



Published in final edited form as:

*Sex Transm Dis.* 2012 September ; 39(9): 687–693. doi:10.1097/OLQ.0b013e31825ef325.

## FACTORS ASSOCIATED WITH CONDOM USE PROBLEMS DURING VAGINAL SEX WITH MAIN AND NON-MAIN PARTNERS

Laura Hoyt D'Anna, DrPH<sup>1</sup>, Olga Korosteleva, PhD<sup>1</sup>, Lee Warner, PhD<sup>2</sup>, John Douglas, MD<sup>2</sup>, Sindy Paul, MD, MPH, FACMP<sup>3</sup>, Carol Metcalf, MB, CHB, MPH<sup>4</sup>, Elizabeth McIlvaine, MS<sup>5</sup>, C. Kevin Malotte, DrPH<sup>1</sup>, and the RESPECT-2 Study Group

<sup>1</sup>California State University, Long Beach, CA, U.S

<sup>2</sup>Centers for Disease Control and Prevention

<sup>3</sup>New Jersey Department of Health and Senior Services

<sup>4</sup>Medecins Sans Frontieres

<sup>5</sup>University of Southern California

### Abstract

**Background**—Incorrect condom use is a common problem that can undermine their prevention impact. We assessed the prevalence of two condom use problems, breakage/slippage and partial use, compared problems by partnership type, and examined associations with respondent, partner, and partnership characteristics.

**Methods**—Data were collected at 3-month intervals over a 12-month period (1999–2000) among urban STD clinic users. Condom use problems were compared between partnership types using z-tests for equality of proportions. Logistic generalized estimating equations modeling accounted for within-participant correlation of repeated measures.

**Results**—Overall, 3,297 respondents reported 9,304 main and 6,793 non-main partnerships; condoms were used at least once in 4,942 (53.0%) and 4,523 (66.6%) of these partnerships respectively. Condom breakage/slippage was reported during 6.0% of uses (5.1% main, 9.4% non-main) and partial use during 12.5% of uses (12.8% main, 11.5% non-main). The proportion of respondents experiencing any condom use problem in the prior 3 months was higher among main compared to non-main partnerships: 39.1% v. 29.9% had either problem; 22.5% v. 19.0% had breakage/slippage only; 21.8% v. 18.7%, partial use; and 8.7% v. 7.1% had both use problems. In multivariable analysis, factors associated with condom use problems varied by partnership type and respondent sex. The most common predictors of problems across models were sex while high and inconsistent condom use.

**Conclusions**—This study highlights the diverse set of risk factors for condom use problems at the individual, partner and partnerships levels.

### Keywords

condom use problems; sexual partnerships

---

For additional information, please contact: Laura Hoyt D'Anna, DrPH, Center for Health Care Innovation, California State University, Long Beach, 5500 Atherton St., Suite 400, Long Beach, CA 90815, Phone: 562-985-2178; Fax: 562-985-2180, ldanna@csulb.edu.

**Publisher's Disclaimer:** This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final citable form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

## Introduction

Consistent and correct use of latex condoms reduces risk for HIV as well as other sexually transmitted infections<sup>1-3</sup> Although most STI/HIV transmission takes place when condoms are not used,<sup>4,5</sup> and mechanical condom failures are relatively rare,<sup>6</sup> the effectiveness of condoms is jeopardized by commonly experienced problems with use resulting in breakage, slippage and partial use (i.e. delayed application or early removal).<sup>7-9</sup>

Many investigations have focused on associations between sexual risk factors and the consistency of self-reported condom use, but few have reported on use problems associated with condoms.<sup>3,8</sup> A systematic review of studies examining condom use and risk of gonorrhea and chlamydia found that of 45 studies evaluated, only 2 measured condom use problems.<sup>10</sup> Studies which examined condom use problems have documented a high prevalence of these outcomes.<sup>11</sup> For example, Project RESPECT, a study of HIV counseling interventions among STD clinic clients, reported high rates of use problems; 41 percent of users experienced at least one problem (i.e., breakage, slippage, leakage during withdrawal and partial use) during a three-month follow-up period, and nearly one in 10 condom uses involved a use problem that could increase STI risk. Further, approximately two-thirds of use problems were related to late application or early removal of condoms during intercourse (and were thus potentially modifiable), whereas largely unintentional use problems (breakage, slippage, leakage) accounted for only one-third overall problems.<sup>12</sup> Other studies have reported similarly high rates.<sup>13</sup> Factors associated with condom use problems have primarily focused on risk factors at the individual level and have included inexperience with condoms, inconsistent use, prior condom breakage or multiple use problems,<sup>12,14</sup> poor condom fit,<sup>15,16</sup> use of oil-based lubricant, difficulties applying and removing condoms after ejaculation, and multiple sex partners.<sup>17</sup>

Some investigators have examined partnership characteristics and inconsistent condom use, and, less frequently, condom use problems. Previous studies have found that relationship status is significantly related to condom use problems,<sup>5</sup> with cohabiting couples less likely to experience breakage or slippage compared to non-cohabiting couples. Other studies have documented the association between men's unilateral decision to use condoms (versus a shared decision with the partner) and increased odds for breakage, slippage and partial use, and perceived partner motivation to use condoms with breakage and slippage.<sup>13</sup> Better understanding of the prevalence of, and factors associated with, condom use errors by partnership type may allow for more personalized risk reduction and condom use messaging.

Using data collected in RESPECT-2, a randomized trial of STI/HIV prevention interventions among urban STD clinic users, we sought to expand on previous studies by exploring how characteristics of heterosexual partnerships affect the odds of experiencing two condom use problems (condom breakage/slippage and partial use) during vaginal intercourse. Specifically, we 1) assessed the prevalence of condom use problems; 2) compared problems by partner type (main and non-main partnerships); and 3) examined how characteristics of respondents, partners, and partnerships affect the odds of experiencing condom breakage/slippage or partial use.

## Materials and Methods

Data were analyzed from RESPECT-2. The study design and primary outcome results for RESPECT-2 have been described elsewhere.<sup>18</sup>

## Recruitment

Participants were recruited from STD clinics in three cities (Denver, Colorado; Long Beach, California; and Newark, New Jersey) between February 1999 and December 2000. Eligible clients presented to the clinics seeking a full diagnostic STD examination: additional eligibility criteria included HIV-negative status at enrollment, vaginal or anal sex in the preceding 3 months, and being ages 15–39 years. A total of 3,297 men (54%) and women (46%) were enrolled. Structured interviews using audio computer-assisted self-interviewing methodology occurred at baseline and at 3-month intervals for a 12-month period during which respondents described sexual behaviors, individual characteristics, partner, and partnership characteristics for up to 3 partners.

## Measures

Detailed information was collected on condom use frequency and problems. Condom use problems were measured with the following two questions: “Of the # times you used a condom, how many times did the condom break or slip off, either during sex or while you/he were/was pulling out?” and, “Of the # times you used a condom, how many times did you/he put the condom on after you started having sex or take it off before you finished having sex?” These variables were dichotomized into *zero times* vs. *one or more times*. (Condom breakage and slippage were combined in RESPECT-2 because both problems may be device-related as well as user-related and thus are only partially modifiable. Partial use of condoms, conversely, is entirely user-related and thus fully modifiable.) For each sexual partner, respondents were asked, “Which of these best describes (first name given to partner 1, 2, and 3)?” The possible responses were “main partner,” “one-time partner,” or “other partner,” and were recoded as main partner vs. non-main partner (i.e. one time + other partner). Thus, respondents were able to name both main and non-main partners (and multiple main or non-main partners) during the same 3-month interval. While the status of these partnerships could have changed during the course of the study and/or the same partnerships could have been reported on during multiple intervals, respondents were not asked to provide this information.

The following characteristics were examined to assess their relationships with each condom use problem for both main and non-main partnerships: *Respondent*: age, race, gender and education level, number of past 3-month sex partners, had sex while high, STI history and symptoms previous 3 months. *Partner*: age, partner had sex with others, intravenous drug user, perceived partner risk for STI (very likely, likely or unlikely v. very unlikely), and partner STI history and symptoms previous 3 months. *Partnership*: how long the couple was acquainted before initiating sex (< 1 month v. > 1 month), length of sexual relationship (> 1 month v. < 1 month), whether STIs or condoms were discussed, number of times a condom was used for vaginal sex acts (continuous variable), and condom use consistency (100% v. <100%). Interview time (baseline, 3, 6, 9, or 12 months), and intervention assignment were included as control variables.

## Analysis

Statistical analysis was conducted among partnerships with valid information where condoms were used for vaginal sex, (n=9,465 sexual partnerships). (Figure 1). Chi-squared tests were conducted to determine individual level predictors associated separately with breakage/slippage and partial use. Proportions of main and non-main partnerships ever experiencing breakage/slippage, partial use, both use problems, and at least one use problem were compared using a z-test for equality of proportions. For all bivariate analyses, we used a more stringent statistical criterion to indicate significance ( $p < 0.005$ ) due to a large sample size.

Eight models were fitted, modeling the probability of any episode of breakage/slippage and/or partial use, stratified by both sex and type of partnership. The models were developed using the generalized estimating equations (GEE) approach to account for possible correlations among multiple partnerships of each participant, multiple condom uses among participants, and multiple time intervals. Proc *genmod* in SAS<sup>®</sup> version 9.2 was employed for fitting the models, and only significant individual predictor variables were retained in final models in accordance with the backward elimination method.

## RESULTS

Respondents who reported vaginal sex in the prior 3 months with a main sexual partner in at least one interview during the study (n= 2,900) were represented equally by men and women, had a median age of 24, and a majority had not obtained a high school education (65.5%). African Americans comprised the largest group of respondents (52.3%) followed by Whites (20.6%), Latinos (18.0%) and other or multiracial (9.1%). Those who reported vaginal sex in the prior 3 months with at least one non-main partner (n=2,195) were more likely to be male (57.4%) but otherwise were similar to the sample reporting main partnerships.

### Frequency of Total Condom Use Problems Experienced

A total of 65,234 condoms were used by all respondents; condom breakage/slippage occurred with 3,940 condoms used (6.0%), and partial use occurred with 8,163 condoms used (12.5%). The per-use rate of condom breakage/slippage and partial use among main partnerships were 5.1% and 12.8% respectively. The per-use rate of condom breakage/slippage and partial use among non-main partnerships were 9.4% and 11.5% respectively (Table 1). All the compared rates were significantly different with  $p < 0.0001$ .

Respondents reported 9,304 total main partnerships, 53.1% (n=4,942) in which condoms were used at least once (Figure 1). Among main partnerships in which condoms were used during the last 3 months, 39.1% (n=1861) experienced at least one type of condom use problem (breakage/slippage or partial use); 22.5% (n=1,091) breakage/slippage, 21.8% (n=1,062) partial use, and 8.7% (n=416) both types of use problems (Table 2). Respondents reported 6,793 total non-main partnerships, 66.6% (n=4,523) in which condoms were used at least once (Figure 1). Among non-main partnerships in which condoms were used, 29.9% (n=1,291) experienced at least one type of condom problem; 19.0% (n=839) breakage/slippage, 18.7% (n=823) partial use, and 7.1% (n=307) both types of use problems (Table 2). All the compared percentages were significantly different with  $p < 0.001$  or  $p < 0.005$ .

### Multivariable Results

**Main Partners: Breakage/Slippage**—For men in main partnerships, increased odds for any breakage/slippage problem were associated with: knowing one's partner less than one month, less education, and having a partner who recently experienced STI-related symptoms. For women, factors included: experiencing past 3-month STI-related symptoms, and talking with sex partner about STIs or condoms. Both men and women had increased odds for any condom breakage/slippage when they had sex while high with drugs/alcohol, and when they had a higher number of condom uses (Table 3).

**Main Partners: Partial Use**—For men in main partnerships, the following characteristics were associated with an increased risk for partial use: having a sexual partner who recently experienced STI symptoms. For women, factors were: being in a sexual partnership for one month or longer, and having a partner with a history of injection drug use. Characteristics

for both men and women included having sex while high, less education, and using condoms less than 100% of the time (Table 4).

**Non-Main Partners: Breakage/Slippage**—For men in non-main partnerships, the following characteristics were associated with an increased risk for any breakage/slippage: engaging in sex while high, an increased number of protected vaginal sex acts, a partner who had an STI in the prior 3 months, being in a sexual partnership for less than one month, and knowing one's partner for less than one month prior to initiating sex. Characteristics for both men and women included the perception that one's partner had STI risk, less education, and having discussed STIs with one's partner (Table 3).

**Non-Main Partners: Partial Use**—Men in non-main partnerships had higher odds for partial condom use if they reported recently having sex while drunk or high, knew one's partner for less than one month before initiating sex, or had previously talked with one's partner about using condoms. The single common predictor associated with partial use for women and men was less than 100% condom use (Table 4).

## Discussion: Implications for Future STI/HIV Prevention and Research Efforts

Condom use problems were prevalent among this large sample of urban STD clinic attendees in the U.S.; more than 1 in 3 partnerships where condoms were used experienced condom use problems over the last 3 months. The per-use rates of condom breakage/slippage (1 of 16 condoms used overall) are slightly higher than estimates from other U.S. studies.<sup>5,16,17,19–21</sup> The per-use rate of partial condom use (1 of 8 condoms used overall) was even higher than breakage/slippage.

We anticipated our finding that partial condom use occurs more frequently in main partnerships where users may be primarily concerned with preventing pregnancy (and not disease); this distinction is important for STI prevention purposes since partial use is likely more amenable to behavioral interventions and partnership communication. Factors associated with early condom removal in other studies include erection loss and difficulties reaching orgasm due to reduced sensation,<sup>22</sup> while delayed application of condoms may be due to mistaken beliefs that condoms are only important for STI or pregnancy prevention during ejaculation.<sup>22,23</sup> The high partial use rates found in this study underscores that that STI/HIV prevention interventions should stress the importance of using condoms from start to finish,<sup>7,22</sup> and also provide and encourage the use of different types of condoms to assist the user in finding the types that may allow for the greatest level of sensitivity.

This study also highlights the diverse set of factors related to condom use problems at the individual, partner and partnerships levels. For both men and women, our research corroborates findings from other studies noting that exposure to risks of pregnancy and STIs are not necessarily isolated to periods of nonuse for these persons.<sup>12</sup> However, even when condoms are used consistently, individuals may use them incorrectly, which has direct implications for STD prevention interventions. For example, men in main partnerships had increased odds for any breakage/slippage when they had a partner who recently experienced STI-related symptoms. Given that men were recruited from STD clinics and had received standard of care counseling following STD treatment, this finding highlights the need for more intensive counseling strategies for these men. For women, risk factors included experiencing past 3-month STI-related symptoms and talking with sex partner about STIs or condoms. Communication with sex partners is one of the most important consistent

predictors of condom use in the literature, and most prevention interventions are designed to enhance partner communication about condom use.

Having vaginal sex while under the influence of alcohol/drugs was the single most consistent predictor of condom use problems. This finding complements studies documenting the association between substance use, higher levels of sexual risk-taking and lower levels of condom use.<sup>25-27</sup> This appears to be particularly true for non-main partnerships where condom use may be more greatly affected by partner characteristics, perceived self-efficacy for negotiation, and the type of sexual encounter (i.e., first time versus casual) to a greater degree than within established relationships.<sup>26,28</sup> Thus, the incorporation of substance use components into sexual risk reduction interventions targeted to partner-specific characteristics and situations may be the most important enhancement to present STI/HIV prevention efforts our study offers.

Our study had several strengths. First, the large number of participants enrolled in RESPECT-2 allowed for comparisons between types of partnerships, specific condom use problems, and by sex. Further, this study improves upon the methodology used in previous studies by collecting detailed condom use problem data from individual partnerships over time.<sup>8</sup> Specifically, the measures of breakage/slippage used in this study were designed to ask about use problems occurring during intercourse thereby eliminating reports of condom breakage that may have occurred prior to usage (i.e., when opening the packaging and/or applying the condom), which would not confer pregnancy or STI risk.<sup>17</sup>

Study limitations include our inability to identify specific partners at each survey because respondents could have reported on the same partnerships multiple times and a partnership could have changed status during the course of the study. This is particularly problematic given the role that partnership status plays in condom use. We were unable to account for additional relationship attributes that may influence condom use frequency and problems, such as communication about overcoming past condom use problems and enhanced proficiency of condom use resulting from using condoms in the same partnership over time. Another caveat is that our dichotomy of main versus non-main partnerships is not necessarily mutually exclusive as many respondents with main partners also had non-main partnerships. Thus, respondents who had both types of partnerships during the course of the study were represented within both samples. As with other studies, this study also relied on self-reported condom use and use problems and not objective biomarkers of unprotected sexual activity, such as prostate-specific antigen and Y chromosome. Finally, the age of the data from RESPECT-2 trial is a potential limitation to the extent that the prevalence of condom use problems and associations with covariates may have changed over time.

Respondents used condoms during less than half of vaginal sexual encounters, and even when condoms were used, problems with use occurred commonly.<sup>5</sup> Understanding factors associated with condom breakage and slippage is important as studies have shown these events can be reduced through behavioral counseling.<sup>24</sup> Our data support the importance of addressing condom skills to enhance proper use, and recent policy developments may enhance opportunities to do so, especially the endorsement by the US Preventive Services Task Force of high-intensity behavioral counseling as a recommended prevention intervention for adolescents and adults at risk of STD,<sup>29</sup> and the decision by the Centers for Medicaid and Medicare Services to provide reimbursement for this prevention service. Additionally, promising new condom technologies are evolving that may improve successful condom application and usage throughout intercourse, and condoms could be further improved to enhance the fit and sensitivity for all users. Additionally, marketing that emphasizes that sexual satisfaction is possible with the use of condoms for both men and women could supplement or replace traditional public health disease avoidance

messaging.<sup>3031</sup> Finally, future research should incorporate detailed questions about condom use problems and the contexts and reasons attributed to these problems. Rigorous examination of the relative effectiveness of skill-based training to prevent condom breakage and slippage, communication techniques to avoid partial usage, and the impact of condom use problems on STI acquisition will further enhance understanding of the importance of condom use problems.

## Acknowledgments

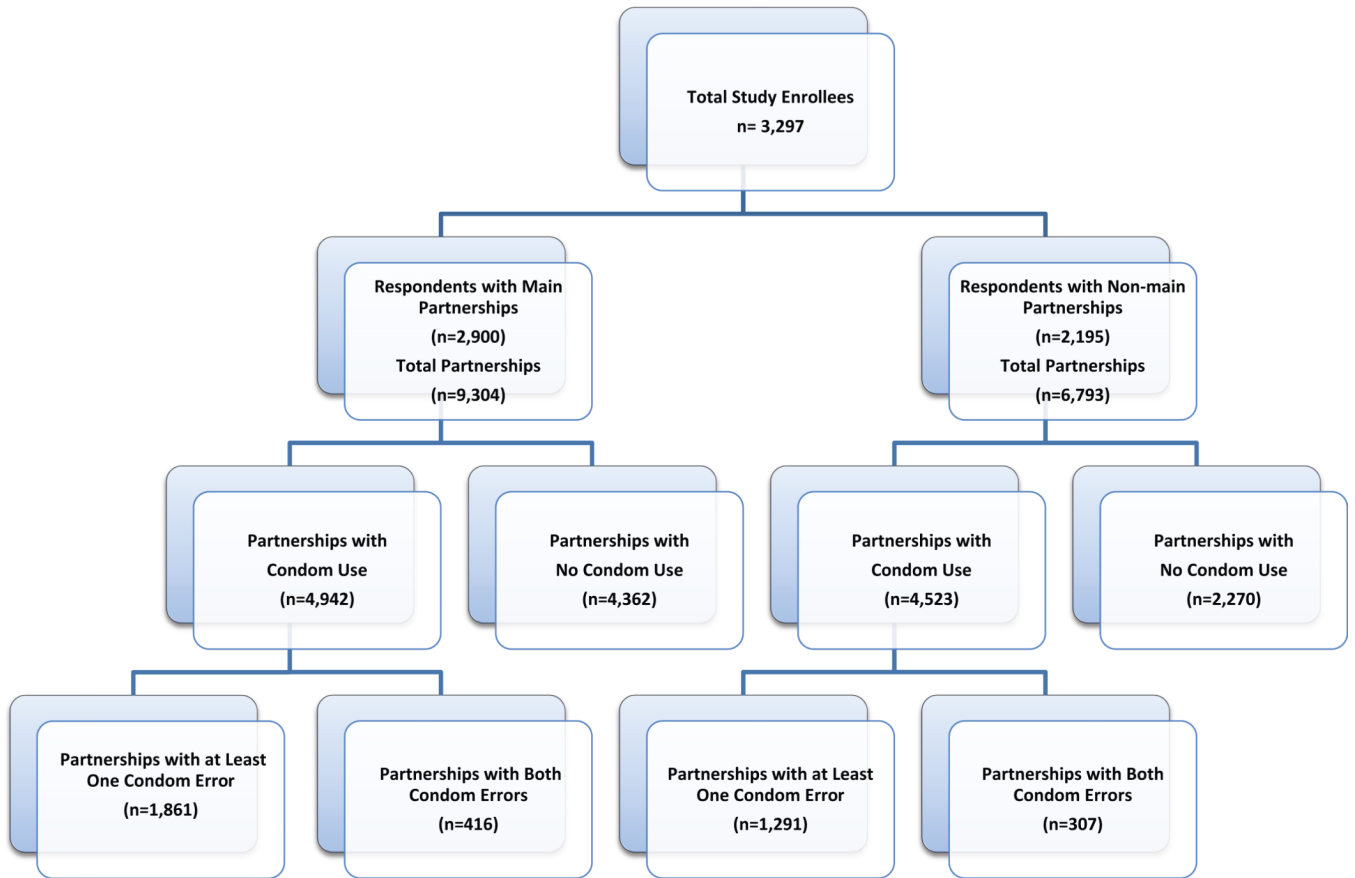
RESPECT-2 was funded by the United States Centers for Disease Control and Prevention. The preparation of this manuscript was supported in part by Award Number P20MD003942 from the National Institute on Minority Health and Health Disparities. The findings and conclusions in this article are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention, the National Institute on Minority Health and Health Disparities, or the National Institutes of Health.

## REFERENCES

1. Peterman TA, Tian LH, Warner DL, et al. Condom use in the year following a sexually transmitted disease clinic visit. *Int J STD AIDS*. 2009; 20:9–13. [PubMed: 19103885]
2. Warner L, Newman DR, Austin HD, et al. Condom effectiveness for reducing transmission of gonorrhea and chlamydia: the importance of assessing partner infection status. *Am J Epidemiol*. 2004; 159:242–251. [PubMed: 14742284]
3. Warner L, Macaluso M, Newman D, et al. Condom effectiveness for prevention of *C trachomatis* infection. *Sexually Transmitted Infections*. 2006; 82:265. [PubMed: 16731685]
4. Rietmeijer CA, Van Bemmelen R, Judson FN, Douglas JM Jr. Incidence and repeat infection rates of *Chlamydia trachomatis* among male and female patients in an STD clinic: implications for screening and rescreening. *Sex Transm Dis*. 2002; 29:65–72. [PubMed: 11818890]
5. Steiner MJ, Cates W Jr, Warner L. The real problem with male condoms is nonuse. *Sex Transm Dis*. 1999; 26:459–462. [PubMed: 10494937]
6. White ND, Hill DM, Bodemeier S. Male condoms that break in use do so mostly by a "blunt puncture" mechanism. *Contraception*. 2008; 77:360–365. [PubMed: 18402853]
7. Choi KH, Gregorich SE. Assessment of fully and partially condom-protected sex among US women: The potential for overestimating protected sex acts. *Sex Transm Dis*. 2010
8. Noar SM, Cole C, Carlyle K. Condom use measurement in 56 studies of sexual risk behavior: Review and recommendations. *Arch Sex Behav*. 2006; 35:327–345. [PubMed: 16799837]
9. Paz-Bailey G, Koumans EH, Sternberg M, et al. The effect of correct and consistent condom use on chlamydial and gonococcal infection among urban adolescents. *Arch Pediatr Adolesc Med*. 2005; 159:536–542. [PubMed: 15939852]
10. Warner L, Stone KM, Macaluso M, Buehler JW, Austin HD. Condom use and risk of gonorrhea and *Chlamydia*: a systematic review of design and measurement factors assessed in epidemiologic studies. *Sex Transm Dis*. 2006; 33:36–51. [PubMed: 16385221]
11. Sanders SA, Yarber WL, Kaufman EL, Crosby RA, Graham CA, Milhausen RR. Condom use errors and problems: a global view. *Sexual health*. 2012; 9:81–95. [PubMed: 22348636]
12. Warner L, Newman DR, Kamb ML, et al. Problems with condom use among patients attending sexually transmitted disease clinics: Prevalence, predictors, and relation to incident gonorrhea and chlamydia. *Am J Epidemiol*. 2008; 167:341–349. [PubMed: 17989058]
13. Crosby R, Milhausen R, Sanders SA, Graham CA, Yarber WL. Two heads are better than one: The association between condom decision-making and condom use errors and problems. *Sexually Transmitted Infections*. 2008; 84:198–201. [PubMed: 18508990]
14. Kalichman SC, Amaral CM, Swetzes C, et al. A simple single-item rating scale to measure medication adherence: further evidence for convergent validity. *J Int Assoc Physicians AIDS Care (Chic Ill)*. 2009; 8:367–374.
15. Crosby R, Sanders S, Yarber WL, Graham CA. Condom-use errors and problems: a neglected aspect of studies assessing condom effectiveness. *Am J Prev Med*. 2003; 24:367–370. [PubMed: 12726876]

16. Gabbay MB, Thomas J, Gibbs A, Hold P. A randomized crossover trial of the impact of additional spermicide on condom failure rates. *Sex Transm Dis*. 2008; 35:862–868. [PubMed: 18685543]
17. Grady WR, Tanfer K. Condom breakage and slippage among men in the United States. *Fam Plann Perspect*. 1994; 26:107–112. [PubMed: 8070546]
18. Metcalf CA, Douglas JM Jr, Malotte CK, et al. Relative efficacy of prevention counseling with rapid and standard HIV testing: A randomized, controlled trial (RESPECT-2). *Sex Transm Dis*. 2005; 32:130–138. [PubMed: 15668621]
19. Macaluso M, Demand MJ, Artz LM, Hook EW 3rd. Partner type and condom use. *AIDS*. 2000; 14:537–546. [PubMed: 10780716]
20. Reece M, Herbenick D, Sanders SA, P M, Temkit M, Yarber WL. Breakage, slippage and acceptability outcomes of a condom fitted to penile dimensions. *Sexually Transmitted Infections*. 2008; 84:143–149. [PubMed: 17971373]
21. Steiner, MJ.; Warner, DL.; Stone, KM.; Cates, W, Jr. Condoms and other barrier methods for prevention of STD/HIV infection and pregnancy. In: Holmes, KK.; Sparling, PF.; Stamm, WE., et al., editors. *Sex Transm Dis. Fourth Edition*. New York: McGraw-Hill; 2008. p. 1821-1830.
22. Graham CA, Crosby RA, Milhausen RR, Sanders SA, Yarber WL. Incomplete Use of Condoms: The Importance of Sexual Arousal. *AIDS Behavior*. 2009
23. Warner L, Klausner JD, Rietmeijer CA, et al. Effect of a brief video intervention on incident infection among patients attending sexually transmitted disease clinics. *PLoS Medicine*. 2008; 5 0919-27.
24. Steiner MJ, Taylor D, Hylton-Kong T, et al. Decreased condom breakage and slippage rates after counseling men at a sexually transmitted infection clinic in Jamaica. *Contraception*. 2007; 75:289–293. [PubMed: 17362708]
25. Sly DF, Quadagno D, Harrison DF, Eberstein I, Riehman K. The association between substance use, condom use and sexual risk among low-income women. *Fam Plann Perspect*. 1997; 29:132–136. [PubMed: 9179583]
26. Brown JL, Venable PA. Alcohol use, partner type, and risky sexual behavior among college students: Findings from an event-level study. *Addict Behav*. 2007; 32:2940–2952. [PubMed: 17611038]
27. Scott-Sheldon LA, Carey MP, Venable PA, Senn TE, Coury-Doniger P, Urban MA. Alcohol consumption, drug use, and condom use among STD clinic patients. *Journal of Studies on Alcohol and Drugs*. 2009; 70:762–770. [PubMed: 19737501]
28. Leigh BC. Alcohol and condom use: a meta-analysis of event-level studies. *Sex Transm Dis*. 2002; 29:476–482. [PubMed: 12172533]
29. [Accessed 2/9/12] Behavioral Counseling to Prevent Sexually Transmitted Infections. 2008. at <http://www.uspreventiveservicestaskforce.org/uspstf/uspstds.htm>.
30. Warner DL, Gallo MF, Macaluso M. Condom use around the globe: How can we fulfill the prevention potential of male condoms? *Sexual health*. 2012 In press.
31. [Accessed 2/9/12] Decision Memo for Screening for Sexually Transmitted Infections (STIs) and High Intensity Behavioral Counseling (HIBC) to prevent (STIs) (CAG-00426N). 2011. at [https://www.cms.gov/medicare-coverage-database/details/nca-decision-memo.aspx?&NcaName=Screening%20for%20Sexually%20Transmitted%20Infections%20\(STIs\)%20and%20High-Intensity%20Behavioral%20Counseling%20\(HIBC\)%20to%20prevent%20\(STIs\)&bc=ACAAAAAAIAAA&NCAId=250&](https://www.cms.gov/medicare-coverage-database/details/nca-decision-memo.aspx?&NcaName=Screening%20for%20Sexually%20Transmitted%20Infections%20(STIs)%20and%20High-Intensity%20Behavioral%20Counseling%20(HIBC)%20to%20prevent%20(STIs)&bc=ACAAAAAAIAAA&NCAId=250&).





**Figure 1.** Analytic Sample Description: Partnerships Reported in at Least One 3-month Interval with Complete Condom Use Data

**Table 1**

Percent of Condom Uses Affected by Different Types of Condom Use Problems by Partnership Type

	<b>Main (% of total condoms used, 95% CI)</b>	<b>Non-main (% of total condoms used, 95% CI)</b>	<b>Total (% of total condoms used, 95% CI)</b>
Condom Breakage/Slippage <sup>†</sup>	2643 (5.1, 4.9–5.3)	1297 (9.4, 8.9–9.9)	3940 (6.0, 5.8–6.2)
Condom Partial Use <sup>†</sup>	6574 (12.8, 12.5–13.1)	1589 (11.5, 11.0–12.1)	8163 (12.5, 12.2–12.8)
Total condoms used	51454	13780	65234

<sup>†</sup>Rates are statistically significantly different for main and non-main partnerships (p<0.0001).

**Table 2**  
 Percentages of Partnerships Experiencing Different Types of Condom Use Problems by Partnership Type

Type of Error	Main Partnerships			Non-main Partnerships		
	Valid Total*	No. with Condom Errors	Percentage with Condom Errors (95% CI)	Valid Total*	No. with Condom Errors	Percentage with Condom Errors (95% CI)
Condom Breakage/Slippage <sup>†</sup>	4839	1091	22.5 (21.4–23.7)	4423	839	19.0 (17.8–20.1)
Condom Partial Use <sup>†</sup>	4866	1062	21.8 (20.7–23.0)	4412	823	18.7 (17.5–19.8)
Both Condom Problems <sup>‡</sup>	4763	416	8.7 (7.9–9.5)	4315	307	7.1 (6.3–7.9)
At Least One Condom Problem <sup>‡</sup>	4763	1861	39.1 (37.7–40.5)	4315	1291	29.9 (28.6–31.3)

\* Some respondents had missing data for one or both condom use problems.

<sup>†</sup> Percentages are statistically significantly different for main and non-main partnerships (p<0.001).

<sup>‡</sup> Percentages are statistically significantly different for main and non-main partnerships (p<0.005).

Table 3

GEE Logistic Regression Models: Condom Breakage/Slippage among Those Who Had Vaginal Sex with a Main Partner (4,839 partnerships) and Non-Main Partner (4,420 partnerships)

Predictors	MAIN PARTNERS						NON-MAIN PARTNERS										
	Males (2,299 partnerships)			Females (2,540 partnerships)			Males (2,785 partnerships)			Females (1,635 partnerships)							
	Odds Ratio	P*	[95% CI]	Odds Ratio	P*	[95% CI]	Odds Ratio	P*	[95% CI]	Odds Ratio	P*	[95% CI]					
<b>RESPONDENT</b>																	
Education																	
	<HS	1.35	0.0174	1.05	1.73	1.21	0.1080	0.96	1.54	1.36	0.0129	1.07	1.74	1.39	0.0287	1.04	1.88
	HS grad +	Ref	N/A	N/A	N/A	Ref	N/A	N/A	N/A	Ref	N/A	N/A	N/A	Ref	N/A	N/A	N/A
Respondent had sex while high																	
	Ever	1.30	0.0287	1.03	1.64	1.50	0.0005	1.19	1.88	1.82	<0.0001	1.46	2.27	1.26	0.0925	0.96	1.66
	Never	Ref	N/A	N/A	N/A	Ref	N/A	N/A	N/A	Ref	N/A	N/A	N/A	Ref	N/A	N/A	N/A
Respondent had STI symptoms prior 3 months																	
	Yes	1.12	0.4279	0.85	1.49	1.31	0.0210	1.04	1.64								
	No or not known	Ref	N/A	N/A	N/A	Ref	N/A	N/A	N/A								
<b>PARTNER</b>																	
Partner had STI prior 3 months																	
	Yes									2.42	0.0042	1.32	4.44	1.65	0.2203	0.74	3.66
	No or not known									Ref	N/A	N/A	N/A	Ref	N/A	N/A	N/A
Partner had STI symptoms prior 3 months																	
	Yes	1.36	0.0297	1.03	1.80	1.23	0.1838	0.90	1.68								
	No or not known	Ref	N/A	N/A	N/A	Ref	N/A	N/A	N/A								
Perceived partner STI risk																	
	Very likely, likely, or unlikely									1.29	0.0424	1.01	1.64	1.63	0.0008	1.22	2.17
	Very unlikely									Ref	N/A	N/A	N/A	Ref	N/A	N/A	N/A

Predictors	MAIN PARTNERS				NON-MAIN PARTNERS												
	Males (2,299 partnerships)		Females (2,540 partnerships)		Males (2,785 partnerships)		Females (1,635 partnerships)										
	Odds Ratio	P*	[95% CI]	Odds Ratio	P*	[95% CI]	Odds Ratio	P*	[95% CI]								
<b>PARTNERSHIP</b>																	
How long partners knew each other before initiating sex																	
Less than 1 month	1.27	0.0439	1.01	1.60	1.06	0.6419	0.84	1.33	1.26	0.0292	1.02	1.56	0.93	0.5908	0.71	1.21	
1 month or longer	Ref	N/A	N/A	N/A	Ref	N/A	N/A	N/A	Ref	N/A	N/A	N/A	Ref	N/A	N/A	N/A	
Discussed condoms with partner																	
Ever	1.23	0.2116	0.89	1.71	1.42	0.0444	1.01	2.00									
Never or not known	Ref	N/A	N/A	N/A	Ref	N/A	N/A	N/A	Ref	N/A	N/A	N/A	Ref	N/A	N/A	N/A	N/A
Discussed STI with partner																	
Ever	1.17	0.1594	0.94	1.46	1.24	0.0378	1.01	1.53	1.35	0.0059	1.09	1.68	1.66	<0.0001	1.28	2.14	
Never or not known	Ref	N/A	N/A	N/A	Ref	N/A	N/A	N/A	Ref	N/A	N/A	N/A	Ref	N/A	N/A	N/A	N/A
Number of protected vaginal sex acts																	
	1.01	0.0288	1.00	1.01	1.01	<0.0001	1.01	1.02	1.03	0.0046	1.01	1.05	1.03	0.0934	1.00	1.06	
Percent protected vaginal sex acts																	
1%-99% condom use	1.05	0.6840	0.83	1.32	0.95	0.6025	0.76	1.17	1.21	0.0969	0.97	1.52	1.07	0.66	0.79	1.44	
100% condom use	Ref	N/A	N/A	N/A	Ref	N/A	N/A	N/A	Ref	N/A	N/A	N/A	Ref	N/A	N/A	N/A	
Length of sexual partnership																	
1 month or longer					0.77	0.0221	0.62	0.96	0.91	0.4878	0.70	1.18					
< 1 month	Ref	N/A	N/A	N/A	Ref	N/A	N/A	N/A	Ref	N/A	N/A	N/A	Ref	N/A	N/A	N/A	

**Table 4**

GEE Logistic Regression Models: Partial Condom Use among Those Who Had Vaginal Sex with a Main Partner (4,865 partnerships) and a Non-Main Partner (4,408 partnerships)

Predictors	MAIN PARTNERS						NON-MAIN PARTNERS					
	Males (2,304 partnerships)			Females (2,561 partnerships)			Males (2,776 partnerships)			Females (1,632 partnerships)		
	Odds Ratio	P*	[95% CI]	Odds Ratio	P*	[95% CI]	Odds Ratio	P*	[95% CI]	Odds Ratio	P*	[95% CI]
<b>RESPONDENT</b>												
Education	<HS	0.75	0.0144	0.59	0.94	0.70	0.0041	0.56	0.89			
	HS Grad +	Ref	N/A	N/A	N/A	Ref	N/A	N/A	N/A			
Respondent had sex while high	Ever	1.62	<0.0001	1.30	2.00	1.34	0.0112	1.07	1.67	1.44	0.0012	1.15
	Never	Ref	N/A	N/A	N/A	Ref	N/A	N/A	N/A	Ref	N/A	1.79
												0.98
												0.8715
												0.75
												1.28
												N/A
												N/A
<b>PARTNER</b>												
Partner had STI symptoms prior 3 months	Yes	1.70	0.0001	1.30	2.22	1.03	0.8555	0.75	1.42			
	No or not known	Ref	N/A	N/A	N/A	Ref	N/A	N/A	N/A			
Partner was IDU	Ever	0.95	0.8876	0.45	1.98	1.83	0.0090	1.16	2.89			
	Never	Ref	N/A	N/A	N/A	Ref	N/A	N/A	N/A			
<b>PARTNERSHIP</b>												
Length of the sexual partnership	1 month or longer	1.08	0.5667	0.84	1.38	1.27	0.0490	1.00	1.62			
	< 1 month	Ref	N/A	N/A	N/A	Ref	N/A	N/A	N/A			
Number of protected vaginal sex acts		1.00	0.0654	0.9997	1.01	1.00	0.5861	0.9972	1.01	1.01	0.1433	0.9959
												1.03
												0.99
												0.7097
												1.04

Predictors	MAIN PARTNERS						NON-MAIN PARTNERS							
	Males (2,304 partnerships)		Females (2,561 partnerships)		Males (2,776 partnerships)		Females (1,632 partnerships)							
	Odds Ratio	P*	[95% CI]	Odds Ratio	P*	[95% CI]	Odds Ratio	P*	[95% CI]	Odds Ratio	P*	[95% CI]		
Percent protected vaginal sex acts														
1%-99% condom use	2.10	<0.0001	1.67	2.64	1.84	1.47	2.30	1.71	2.30	1.37	2.14	2.37	1.83	3.08
100% condom use	Ref	N/A	N/A	N/A	Ref	N/A	N/A	Ref	N/A	N/A	N/A	Ref	N/A	N/A
How long partners knew each other before initiating sex														
Less than 1 month								1.30		1.07	1.58	1.06	0.6813	1.39
1 month or longer								Ref		N/A	N/A	Ref	N/A	N/A
Discussed condoms with partner														
Ever								1.31		1.04	1.66	1.37	0.0819	1.95
Never or not known								Ref		N/A	N/A	Ref	N/A	N/A