study demonstrated low levels of treatment optimism among YMSM (Huebner et al., 2004), but none have examined prevention fatigue in this group.

On the other hand, some have suggested that YMSM who came of age well after the beginning of the HIV epidemic could be *more* susceptible to prevention fatigue (Flowers et al., 2001; Kellogg, 2002). There are several potential reasons for this. In recent years, wider availability and effectiveness of antiretroviral therapies has resulted in the perception of HIV as a chronic, rather than terminal illness (Deeks, Lewin, & Havlir, 2013), which may

contribute to treatment optimism and lenient attitudes toward condom use among YMSM. Moreover, the emergence of biomedical prevention approaches like non-occupational post-exposure prophylaxis (nPEP) and pre-exposure prophylaxis (PrEP), which are less obtrusive during sex than condoms, as well as reports of virological remission (Saez-Cirion et al., 2013) and functional cure (Hütter et al., 2009) may reduce YMSM's perceived risk of HIV, increase treatment optimism (Hart et al., 2010) and contribute to a decrease in condom use (Golub, Rosenthal, Cohen, & Mayer, 2008; Mustanski, Johnson, Garofalo, Ryan, & Birkett, 2013b). Finally, perceived invulnerability to HIV infection (Huebner et al., 2004; Mustanski, Rendina, Greene, Sullivan, & Parsons, 2014) and a lack of firsthand experience with losing loved ones to AIDS (Flowers et al., 2001) may lead to a tendency for YMSM to downplay HIV prevention messages and to feel optimistic about HIV. Taken together, these advances in HIV treatment and prevention could inadvertently contribute to higher rates of HIV prevention fatigue and treatment optimism in YMSM and result in a lower likelihood of using condoms and biomedical prevention methods. Further research is needed to assess the state of HIV prevention fatigue and treatment optimism and their links with HIV risk behavior among YMSM, which would guide the development of future prevention programs for this group.

Other questions about HIV prevention fatigue and treatment optimism remain unexplored. First, previous research has assessed HIV prevention fatigue qualitatively (Flowers et al., 2001) or by using a variety of single and multiple item measures (Cox et al., 2004; Ostrow et al., 2008; Stolte et al., 2006; Tun et al., 2003). Yet psychometric data on any one measure is lacking. Moreover, potential correlates of prevention fatigue and treatment optimism, such as knowledge about HIV prevention and interest in using PrEP, have not been examined and may be useful in understanding possible precursors to and consequences of these attitudes and beliefs. In addition, research largely has examined cross-sectional associations among prevention fatigue, treatment optimism, and condomless sex among MSM, precluding our understanding of potential changes in these variables over time. The limited longitudinal work on treatment optimism has yielded conflicting results, with some suggesting that treatment optimism predicts HIV risk behavior (Stolte et al., 2004), and others showing that it results from HIV risk behavior (Huebner et al., 2004), indicating a need for more research to clarify these relationships.

The present study had several goals. First, we aimed to investigate levels of HIV prevention fatigue and HIV treatment optimism among YMSM, and examine the suitability of a measure of HIV prevention fatigue that was previously used with older MSM and other at-risk groups (Stockman et al., 2004) for use with YMSM. Second, we sought to examine relationships between HIV prevention fatigue and treatment optimism and HIV-related knowledge, PrEP intentions, and HIV risk behaviors (e.g., condomless anal sex). Third, we explored whether HIV prevention fatigue and treatment optimism changed over 18 months, and using path analysis we modeled the directions of relationships between prevention fatigue, treatment optimism, and condomless sex at several time points. To our knowledge, ours is among the first studies to describe HIV prevention fatigue and treatment optimism among a sample of diverse YMSM.

METHODS

Participants were enrolled in a longitudinal cohort study designed to examine psychosocial health problems linked to HIV in a community sample of racially- and ethnically-diverse YMSM (Mustanski et al., 2013b). Data collection for the first wave of the study began in December 2009. Eligibility criteria included being between ages 16-20 at baseline, male sex assigned at birth, English-speaking, identifying as gay or bisexual or having had sex with men, and available for follow-up study visits. Participants were recruited through a modified form of respondent-driven sampling that allowed for a greater proportion of the sample to be initial recruits (Heckathorn, 1997). Initial recruitment consisted of community and school outreach.

The university's Institutional Review Board approved all study procedures. Measures for this study were collected in Waves 2–6. Each wave was approximately 6 months apart. During each 1 hour study visit, participants provided informed consent and completed computer-based self-report measures. Participants were compensated with \$45 USD. As the present study focused on describing associations between measures administered at multiple waves, for cross-sectional analyses the sample included 352 YMSM who completed study measures at both Waves 2 and 3, when initial measures of prevention fatigue, treatment optimism, and HIV-related knowledge and attitudes were administered. For path analyses examining HIV prevention fatigue and treatment optimism at Waves 3 and 6, the analytic sample shifted to the 307 YMSM who had completed both measures at both waves at the time of manuscript preparation.

Measures

Demographics—At each visit, participants completed a brief demographic questionnaire. Race and ethnicity were reported only at baseline, and HIV status was assessed via a rapid test once per year. HIV status at Wave 3 was used for the purposes of this study. All other demographics (e.g., sexual orientation, level of education) were collected at each wave.

Sexual behavior—Sexual risk behavior was assessed at each wave using items from the AIDS Risk Behavior Assessment (Donenberg, Emerson, Bryant, Wilson, & Weber-Shifrin, 2001). Variables included participants' number of condomless anal sex acts with male partners and number of condomless anal sex male partners in the past six months. Age of sexual debut with a same-sex partner was assessed at Wave 3, and length of time since sexual debut with a same-sex partner was calculated by subtracting age of debut from participants' age at Wave 3.

HIV prevention fatigue and HIV treatment optimism—At Waves 3 and 6, a 6-item questionnaire designed by Stockman et al. (2004) assessed levels of HIV prevention fatigue. Higher mean scores indicated higher levels of prevention fatigue. A single item administered at these waves, adapted from Stockman et al. (2004) assessed optimism regarding HIV treatments ("I am less careful about being safe with sex because there are good treatments for HIV"). Response options ranged from 1 = *strongly disagree* to 4 = *strongly agree*, with higher scores indicating higher levels of treatment optimism.

HIV knowledge and HIV-related education—A 28-item questionnaire (Carey & Schroder, 2002; Mustanski et al., 2013b) administered at Wave 2 assessed knowledge about HIV transmission and prevention behaviors. Response options were 1 = *true*, 2 = *false*, or 3 = *unsure*, with *unsure* responses coded as incorrect for analyses. Reliability was excellent ($\alpha = .92$). In addition, HIV-related sexual education was assessed at Wave 2 using items from the Youth Risk Behavior Survey: “Have you ever been taught about AIDS or HIV infection in school?”, and “In school, have you ever been taught how to use condoms?” (CDC, 2009; Massachusetts Department of Public Health, 2009) and an item developed by the study team: “Have you ever been taught about homosexuality in school?” Response options were 0 = *no*, and 1 = *yes*.

PrEP likelihood—An 8-item scale administered at Wave 2 to participants who were HIV-negative assessed the likelihood of taking PrEP under various conditions of side effects, dosing schedules, and effectiveness (Mustanski et al., 2013b). The measure also assessed the likelihood of using condoms while on PrEP, while in a serodiscordant monogamous relationship, and if all sex was with casual partners. Response options were 1 = *not at all likely*, 2 = *somewhat likely*, and 3 = *very likely*. Reliability was good ($\alpha = .85$).

RESULTS

Participant characteristics are summarized in Table 1. Participants' mean age at wave 3 was 19.9 (SD = 1.3 years). Most identified as gay (79.6%), were racial or ethnic minorities (81.2%), and had completed high school or more (77.8%); 11.9% were HIV-positive. With regard to sexual behaviors reported at Wave 3, mean age at same-sex sexual debut was 15.2 (SD = 2.8 years). Participants also reported an average of 0.87 condomless anal sex partners in the past 6 months, ranging from 0–20 partners, and an average of 12.6 condomless anal sex acts with their last 3 partners, ranging from 0–1009 acts. As condomless sex acts were not significantly associated with prevention fatigue or treatment optimism, the remaining analyses focus on number of condomless sex partners.

The majority of participants (82.1%) reported having had school-based sex education focused on HIV and a minority reported learning about homosexuality (30.1%). Of the participants who had school-based sex education, 61.6% learned about condom use. Participants reported relatively low treatment optimism at wave 3 ($M = 1.20$; $SD = 0.5$) and wave 6 ($M = 1.14$; $SD = .05$); an average of 76.7% of answers correct on the HIV knowledge scale; and on average endorsed being “somewhat likely” to use PrEP ($M = 2.18$; $SD = 0.5$).

HIV prevention fatigue measure

Descriptive statistics and item loadings of the HIV prevention fatigue measure at Wave 3 are in Table 2. Item and scale means ranged from 1.24–2.00, indicating mild to strong disagreement with items suggestive of HIV prevention fatigue and low levels of overall fatigue. Exploratory factor analysis using principal axis factoring was conducted to determine the underlying structure of the HIV prevention fatigue scale. Separate factor analyses were conducted based on HIV status; however, as results for the HIV-positive and HIV-negative participants were very similar, factor analysis for the combined sample is

reported here. Analyses extracted a single factor with an eigenvalue of 2.41, which explained 40% of the variance. Internal consistency was acceptable ($\alpha = .68$); as deletion of one item ("I am burned out thinking about HIV") resulted in a marginally higher reliability of .70, the full scale was used for subsequent analyses. Stability of the prevention fatigue and treatment optimism measures was computed by correlating scores from participants who completed the measures at both waves 3 and 6 ($n = 240$) (Table 3). Correlation coefficients were modest (fatigue $r = .39$, optimism $r = .38$), indicating relatively low levels of stability. However, these were not unexpected given that HIV prevention fatigue and treatment optimism may change over 18 months.

Prevention fatigue, treatment optimism, and participant characteristics

ANOVAs examined differences in HIV prevention fatigue and treatment optimism at Wave 3 by participant characteristics and health status. Treatment optimism was linked with differences in sex education such that those who did not have education about HIV endorsed higher rates of treatment optimism ($M = 1.32$, $SE = .09$) relative to participants who did ($M = 1.17$, $SE = .03$; $F(1,334) = 4.01$, $p < .05$). Prevention fatigue and treatment optimism also differed by HIV status. HIV-positive participants had higher levels of HIV prevention fatigue ($M = 1.73$, $SE = .09$) than HIV-negative participants ($M = 1.54$, $SE = .03$), $F(1,351) = 4.95$, $p = .03$. HIV-positive participants also endorsed higher levels of treatment optimism ($M = 1.36$, $SE = .11$) than HIV-negative participants ($M = 1.18$, $SE = .03$), $F(1,351) = 4.15$, $p = .04$. Prevention fatigue and treatment optimism were not significantly related to other demographic variables.

Prevention fatigue/treatment optimism and HIV risk, knowledge, PrEP attitudes

Correlations between HIV prevention fatigue and treatment optimism, and HIV risk behaviors, knowledge, and PrEP attitudes are in Table 3. HIV prevention fatigue and HIV treatment optimism were significantly and positively correlated within Wave 3. Higher levels of prevention fatigue and treatment optimism also were significantly correlated with having more condomless sex partners at Wave 3. Longer time elapsed since sexual debut at Wave 3 was positively correlated with prevention fatigue at Wave 6. Regarding HIV-related knowledge and attitudes, lower levels of HIV knowledge were significantly correlated with higher levels of treatment optimism, but not with prevention fatigue. Of note, treatment optimism and prevention fatigue were not significantly related with PrEP likelihood.

Changes in prevention fatigue and treatment optimism between waves

Repeated measures ANOVAs were conducted to examine changes in HIV prevention fatigue and treatment optimism between Waves 3 and 6. Mean HIV prevention fatigue scores were significantly lower at Wave 6 ($M = 1.48$, $SE = .03$) than at Wave 3 ($M = 1.56$, $SE = .03$), $F(1,239) = 5.85$, $p = .02$. While treatment optimism was somewhat lower at Wave 6 ($M = 1.14$, $SE = .03$) than at Wave 3 ($M = 1.20$, $SE = .04$), the difference was not statistically significant.

Path analysis of prevention fatigue, treatment optimism, and condomless sex

Path analysis was used to examine relationships between treatment optimism and prevention fatigue at Waves 3 and 6 and condomless sex partners at Wave 4. Figure 1 displays the path diagram for this model. Demographic and health status variables (age, race, sexual orientation, HIV status) and variables that showed significant bivariate relationships with prevention fatigue at Wave 6 were entered as covariates into the analysis. The model indicated that prevention fatigue ($b = 0.518$, $p = 0.014$) and treatment optimism ($b = 0.618$, $p < 0.001$) at Wave 3 significantly predicted the number of condomless sex partners at Wave 4. Furthermore, the number of condomless sex partners at Wave 4 was not a significant predictor of either prevention fatigue ($b = 0.026$, $p = 0.175$) or treatment optimism ($b = 0.022$, $p = 0.282$) at Wave 6. The only significant predictor of prevention fatigue at Wave 6 was prevention fatigue at Wave 3 ($b = 0.288$, $p < 0.001$); similarly the only significant predictor of treatment optimism at Wave 6 was treatment optimism at Wave 3 ($b = 0.251$, $p = 0.004$). This pattern of findings remained the same when the model was examined with condomless sex at Wave 5.

DISCUSSION

HIV prevention interventions are increasingly being targeted at YMSM (Hidalgo et al., 2015; Mustanski, Garofalo, Monahan, Gratzner, & Andrews, 2013a), but their ability to benefit from these programs may be compromised by HIV prevention fatigue and treatment optimism. Evaluating the extent of prevention fatigue and treatment optimism in YMSM can inform whether changes to prevention approaches are needed to attenuate the negative effects of these attitudes. Inconsistent with the hypothesis of a large historical increase in HIV prevention fatigue, YMSM reported low levels of fatigue that also were lower than previously described among heterosexual adults and MSM (Stockman et al., 2004). Moreover, on average, levels of prevention fatigue decreased across 18 months.

There are several possible explanations for the relative lack of prevention fatigue in our sample. First, participants may simply not have been exposed to much prevention messaging specific to YMSM. Few evidence-based interventions for HIV risk reduction are targeted at YMSM (CDC, 2015a; Harper & Riplinger, 2013; Mustanski et al., 2011b), and although most participants reported hearing about HIV and condom use in sex education, a minority learned about homosexuality specifically; school-based sex education programs typically spend a cursory amount of time on these topics and rarely discuss sex between men (Kann, Telljohann, & Wooley, 2007). Second, this generation of participants came of age two decades after the HIV epidemic began and may perceive messages about HIV prevention as important rather than tiresome. Indeed, YMSM show high levels of interest in learning about sexual health and HIV prevention (Mustanski, Lyons, & Garcia, 2011a) and MSM in general report that HIV prevention remains an important topic for their community (Grov, Ventuneac, Rendina, Jimenez, & Parsons, 2013). Lack of exposure to sexual health information specific to gay and bisexual men and greater interest in HIV prevention interventions may result in lower levels of prevention fatigue among YMSM.

While overall fatigue in our sample was low, individual differences among participants were linked to greater fatigue. Consistent with previous findings, higher levels of prevention

fatigue were associated with higher rates of condomless sex and HIV-positive status (Cox et al., 2004; Ostrow et al., 2008; Stolte et al., 2006; Tun et al., 2003). We also found that a longer period of time since sexual debut was correlated with greater fatigue, reflecting research on younger age of sexual debut and increased HIV risk among YMSM (Outlaw et al., 2011). YMSM may become more conscious of HIV prevention messages after they begin having sex, and as such, those who have been sexually active longer may be more tired of these messages. Findings suggest that YMSM generally remain receptive to prevention messaging and HIV risk reduction behaviors, but that their prevention fatigue may increase the longer they are exposed to prevention messages and engage in safe sex behaviors.

YMSM also reported low levels of treatment optimism, which was related to greater HIV-related knowledge and having had sex education related to HIV risk. Providing YMSM with up-to-date, comprehensive information about HIV and prevention may help these men develop accurate beliefs about HIV treatments and make reasoned decisions about behavioral or biomedical prevention in light of their HIV risk. Supporting previous longitudinal work showing that decreased concerns about HIV explain later increases in risk behavior among MSM (Stolte et al., 2004), path analyses showed that HIV prevention fatigue and treatment optimism predicted condomless sex, and that condomless sex did not predict increased prevention fatigue and treatment optimism. Prevention fatigue and treatment optimism may be cognitive mechanisms that help YMSM justify or reduce concerns about having high-risk sex, and that condomless sex may not necessarily produce or strengthen prevention fatigue or treatment optimism as suggested previously (Flowers et al., 2001; Huebner et al., 2004). More research is needed to substantiate the causal relationships observed in this study which can help identify where interventions may be most beneficial. Finally, though high levels of treatment optimism may be problematic, low levels of optimism may prevent YMSM newly-diagnosed with HIV from engaging in care. Prevention messages must balance instilling optimism about HIV care while tempering overly optimistic beliefs that may be associated with increased risk behavior. A recently-launched CDC campaign, *HIV Treatment Works*, is one example of this approach (CDC, 2016b).

Prevention fatigue and treatment optimism were not significantly correlated with likelihood of using PrEP, which is preliminarily positive news for the uptake of biomedical prevention among YMSM. However, the absence of this relationship may instead reflect low knowledge and uptake of PrEP among YMSM (Bauermeister, Meanley, Pingel, Soler, & Harper, 2013), especially since initial data on PrEP knowledge was collected prior to FDA approval of PrEP in 2012. As PrEP becomes more widely adopted among younger men, follow-up studies on the relationship between PrEP use, prevention fatigue, treatment optimism, and HIV risk behaviors are needed, as past research found a link between prevention fatigue and condomless sex despite MSM's use of biomedical prevention (specifically nPEP) (Golub et al., 2008).

Unlike previous research (Stockman et al., 2004), prevention fatigue did not differ by sociodemographic characteristics. This suggests that Black and Hispanic YMSM who are at higher risk for HIV (CDC, 2012) may not be experiencing greater prevention fatigue. As efforts to curb HIV among YMSM of color increase (Hidalgo et al., 2015; Mustanski et al.,

2013a), monitoring prevention fatigue in these youth is needed to determine whether to modify prevention approaches. Creative approaches such as those that use new media and engaging storytelling may sustain YMSM's interest in HIV prevention. For example, Keep it Up!, an interactive online program focused on healthy sexuality, relationships, and preventing HIV was recently found to be feasible and acceptable among diverse YMSM, and produced a significantly lower rate of condomless sex relative to controls (Mustanski et al., 2013a). As MSM report that HIV prevention messages are important but overlook other psychosocial and contextual issues related to HIV transmission among gay and bisexual men (Thomas et al., 2012), tailoring messages to youth's unique risk factors may better resonate with that individual, reduce risk of fatigue, and increase likelihood of adherence to HIV prevention behaviors (Flowers et al., 2001).

The study had several limitations. First, most of our findings were cross-sectional or correlational in nature. Second, we did not measure exposure to HIV prevention messages directly. We instead relied on time elapsed since sexual debut and between waves as a proxy for exposure; more work is needed to assess whether actual exposure to HIV prevention messaging is linked with fatigue, optimism, and HIV risk behavior. Third, participants in our longitudinal study related to HIV may have been more interested in HIV prevention to begin with, which may explain lower levels of prevention fatigue and treatment optimism than among MSM in the general population. Fourth, regional differences in prevention fatigue and treatment optimism may exist depending on the extent of exposure to HIV prevention messages and HIV-related education; our participants were primarily from a large metropolitan area in the Midwest. Fifth, findings may not generalize to samples of predominantly White YMSM given the highly racially- and ethnically-diverse composition of our sample. We did not directly compare YMSM to older groups of MSM, and attitudes toward HIV prevention messages among older MSM may have improved since the publication of Stockman et al. (2004).

The findings have implications for future work on HIV prevention fatigue and treatment optimism. First, further research should investigate factors that lead to prevention fatigue and treatment optimism. Longitudinal examinations of YMSM's exposure to or participation in prevention programs can help confirm whether sustained exposure to these messages contributes to greater prevention fatigue. As new prevention methods emerge, continued assessment of prevention fatigue and treatment optimism is warranted to determine their impact on YMSM's adherence to these methods. In addition, research should disentangle whether YMSM are fatigued by HIV prevention messages, having safe sex, or both, which can help healthcare providers individualize prevention messages. Moreover, as engaging in insertive or receptive anal sex varies in level of transmission risk (CDC, 2015b) it would be worthwhile to examine whether differential engagement in these behaviors may be linked with different levels of prevention fatigue or treatment optimism. Finally, given the rising rates of HIV in primary partnerships among MSM (Sullivan, Salazar, Buchbinder, & Sanchez, 2009), research could examine whether prevention fatigue and treatment optimism impact rates of condom use in YMSM's relationships, and whether these differ between serious versus casual relationships.

Findings suggest that YMSM experience low levels of HIV prevention fatigue, contrary to past research (Flowers et al., 2001; Huebner et al., 2004) and speculations in the popular press (Kellogg, 2002; Tuller, 2013). Relatedly, YMSM were not unusually optimistic about HIV. Our preliminary evidence also suggests that HIV prevention fatigue and treatment optimism are not associated with YMSM's intentions to use PrEP, which may bode well for PrEP adoption in this group. However, as HIV prevention fatigue and treatment optimism may increase among certain groups of YMSM over time, continued attention to these phenomena may identify ways in which messages can be adapted to be responsive to changing attitudes toward HIV risk reduction.

Acknowledgments

We are grateful to Janina Mayeux for her assistance with the literature review.

Sources of support:

Data collection for this study was funded by the National Institute on Drug Abuse (R01DA025548). Analyses and manuscript preparation were supported by a grant from the National Institute on Drug Abuse (U01DA036939), a postdoctoral training grant from the Agency for Healthcare Research and Quality (T32 HS000078), and support from the Third Coast Center for AIDS Research (CFAR), an NIH funded center (P30AI117943). The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institute on Drug Abuse, National Institutes of Health, and Agency for Healthcare Research and Quality.

References

- Bauermeister JA, Meanley S, Pingel E, Soler JH, Harper GW. PrEP awareness and perceived barriers among single young men who have sex with men. *Current HIV Research*. 2013; 11:520–527. [PubMed: 24476355]
- Carey MP, Schroder KE. Development and psychometric evaluation of the brief HIV Knowledge Questionnaire. *AIDS Education and Prevention*. 2002; 14:172–182. [PubMed: 12000234]
- CDC. 2009 Youth Risk Behavior Survey. 2009. Retrieved from <http://www.cdc.gov/healthyyouth/yrbs/pdf/questionnaire/2009HighSchool.pdf>
- CDC. National Health Interview Survey. 2012. Retrieved December 2, 2016 from <http://www.cdc.gov/nchs/nhis.htm>
- CDC. Compendium of evidence-based interventions and best practices for HIV prevention. 2015a. Retrieved December 2 2016 from <http://www.cdc.gov/hiv/prevention/research/compendium/rr/complete.html>
- CDC. HIV Risk Behaviors. 2015b. Retrieved December 2 2016, from <http://www.cdc.gov/hiv/risk/estimates/riskbehaviors.html>
- CDC. HIV Among Youth. 2016a. Retrieved December 2 2016, from <http://www.cdc.gov/hiv/group/age/youth/>
- CDC. HIV Treatment Works. 2016b. Retrieved December 2 2016 from <https://www.cdc.gov/actagainstaids/campaigns/hivtreatmentworks/>
- Cox J, Beauchemin J, Allard R. HIV status of sexual partners is more important than antiretroviral treatment related perceptions for risk taking by HIV positive MSM in Montreal, Canada. *Sexually Transmitted Infections*. 2004; 80:518–523. [PubMed: 15572627]
- Deeks SG, Lewin SR, Havlir DV. The end of AIDS: HIV infection as a chronic disease. *Lancet*. 2013; 382:1525–1533. [PubMed: 24152939]
- Donenberg GR, Emerson E, Bryant FB, Wilson H, Weber-Shiffrin E. Understanding AIDS-risk behavior among adolescents in psychiatric care: links to psychopathology and peer relationships. *Journal of the American Academy of Child and Adolescent Psychiatry*. 2001; 40:642–653. [PubMed: 11392341]

- Flowers P, Knussen C, Duncan B. Re-appraising HIV Testing among Scottish gay men: The impact of new HIV treatments. *Journal of Health Psychology*. 2001; 6:665–678. [PubMed: 22049469]
- Golub SA, Rosenthal L, Cohen DE, Mayer KH. Determinants of high-risk sexual behavior during post-exposure prophylaxis to prevent HIV infection. *AIDS and Behavior*. 2008; 12:852–859. [PubMed: 17682938]
- Grov C, Ventuneac A, Rendina HJ, Jimenez RH, Parsons JT. Perceived importance of five different health issues for gay and bisexual men: implications for new directions in health education and prevention. *American Journal of Mens Health*. 2013; 7:274–284.
- Hanif H, Bastos FI, Malta M, Berton N, Winch PJ, Kerrigan D. Where does treatment optimism fit in? Examining factors associated with consistent condom use among people receiving antiretroviral treatment in Rio de Janeiro, Brazil. *AIDS and Behavior*. 2014; 18:1945–1954. [PubMed: 24531794]
- Harper GW, Riplinger AJ. HIV prevention interventions for adolescents and young adults: what about the needs of gay and bisexual males? *AIDS and Behavior*. 2013; 17:1082–1095. [PubMed: 22460226]
- Hart TA, James CA, Hagan CMP, Boucher E. HIV optimism and high-risk sexual behavior in two cohorts of men who have sex with men. *Journal of the Association of Nurses in AIDS Care*. 2010; 21:439–443. [PubMed: 20656521]
- Heckathorn DD. Respondent-driven sampling: A new approach to the study of hidden populations. *Social Problems*. 1997; 44:174–199.
- Hidalgo MA, Kuhns LM, Hottot AL, Johnson AK, Mustanski B, Garofalo R. The MyPEEPS randomized controlled trial: a pilot of preliminary efficacy, feasibility, and acceptability of a group-level, HIV risk reduction intervention for young men who have sex with men. *Archives of Sexual Behavior*. 2015; 44:475–485. [PubMed: 25135064]
- Huebner DM, Gerend MA. The relation between beliefs about drug treatments for HIV and sexual risk behavior in gay and bisexual men. *Annals of Behavioral Medicine*. 2001; 23:304–312. [PubMed: 11761348]
- Huebner DM, Rebchook GM, Kegeles SM. A longitudinal study of the association between treatment optimism and sexual risk behavior in young adult gay and bisexual men. *Journal of Acquired Immune Deficiency Syndrome*. 2004; 37:1514–1519.
- Hütter G, Nowak D, Mossner M, Ganepola S, Müßig A, Allers K, Thiel E. Long-term control of HIV by CCR5 Delta32/Delta32 stem-cell transplantation. *New England Journal of Medicine*. 2009; 360:692–698. [PubMed: 19213682]
- Kann L, Telljohann SK, Wooley SF. Health education: Results from the School Health Policies and Programs Study 2006. *Journal of School Health*. 2007; 77:408–434.
- Kellogg, AP. 'Safe sex fatigue' grows among gay students. *The Chronicle of Higher Education*. 2002. Retrieved from <http://chronicle.com/article/Safe-Sex-Fatigue-Grows-Among/35434/>
- Massachusetts Department of Public Health. 2009 Massachusetts Youth Risk Behavior Survey. 2009. Retrieved from <http://www.doe.mass.edu/cnp/hprograms/yrbs/2009questions.pdf>
- Mustanski B, Garofalo R, Monahan C, Gratz B, Andrews R. Feasibility, acceptability, and preliminary efficacy of an online HIV prevention program for diverse young men who have sex with men: the Keep It Up! intervention. *AIDS and Behavior*. 2013a; 17:2999–3012. [PubMed: 23673793]
- Mustanski B, Johnson AK, Garofalo R, Ryan D, Birkett M. Perceived likelihood of using HIV pre-exposure prophylaxis medications among young men who have sex with men. *AIDS and Behavior*. 2013b; 17:2173–2179. [PubMed: 23128980]
- Mustanski B, Lyons T, Garcia SC. Internet use and sexual health of young men who have sex with men: a mixed-methods study. *Archives of Sexual Behavior*. 2011a; 40:289–300. [PubMed: 20182787]
- Mustanski B, Newcomb M, Du Bois SN, Garcia SC, Grov C. HIV in young men who have sex with men: A review of epidemiology, risk and protective factors, and interventions. *Journal of Sex Research*. 2011b; 48:218–253. [PubMed: 21409715]

- Mustanski B, Rendina HJ, Greene GJ, Sullivan PS, Parsons JT. Testing negative means I'm lucky, making good choices, or immune: Diverse reactions to HIV test results are associated with risk behaviors. *Annals of Behavioral Medicine*. 2014; 48:371–383. [PubMed: 24817015]
- Ostrow DE, Fox KJ, Chmiel JS, Silvestre A, Visscher BR, Venable PA, Strathdee SA. Attitudes towards highly active antiretroviral therapy are associated with sexual risk taking among HIV-infected and uninfected homosexual men. *AIDS*. 2002; 16:775–780. [PubMed: 11964534]
- Ostrow DG, Silverberg MJ, Cook RL, Chmiel JS, Johnson L, Li X, Jacobson LP. Prospective study of attitudinal and relationship predictors of sexual risk in the Multicenter AIDS Cohort Study. *AIDS and Behavior*. 2008; 12:127–138. [PubMed: 17410419]
- Outlaw AY, Phillips G, Hightow-Weidman LB, Fields SD, Hidalgo J, Halpern-Felsher B, The Young MSM of Color SPNS Initiative Study Group, M. Age of MSM sexual debut and risk factors: Results from a multisite study of racial/ethnic minority YMSM living with HIV. *AIDS Patient Care and STDS*. 2011; 25:S23–S29. [PubMed: 21711140]
- Peterson JL, Rothenberg R, Kraft JM, Beeker C, Trotter R. Perceived condom norms and HIV risks among social and sexual networks of young African American men who have sex with men. *Health Education Research*. 2009; 24:119–127. [PubMed: 18281710]
- Saez-Cirion A, Bacchus C, Hocqueloux L, Avettand-Fenoel V, Girault I, Lecuroux C, Rouzioux C. Post-treatment HIV-1 controllers with a long-term virological remission after the interruption of early initiated antiretroviral therapy ANRS VISCONTI Study. *PLoS Pathogens*. 2013; 9:e1003211. [PubMed: 23516360]
- Stokman JK, Schwarcz SK, Butler LM, de Jong B, Chen SY, Delgado V, McFarland W. HIV prevention fatigue among high-risk populations in San Francisco. *Journal of Acquired Immune Deficiency Syndrome*. 2004; 35:432–434.
- Stolte IG, de Wit JB, Kolader M, Fennema H, Coutinho RA, Dukers NH. Association between 'safer sex fatigue' and rectal gonorrhea is mediated by unsafe sex with casual partners among HIV-positive homosexual men. *Sexually Transmitted Diseases*. 2006; 33:201–208. [PubMed: 16505749]
- Stolte IG, Dukers NH, Geskus RB, Coutinho RA, de Wit JB. Homosexual men change to risky sex when perceiving less threat of HIV/AIDS since availability of highly active antiretroviral therapy: a longitudinal study. *AIDS*. 2004; 18:303–309. [PubMed: 15075549]
- 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; 23:1153–1162. [PubMed: 19417579]
- Thomas B, Mimiaga MJ, Mayer KH, Closson EF, Johnson CV, Menon S, Safren SA. Ensuring it works: a community-based approach to HIV prevention intervention development for men who have sex with men in Chennai, India. *AIDS Education and Prevention*. 2012; 24:483–499. [PubMed: 23206199]
- Tuller, D. A resisted pill to prevent HIV. *The New York Times*. 2013. Retrieved from http://www.nytimes.com/2013/12/31/health/a-resisted-pill-to-prevent-hiv.html?_r=1&
- Tun W, Celentano DD, Vlahov D, Strathdee SA. Attitudes toward HIV treatments influence unsafe sexual and injection practices among injecting drug users. *AIDS*. 2003; 17:1953–1962. [PubMed: 12960828]

Figure 1.
Path Model with Parameter Estimates.

Note. The model was estimated using Monte Carlo integration with the *number of condomless sex partners* being modeled using a zero-inflated Poisson distribution. Covariates are not shown.

* $p < 0.05$

** $p < 0.001$

Table 1

Sample characteristics (n = 352).

	<i>M (SD)</i>
Age in years (T3)	19.9 (1.3)
Age in years (T6)	21.4 (1.3)
Age of same sex sexual debut in years (T3)	15.2 (2.8)
Years since same sex sexual debut (T3)	4.7 (2.8)
# condomless anal sex acts with male partners (T3) ^a	12.63 (65.0)
# condomless anal sex male partners (T3) ^b	0.87 (2.0)
# condomless anal sex male partners (T4) ^b	0.88 (2.4)
# condomless anal sex male partners (T5) ^b	1.02 (4.3)
# condomless anal sex male partners (T6) ^b	0.63 (1.0)
HIV treatment optimism (T3)	1.20 (0.5)
HIV treatment optimism (T6)	1.14 (0.5)
HIV knowledge (% correct) (T2) ^c	76.7 (21.0)
PrEP likelihood (T2)	2.18 (0.5)
	% (n)
Race/ethnicity	
Black	50.0 (176)
Hispanic/Latino	21.8 (77)
White	18.8 (66)
Multiracial/other	9.4 (33)
Sexual orientation	
Only/mostly gay	79.6 (280)
Bisexual	14.5 (51)
Only/mostly heterosexual	1.4 (5)
Other/not listed	4.5 (16)
HIV status	
Negative	88.1 (310)
Positive	11.9 (42)
Level of education completed	
Less than high school diploma	22.2 (78)
High school diploma or GED	18.7 (66)
Greater than high school diploma	59.1 (208)
School-based sex education – HIV/AIDS ^c	
Yes	82.1 (276)
No	17.9 (60)
School-based sex education – condom use ^c	
Yes	61.6 (207)
No	38.4 (129)

		<i>M (SD)</i>
School-based sex education - homosexuality		
Yes		30.1 (101)
No		69.9 (235)

Note.

^aLast three sex partners only;

^blast six months only;

^cOf the 336 participants who answered these items in the 2nd wave of data collection.

Table 2

HIV Prevention Fatigue scale descriptive statistics among young men who have sex with men (n = 352)

	<i>M</i>	<i>SD</i>	Factor 1 Loading
Please tell me how strongly you agree or disagree with the following statements:			
I am burned out thinking about HIV	2.00	0.97	0.394
I am less careful about avoiding HIV today because I am tired of being safe	1.24	0.59	0.656
I have heard so much about HIV that I often tune out messages about it	1.84	1.00	0.739
I don't want to hear any more about HIV	1.72	0.92	0.750
Sometimes I do things where I might get HIV because I am tired of being careful	1.28	0.61	0.661
HIV is really not my problem, it's somebody else's	1.30	0.68	0.523
HIV Prevention Fatigue scale score	1.56	0.50	–

Note. Items are scored as follows: 1 = strongly disagree; 2 = mildly disagree; 3 = mildly agree; 4 = strongly agree.

Table 3

Correlations between HIV prevention fatigue, treatment optimism, and HIV risk factors in a sample of young men who have sex with men.

	1	2	3	4	5	6	7	8	9	10	11	12	13
1. HIV prevention fatigue – wave 3	–												
2. HIV prevention fatigue – wave 6	.39 ^c	–											
3. Treatment optimism – wave 3	.48 ^c	.17 ^b	–										
4. Treatment optimism – wave 6	.28 ^c	.37 ^c	.38 ^c	–									
5. HIV knowledge – wave 2	–.08	–.03	–.12 ^a	–.14	–								
6. PrEP likelihood – wave 2	.01	.04	–.02	–.04	.19 ^c	–							
7. # condomless sex partners – wave 3	.24 ^c	.14	.37 ^c	.23 ^b	.04	.04	–						
8. # condomless sex partners – wave 4	.28 ^c	.14	.26 ^c	.16 ^a	.03	.00	.70 ^c	–					
9. # condomless sex partners – wave 5	.27 ^c	.02	.18 ^a	.10	.09	.00	.65 ^c	.84 ^c	–				
10. # condomless sex partners – wave 6	.05	.09	.08	.20 ^a	.01	.03	.01	.18 ^a	.18 ^a	–			
11. Age of same-sex sexual debut – wave 3	–.03	–.17 ^a	.04	.00	.07	–.05	–.07	–.01	.03	–.11	–		
12. Time since sexual debut – wave 3	.06	.18 ^b	.00	.01	.02	.03	.12	.07	.04	.07	–.90 ^c	–	
13. HIV status ^d – wave 3	.12 ^a	.03	.11 ^a	.10	–.05	.06	.01	.02	–.02	–.04	–.09	.13 ^a	

Note.

^a p < .05,^b p < .01,^c p < .001,^d dichotomous variable; 0 = HIV negative, 1 = HIV positive