Published in final edited form as:

Sex Transm Infect. 2014 December ; 90(8): 602–607. doi:10.1136/sextrans-2014-051581.

How often do condoms fail? : A cross-sectional study exploring incomplete use of condoms, condom failures, and other condom problems among Black and White MSM in the Southern U.S

Alfonso C. Hernández-Romieu, MBBS, MPH¹, Aaron Siegler, PhD, MHS¹, Patrick S. Sullivan, PhD, DVM¹, Richard Crosby, PhD², and Eli S. Rosenberg, PhD¹

¹Department of Epidemiology, Rollins School of Public Health, Emory University, Atlanta, GA. USA

²Department of Health Behavior, College of Public Health, University of Kentucky, Lexington, KY. USA

Abstract

Objectives—Compare the occurrence of risk-inducing condom events (condom failures and incomplete use) and the frequency of their antecedents (condom errors, fit/feel problems, and erection problems) between Black and White MSM, and determine the associations between risk-inducing condom events and their antecedents.

Methods—We studied cross-sectional data of 475 MSM who indicated using a condom as an insertive partner in the previous 6 months enrolled in a cohort study in Atlanta, GA.

Results—Nearly 40% of Black MSM reported breakage or incomplete use, and they were more likely to report breakage, early removal, and delayed application of a condom than White MSM. Only 31% and 54% of MSM reported correct condom use and suboptimal fit/feel of a condom respectively. The use of oil-based lubricants and suboptimal fit/feel were associated with higher odds of reporting breakage ($P = 0.009$). Suboptimal fit/feel was also associated with higher odds of incomplete use of condoms ($P < 0.0001$).

Conclusions—Incomplete use of condoms and condom failures were especially common among Black MSM. Our findings indicate that condoms likely offered them less protection against HIV/STI when compared to White MSM. More interventions are needed, particularly addressing the use of oil-based lubricants and suboptimal fit/feel of condoms.

CORRESPONDING AUTHOR: Alfonso C. Hernández-Romieu, Department of Epidemiology, Rollins School of Public Health, Emory University, 1518 Clifton Rd. NE, Room 444 GCR, Atlanta, Georgia 30322, Phone: (+1) (404)727-8974/Fax: (404)712-8392, alfonso.claudio.hernandez@emory.edu.

Competing Interests: None to declare.

Contributions: ACH and ESR were responsible for designing and conducting the analysis, and interpretation of results. ACH was responsible for drafting and production of the final manuscript. All authors read and approved the final manuscript.

The Corresponding Author has the right to grant on behalf of all authors and does grant on behalf of all authors, an exclusive licence (or non exclusive for government employees) on a worldwide basis to the BMJ Publishing Group Ltd to permit this article (if accepted) to be published in STI and any other BMJPL products and sub-licences such use and exploit all subsidiary rights, as set out in our licence <http://group.bmj.com/products/journals/instructions-for-authors/licence-forms>

Keywords

condoms; men; HIV; behavioural interventions; prevention

INTRODUCTION

The HIV epidemic among men who have sex with men (MSM) is expanding in developed and developing countries. In 2012, estimates of HIV prevalence in America, south and south-east Asia, and Sub-Saharan Africa ranged between 14–18%, and was highest in the Caribbean region with 25% [1]. There are racial disparities in HIV infection among MSM, with Black MSM being at higher risk of HIV infection [2, 3]. Disparities are particularly salient in the United States (U.S.), where the rate of new HIV infections among Black MSM is six times that of White MSM [4].

Racial disparities in HIV infection among MSM in the U.S. are complex. Across studies of MSM, there is no evidence of greater sexual risk among Black MSM, including no evidence of more frequent anal intercourse (AI) without a condom [2]. The evidence points instead to other factors such as the increased prevalence of STI/HIV in sexual networks of Black MSM, racial homophily, lack of access to HIV treatment and prevention services, and stigma and discrimination as contributors to racial disparities in HIV-infection [2, 5]. However, certain aspects of racial differences in sexual risk remain understudied, in particular the occurrence of risk-inducing condom events, defined as condom use problems that can result in an increased risk of exposure to STI/HIV.

Risk-inducing condom events include incomplete use of condoms (i.e., early removal and delayed application of a condom during sex) and condom failures (i.e., breakage and slippage). Several U.S.-based and international studies have shown risk-inducing condom events to be highly prevalent among heterosexual and MSM populations [6, 7]. However, only two studies to date have assessed differences in the occurrence of these events among MSM by race, and reported contradictory results [7, 8].

In addition to studying risk-inducing condom events, determining the antecedents of these events among MSM is important, and some are amenable to behavioral interventions. Three particular antecedents – condom errors, fit/feel problems, and erection problems – have been associated with risk-inducing condom events in previous studies [6, 9–16]; few studies have examined these relationships among MSM [8, 16]. Condom errors are mistakes in the technical use of condoms (e.g., letting condoms contact sharp objects). Among heterosexuals, errors such as the use of oil-based lubricants have been linked to an increased likelihood of condom failure [12].

Fit/feel problems refer to the perceived comfort of the condom by the user (e.g. a condom is “too tight” or “too loose”). Erection problems include erection loss while putting on a condom and while having sex with a condom. Studies among heterosexual men identified erection loss during sex [10, 14, 15] and poorly fitting condoms [13] as correlates of early removal of a condom. Another study among Black MSM found that participants indicating that condoms felt “too tight” were more likely to report condom breakage [16].

We developed two research objectives: 1) Compare the occurrence of risk-inducing condom events and the frequency of their antecedents (i.e., errors, fit/feel problems, and erection problems) between Black and White MSM; and 2) Determine associations between risk-inducing condom events and their antecedents. To achieve these objectives, we analyzed cross-sectional data from the baseline assessment of a cohort study of 803 Black and White MSM recruited in the Southern U.S.

METHODS

Study Design

InvolveMENT was a prospective cohort study at Emory University that assessed individual, dyadic, and community level factors that might explain disparities in HIV/STI incidence between Black and White MSM in Atlanta, Georgia (U.S.). An in-depth description of the study methods is available elsewhere [17]. Briefly, Black and White MSM were recruited from June 2010 to December 2012 in venues and through the internet. Individuals were eligible if they were male at birth, self-reported Black or White race, could complete study instruments in English, currently lived in Atlanta, had at least 1 male sex partner in the previous 3 months and provided at least 2 means of contact. At the baseline study visit, potential participants completed screening for HIV and STI, and a computer-administered self-interview questionnaire. This study was approved by the Emory University Institutional Review Board.

Questionnaire Measures

The self-interview questionnaire assessed participant demographic factors, sexual behaviors, and HIV knowledge [18], and included separate sections assessing condom use in the last 6 months, and condom use at last sex with up to 5 recent partners.

Condom use in the previous 6 months was quantified for episodes where the participant was the insertive partner. An adaptation of the “Condom use, errors, and problems questionnaire” [19] was used to measure risk-inducing condom events and their antecedents by asking whether insertive partners had experienced them one or more times in the previous 6 months. Responses were analyzed as dichotomous variables (i.e., Ever/Never) for each outcome.

In the section that collected partner-by-partner data for up to 5 recent partners, we assessed condom use during engagement in insertive (IAI) and receptive anal intercourse (RAI) at last sex. For each anal sex role, incomplete use and breakage were queried by asking, for sex episodes where the respondent reported anal intercourse, whether he (insertive episodes) or his partner (receptive episodes) used a condom none of the time, part of the time, all of the time, or used a condom that broke. Episodes of IAI and RAI were analyzed separately, and participants indicating both IAI and RAI were counted in both categories. Measures of slippage, errors, fit/feel problems and erection problems were unavailable for this section of the questionnaire.

Analysis

Data on demographic factors, sexual behaviors, HIV-status, and HIV knowledge were analyzed for all men reporting condom use for IAI in the previous 6 months. χ^2 tests and Wilcoxon signed-rank tests were used to perform race comparisons for categorical and continuous variables, respectively.

To address our first objective, data regarding risk-inducing condom events and antecedents during IAI in the previous 6 months were described as frequencies and proportions and compared using χ^2 tests. Summary descriptive measures were effective condom use in the period (i.e., never having experienced a risk-inducing condom event) and correct use in the period (i.e. having reported no errors). We used multivariate logistic regression to obtain adjusted prevalence ratios comparing risk-inducing condom events and antecedents by race. We used the prevalence ratio as our measure of effect because odds ratios inflate the associations involving non-rare outcomes and yield less precise estimates [20]. To assess, whether racial differences in the occurrence of risk-inducing condom events depended on levels of age and education, all models included race-age and race-education interaction terms.

To address our second objective we selected condom-related antecedents previously associated with risk-inducing condom events [6, 9–16]. We developed multivariable logistic regression models for each risk-inducing condom event (i.e., breakage, slippage, and incomplete use) that contained all of the hypothesized antecedents including interaction terms of erection problems and fit and feel problem where appropriate.

To better understand frequency of risk-inducing condom events, we used multivariable Poisson regression models to estimate adjusted rates of incomplete condom use at last sex, and rates of condom breakage for sex acts where condom use was reported. Because individuals reported on multiple partners, we used GEE models to adjust for repeated measures.

Missing data were excluded from the analyses. All statistical tests were conducted at $\alpha = 0.05$. Analyses were conducted in SAS V.9.3 (Cary, North Carolina, USA).

RESULTS

In our study, 659 out of 801 (82%) participants indicated using a condom in the previous 6 months, with proportions higher among Black MSM (87%) than White MSM (77%) ($P = 0.0004$). Of those reporting condom use in the previous 6 months, 475 (72%) indicated having used a condom as an insertive partner in the last 6 months, with younger men indicating less use of condoms as the insertive partner ($P = 0.0003$). A detailed analysis of these differences is shown in Web-only Table 1.

Our final sample included 475 participants who indicated using a condom as an insertive partner in the previous 6 months, of whom 61% ($n = 278$) were Black MSM. Their characteristics are shown in Table 1.

The frequency of risk-inducing condom events and their antecedents compared by race are shown in Table 2. In our sample, 36% of participants who used condoms for IAI reported effective use of a condom in the previous 6 months. Both condom breakage and slippage when pulling out were nearly twice as prevalent among Black MSM compared to White MSM. Additionally, nearly 40% of Black MSM reported incomplete use of a condom in the previous 6 months and were significantly more likely than White MSM to report incomplete use of a condom.

Among IAI condom users, only 31% reported correct condom use in the previous 6 months. Most condom errors were not different by race, but Black MSM were more likely to report using an oil-based lubricant or unrolling a condom completely before use than White MSM.

Most participants (54%) indicated that standard condoms did not provide optimal fit/feel. Sixty percent reported erection problems associated with condoms. White MSM were more likely to report both fit/feel and erection problems.

In addition to racial comparisons, we also examined differences by age-group and education (data not shown). Men aged 18–24 were less likely to use a condom correctly ((aPR: 0.6, 95%CI: [0.4 – 0.8]) compared to those 25 to 29 years of age). Only the use of oil-based lubricants significantly differed by age-group and education.

Oil-based lubricant use was more common among Black MSM (53%) than White MSM (21%) (Table 3). After adjusting for racial differences, oil-based lubricant use was more common among younger men and men with less education.

Table 4 presents multivariable model results for the hypothesized associations between antecedents and risk-inducing condom events. After adjusting for antecedents and other confounders, Black MSM remained over twice as likely to report breakage relative to White MSM. Oil-based lubricant use and reporting that standard condoms fit poorly were associated with higher odds of experiencing any condom breakage in the previous six months. In a separate model, reporting poorly fitting condoms and erection problems while putting on a condom were associated with slippage. Erection and fit/feel problems were found to be associated with delayed application and early removal of condoms, and similar to breakage, after adjusting for antecedents, Black MSM were three times more likely to report early removal and twice as likely to report delayed application of a condom.

In addition to 6-month recall, condom use data were provided on 3,418 of 3,432 (99%) acts of IAI and RAI during last sex with 4,396 partners. Condom use, incomplete use of a condom, and condom breakage for IAI and RAI episodes are shown in Web-only Table 2. Black MSM were more likely to use condoms both as insertive and receptive partners. The rate of incomplete use was 14.4 and 12.2 per 100 condoms used for IAI and RAI episodes respectively. The rate of condom breakage was 2.3 and 3.6 per 100 condoms used for IAI and RAI respectively. Rates of incomplete use and condom breakage were similar by race.

DISCUSSION

This is one of the first studies to quantify and compare the occurrence of condom failures and incomplete use as well as the frequency of condom errors, and fit/feel and erection problems among Black and White MSM. Additionally, the associations between antecedents and risk-inducing condom events had not been studied among MSM. According to our data, condoms may be used more frequently by Black MSM, but they are also used less effectively and with more errors. In addition to the network and structural barriers that increase the risk of HIV among Black MSM, racial disparities in HIV-infection may be further incremented by high rates of condom failure and incomplete use of condoms.

Clinicians, nurses and other health-care workers are an essential component of HIV prevention as many times they are the first point of contact for MSM at risk of or infected with HIV/STI. The translation of our findings into health-care settings could be achieved by offering men extended learning sessions designed to promote complete (start-to-finish) and correct use of condoms. In addition, when collecting sexual histories and providing recommendations, care-providers should be aware of the use of condom degrading products, such as oil-based lubricants, and the possibility of suboptimal fit and feel of standard condoms.

Contrary to previous findings [11, 12] most errors were not associated with increased breakage after controlling for other antecedents such as fit/feel problems. Although errors when using a condom might mediate the relationship of suboptimal fit/feel with condom breakage, we found that the later were not subject to confounding when including errors in the multivariate model. Our findings indicate that the use of oil-based lubricants and fit/feel problems may account for a large portion of condom breaks among MSM.

Oil-based lubricants are of particular importance as they have been shown to decrease the strength of condoms by 90% [9], to strip the mucosal epithelia of the colorectal tissue [21], and to increase rectal luminal secretion [22], increasing the efficiency of HIV transmission. In our sample, this was a particularly important problem among young Black MSM, who had high proportions of oil-based lubricant use and condom breakage. A high proportion of oil-based lubricant use was also observed in a study of young black MSM in Chicago [7]. Young Black MSM account for the largest number of new HIV infections among MSM [23] and may be the group most benefited from incorporating condom proficiency interventions into existing HIV/STI prevention programs. Moreover, future research should seek to determine the contextual factors linked to the use of oil-based lubricants.

The high prevalence of fit/feel problems among our participants suggests that, beyond condom education, more fundamental changes in the condom industry may be needed to achieve higher levels of correct condom use. The associations of poor fit/feel of a condom with risk-inducing condom events agrees with previous findings [6, 11, 13, 15, 16] and support the need for the development of better fitting condoms for MSM. Increasing availability of more sizes of condoms might improve fit and feel, and thereby might increase the use of condoms among MSM or decrease incomplete use of condoms. Additionally,

given the high rate of condom breakage reported by our participants, further study of condom performance for anal-sex should be considered.

Despite adjusting for antecedents in our multivariate models, the associations between race and risk-inducing condom events remained significant suggesting the existence of unmeasured factors that may account for the racial differences observed. Among MSM, difficulties reaching an orgasm have been associated with incomplete use of condoms [24]. More research is needed exploring the psychosexual differences and the effect of social stressors (e.g., anti-gay stigma) on sexual behavior between Black and non-Black MSM.

The incomplete use of condoms and condom breakage at last sex in our sample were higher than those previously reported for Black and White MSM [6, 25]. While we noted important racial differences in condom breakage and incomplete use in a 6-month recall period, the rates of breakage and incomplete use at last sex were similar by race. This discrepancy may be related to the use of different recall periods. A longer recall period 6-month recall period increases the sensitivity of detection of rare outcomes, such as condom breakage and incomplete use, by allowing for a larger number of sexual episodes to be considered. Regardless, the high levels of incomplete condom use and breakage provide evidence that there may be important misclassification of unprotected anal intercourse (UAI) into the category of condom protected sex among MSM. This misclassification, in turn, might create bias favoring the null hypothesis in randomized studies testing the effect of behavioral interventions on HIV/STI transmission.

Our findings are comparable to those obtained in other settings. In a representative sample of Australian MSM, 24% reported condom breakage in the past 12 months [26]. In a survey of gay and bisexual Canadian men 47% reported incomplete use of a condom in the previous 12 months as an insertive partner [27]. The similarities in the occurrence of risk-inducing condom events may indicate that important antecedents, like the use of oil-based lubricants and fit/feel problems, may also be common among MSM in international settings and require further research.

There are at least four limitations to our study. First, because we used venues to recruit MSM, our findings may not be generalizable to MSM not visiting these venues. In addition, insertive partners in our sample were older and more likely to have had multiple partners in the previous 6 months compared to non-insertive partners, and may not be representative of all MSM. Second, we were unable to assess the occurrence of slippage, errors, and erection and fit/feel problems at last sex; by relying on a 6-month recall period, the estimates of occurrence of these events might have subject to recall or social desirability biases. Third, given the recall period used, we could not establish whether errors preceded condom failures or were co-located at the same sexual episode; therefore our results do not indicate causation. Finally, we relied on self-report data because biological measures of condom use were not available. Although measurements of prostate-specific antigen and Y-chromosome DNA have been used to assess exposure to semen in heterosexual women, no effective biomarker for UAI has been developed or tested for MSM [28]. Studies seeking to address condom use among MSM should seek to develop biological measures to avoid relying on self-report data.

CONCLUSIONS

This is one of the first studies to quantify the occurrence of condom use errors and problems among MSM. Incomplete use of condoms and condom failures were common, and our findings indicate that condoms likely offer Black MSM less protection against HIV/STI compared to White MSM. The public health implications are clear. First, improving condom use proficiency and reducing the use of oil-based lubricants among MSM should be incorporated into prevention programs. Second, there is a need to consider supply-side research to develop better condom options for MSM. Third, researchers should carefully assess risk-inducing condom events when measuring the sexual behaviors of MSM. Finally, UAI events may be subject to misclassification bias, indicating the need to incorporate more refined measures of condom use into HIV prevention research and behavioral surveillance of MSM.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

Support: National Institute of Mental Health R01MH085600, Minority Health and Health Disparities RC1MD004370, Eunice Kennedy Shriver National Institute of Child Health and Human Development R01HD067111, NIH P30AI050409 – the Emory Center for AIDS Research, and the National Center for Advancing Translational Sciences of the National Institutes of Health under Award Number UL1TR000454.

References

1. Beyrer C, Baral SD, van Griensven F, et al. Global epidemiology of HIV infection in men who have sex with men. *Lancet*. 2012; 380(9839):367–77. [PubMed: 22819660]
2. 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(9839):341–8. [PubMed: 22819656]
3. Millett GA, Jeffries WL, Peterson JL, et al. Common roots: a contextual review of HIV epidemics in black men who have sex with men across the African diaspora. *Lancet*. 2012; 380(9839):411–23. [PubMed: 22819654]
4. Purcell DW, Johnson CH, Lansky A, et al. Estimating the population size of men who have sex with men in the United States to obtain HIV and syphilis rates. *Open AIDS J*. 2012; 6:98–107. [PubMed: 23049658]
5. Maulsby C, Millett G, Lindsey K, et al. HIV among Black men who have sex with men (MSM) in the United States: a review of the literature. *AIDS Behav*. 2014; 18(1):10–25. Epub 2013/04/27. [PubMed: 23620241]
6. Sanders SA, Yarber WL, Kaufman EL, et al. Condom use errors and problems: a global view. *Sex Health*. 2012; 9(1):81–95. Epub 2012/02/22. [PubMed: 22348636]
7. Mustanski B, Ryan DT, Garofalo R. Associations of sexually transmitted infections with condom problems among young men who have sex with men. *Sex Transm Dis*. 2014; 41(7):427–32. Epub 2014/06/13. [PubMed: 24922101]
8. Du Bois SN, Emerson E, Mustanski B. Condom-related problems among a racially diverse sample of young men who have sex with men. *AIDS Behav*. 2011; 15(7):1342–6. Epub 2010/12/15. [PubMed: 21153431]
9. Voeller B, Coulson Ah, Bernstein GS, et al. Mineral oil lubricants cause rapid deterioration of latex condoms. *Contraception*. 1989; 39(1):95–102. [PubMed: 2535978]

10. Du Bois SN, Emerson E, Mustanski B. Condom-related problems among a racially diverse sample of young men who have sex with men. *AIDS Behav.* 2011; 15(7):1342–6. Epub 2010/12/15. [PubMed: 21153431]
11. Graham CA, Crosby R, Yarber WL, et al. Erection loss in association with condom use among young men attending a public STI clinic: potential correlates and implications for risk behaviour. *Sex Health.* 2006; 3(4):255. [PubMed: 17112437]
12. Crosby R, Yarber WL, Sanders SA, et al. Slips, breaks and ‘falls’: condom errors and problems reported by men attending an STD clinic. *Int J STD AIDS.* 2008; 19(2):90–3. Epub 2008/03/13. [PubMed: 18334060]
13. Crosby R, Diclemente RJ, Yarber WL, et al. An event-specific analysis of condom breakage among African American men at risk of HIV acquisition. *Sex Transm Dis.* 2008; 35(2):174–7. Epub 2007/12/20. [PubMed: 18090176]
14. Crosby R, Yarber WL, Sanders SA, et al. Condom discomfort and associated problems with their use among university students. *J of ACH.* 2005; 54(3):143–7. Epub 2005/12/13.
15. Yarber WL, Crosby RA, Graham CA, et al. Correlates of putting condoms on after sex has begun and of removing them before sex ends: a study of men attending an urban public STD clinic. *Am J Mens Health.* 2007; 1(3):190–6. Epub 2007/09/01. [PubMed: 19482797]
16. Crosby RA, Yarber WL, Graham CA, et al. Does it fit okay? Problems with condom use as a function of self-reported poor fit. *Sex Trans Infect.* 2010; 86(1):36–8. Epub 2010/02/17.
17. Reece M, Dodge B, Herbenick D, et al. Experiences of condom fit and feel among African-American men who have sex with men. *Sex Trans Infect.* 2007; 83(6):454–7. Epub 2007/08/19.
18. Sullivan PS, Peterson J, Rosenberg ES, et al. Understanding racial HIV/STI disparities in black and white men who have sex with men: a multilevel approach. *PLoS One.* 2014; 9(3):e90514. Epub 2014/03/13. [PubMed: 24608176]
19. Carey MP, Schroder KE. Development and psychometric evaluation of the brief HIV Knowledge Questionnaire. *AIDS education and prevention.* 2002; 14(2):172–82. [PubMed: 12000234]
20. Crosby R, Sanders SA, Yarber W, et al. Condom Use Errors and Problems Among College Men. *Sex Transm Dis.* 2002; 29(9):552–7. [PubMed: 12218848]
21. Zocchetti C, Consonni D, Bertazzi PA. Relationship between prevalence rate ratios and odds ratios in cross-sectional studies. *Int J Epidemiol.* 1997; 26(1):220–3. [PubMed: 9126523]
22. Dezzutti CS, Brown ER, Moncla B, et al. Is wetter better? An evaluation of over-the-counter personal lubricants for safety and anti-HIV-1 activity. *PLoS One.* 2012; 7(11):e48328. Epub 2012/11/13. [PubMed: 23144863]
23. Fuchs EJ, Lee LA, Torbenson MS, et al. Hyperosmolar sexual lubricant causes epithelial damage in the distal colon: potential implication for HIV transmission. *J Infect Dis.* 2007; 195(5):703–10. Epub 2007/01/31. [PubMed: 17262713]
24. Centers for Disease Control (CDC). Estimated HIV incidence among adults and adolescents in the United States, 2007–2010. *HIV Surveillance Supplemental Report.* 2012; 17(4)
25. Graham CA, Crosby RA, Milhausen RR, et al. Incomplete use of condoms: the importance of sexual arousal. *AIDS Behav.* 2011; 15(7):1328–31. Epub 2009/11/19. [PubMed: 19921418]
26. D’Anna LH, Margolis AD, Warner L, et al. Condom use problems during anal sex among men who have sex with men (MSM): findings from the Safe in the City study. *AIDS Care.* 2012; 24(8):1028–38. Epub 2012/04/24. [PubMed: 22519680]
27. de Visser RO, Smith AM, Rissel CE, et al. Sex in Australia: experience of condom failure among a representative sample of men. *Aust N Z J Public Health.* 2003; 27(2):217–22. [PubMed: 14696714]
28. Allman D, Xu K, Myers T, et al. Delayed application of condoms with safer and unsafe sex: factors associated with HIV risk in a community sample of gay and bisexual men. *AIDS Care.* 2009; 21(6):775–84. Epub 2009/10/07. [PubMed: 19806491]
29. Gallo MF, Steiner MJ, Hobbs MM, et al. Biological markers of sexual activity: tools for improving measurement in HIV/sexually transmitted infection prevention research. *Sex Transm Dis.* 2013; 40(6):447–52. Epub 2013/05/17. [PubMed: 23677018]

KEY MESSAGES

1. Condom failures and incomplete use of condoms are common among MSM.
2. Use of oil-based lubricants is common among Black MSM and further research is needed to understand contextual factors related to their use.
3. There is a need to provide innovative solutions to the suboptimal fit and feel provided by standard condoms.
4. Interventions aiming to increase the correct use of condoms should be included in HIV/STI prevention programs.

Table 1

Associations between participant characteristics and condom use as the insertive partner in the previous 6 months at baseline among InvolveMENT study participants in Atlanta, GA

	Overall	BMSM	WMSM	
	% (freq.)	% (freq.)	% (freq.)	p-value
Total	59 (475/801)	61 (278/452)	57 (197/349)	0.15
Age				0.25
18 – 24	33 (158/475)	34 (100/278)	29 (58/197)	
25 – 29	30 (142/475)	30 (83/278)	30 (59/197)	
30 – 39	37 (175/475)	34 (95/278)	41 (80/197)	
Education				<0.0001
High School/GED or less	17 (78/473)	23 (64/277)	7 (14/196)	
Some College	41 (196/473)	47 (129/277)	34 (67/196)	
College or >	42 (199/473)	30 (84/277)	59 (115/196)	
Number of partners (previous 6 months)				0.0029
1	10 (47/467)	13 (35/273)	6 (12/194)	
2 – 5	54 (254/467)	57 (157/273)	50 (97/194)	
6 – 10	22 (103/467)	20 (54/273)	25 (49/194)	
11+	14 (63/467)	10 (27/273)	19 (36/194)	
HIV status at baseline				<0.0001
Positive	32 (154/475)	47 (132/278)	11 (22/197)	
Negative	68 (321/475)	53 (146/278)	89 (175/197)	
HIV knowledge score - median (IQR)	89 (83 – 94)	89 (78 – 94)	94 (88 – 100)	<0.0001

Condom failures, errors, and erection/fit problems by race among MSM with condom use as the insertive partner in the previous 6 months in Atlanta, GA

Table 2

	Overall	Black MSM	White MSM	Black vs. White adjusted prevalence ratio
RISK-INDUCING CONDOM EVENTS				
Effective use	36 (169/475)	31 (85/278)	43 (84/197)	aPR (95%CI) [§] 0.63 (0.49 – 0.80) [‡]
Condom Failures				
<i>Breakage</i>	31 (148/470)	39 (106/274)	21 (42/196)	1.71 (1.24 – 2.37) [‡]
<i>Slippage during sex</i>	18 (84/469)	20 (55/274)	15 (29/195)	1.25 (0.82 – 1.92)
<i>Slippage while pulling out</i>	23 (109/468)	29 (78/273)	16 (31/195)	1.88 (1.27 – 2.78) [‡]
Incomplete Use				
<i>Removed condom before sex was over</i>	32 (149/468)	38 (103/272)	23 (46/196)	1.87 (1.35 – 2.58) [‡]
<i>Delayed application of condom</i>	36 (167/473)	39 (106/272)	31 (61/196)	1.36 (1.04 – 1.78) [*]
ANTECEDENTS				
Correct use	31 (146/473)	28 (77/277)	35 (69/196)	0.82 (0.62 – 1.09)
Condom Errors				
<i>Let condom touch a sharp object</i>	16 (75/473)	15 (41/277)	17 (34/196)	0.77 (0.49 – 1.22)
<i>Applied condom incorrectly, flipped it and reapplied</i>	28 (131/471)	23 (63/276)	35 (68/195)	0.77 (0.56 – 1.05)
<i>Completely unrolled the condom before applying</i>	22 (103/465)	27 (74/273)	15 (29/192)	1.60 (1.07 – 2.40) [*]
<i>Did not hold tip of the condom to leave space and rolled condom down to base of penis</i>	28 (130/472)	27 (75/276)	28 (55/196)	0.91 (0.67 – 1.24)
<i>Used a dry condom</i>	19 (91/472)	21 (59/276)	16 (32/196)	1.15 (0.76 – 1.74)
<i>Used an oil-based lubricant</i>	40 (187/470)	53 (147/276)	21 (40/194)	2.10 (1.57 – 2.80) [‡]
Erection and Fit				
<i>Had a problem with the way the condom fit or felt</i>	54 (256/471)	49 (135/275)	62 (121/196)	0.81 (0.68 – 0.96) [*]
<i>Had erection problems while putting on a condom</i>	63 (299/471)	60 (164/275)	69 (135/196)	0.93 (0.80 – 1.07)
<i>Had erection problems while having sex with a condom</i>	60 (284/472)	54 (149/276)	69 (135/196)	0.84 (0.72 – 0.98) [*]

* p<.05,

[‡] p<.01,

Author Manuscript

Author Manuscript

Author Manuscript

Author Manuscript

‡;1001

§ Adjusted for age, education, HIV knowledge and male sex partners in the previous 6 months; race-age and race-education interactions were not significant

Table 3

Oil-based lubricant use among MSM with condom use as the insertive partner in the previous 6 months in Atlanta, GA

	Overall		Black MSM [¶]	White MSM
	% reporting use (freq)	aPR (95%CI) [§]	% reporting use (freq)	
Race				
Black MSM	53 (147/276)	2.10 (1.57 – 2.80) [‡]	-	-
White MSM	21 (40/194)	ref.	-	-
Age				
18 – 24	51 (80/156)	1.37 (1.06 – 1.78) [†]	62 (62/100)	32 (18/56)
25 – 29	39 (55/141)	1.16 (0.88 – 1.54)	52 (43/82)	20 (12/59)
30+	30 (52/173)	ref.	45 (42/94)	13 (10/79)
Education				
High School/GED or less	62 (48/78)	1.40 (1.05 – 1.87) [†]	67 (43/64)	36 (5/14)
Some College	43 (83/194)	1.16 (0.90 – 1.49)	51 (65/128)	27 (18/66)
College or graduate degree	28 (55/196)	ref.	46 (38/83)	15 (17/113)
Number of partners				
1	40 (19/47)	0.85 (0.57 – 1.25)	51 (18/35)	8 (1/12)
2 – 5	40 (101/252)	ref.	54 (84/156)	18 (17/96)
6 – 10	41 (42/103)	1.09 (0.85 – 1.39)	57 (31/54)	22 (11/49)
11+	39 (24/62)	1.11 (0.81 – 1.52)	48 (13/27)	31 (11/35)

*
p<.05,

[†]
p<.01,

[‡]
p<.001;

[§]PR from a model adjusting for race, age, education, HIV knowledge and partnerships in the previous 6 months;

[¶]Interaction terms between race and age, and race and education were not significant

Adjusted and unadjusted correlates of risk-inducing condom events among MSM with condom use as the insertive partner in the previous 6 months in Atlanta, GA

Table 4

	RISK-INDUCING CONDOM EVENTS					
	Breakage		Slippage during sex		Early removal of a condom	
	cOR	aOR (95%CI) [§]	cOR	aOR (95%CI) [§]	cOR	aOR (95%CI) [§]
Race						
Black MSM	2.31 [‡]	2.10 (1.27 – 3.47) [‡]	1.44	1.79 (1.01 – 3.16) [*]	1.99 [‡]	3.50 (2.12 – 5.77) [‡]
White MSM	ref.	ref.	ref.	ref.	ref.	ref.
ANTECEDENTS						
Errors						
Let condom touch a sharp object	1.79 [*]	1.26 (0.71 – 2.23)	-	-	-	-
Completely unrolled the condom before applying	1.51	1.23 (0.73 – 2.06)	-	-	-	-
Did not hold tip of the condom to leave space and rolled condom down to base of penis	0.92	0.76 (0.47 – 1.25)	-	-	-	-
Used a dry condom	1.5	1.05 (0.60 – 1.81)	-	-	2.94 [‡]	2.85 (1.66 – 4.88) [‡]
Used an oil-based lubricant	2.92 [‡]	1.90 (1.17 – 3.09) [‡]	-	-	-	-
Erection/fit problems						
Had a problem with the way the condom fit or felt	2.91 [‡]	2.73 (1.71 – 4.36) [‡]	6.73 [‡]	5.47 (2.77 – 10.78) [‡]	3.67 [‡]	3.27 (2.01 – 5.34) [‡]
Had erection problems while having sex with a condom	-	-	3.40 [*]	2.88 (1.47 – 5.61) [‡]	2.86 [‡]	2.45 (1.47 – 4.10) [‡]
Had erection problems while putting on a condom	-	-	-	-	-	2.04 (1.26 – 3.29) [‡]

* p<.05,

[‡] p<.01,

^{‡‡} p<.001;

[§] Adjusted for race, age, education, HIV knowledge and partners in the previous 6 months (only results for race and condom errors and erection/fit problems shown); interaction terms between race and age, race and education, and erection and fit/feel problems were not significant