

Factors Associated With Condom Use Problems During Vaginal Sex With Main and Non-Main Partners

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Background: Incorrect condom use is a common problem that can undermine their prevention impact. We assessed the prevalence of 2 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 during a 12-month period (1999–2000) among urban sexually transmitted disease (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 3297 respondents reported 9304 main and 6793 non-main partnerships; condoms were used at least once in 4942 (53.0%) and 4523 (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 with non-main partnerships: 39.1% versus 29.9% had either problem; 22.5% versus 19.0% had breakage/slippage only; 21.8% versus 18.7% had partial use; and 8.7% versus 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.

Consistent and correct use of latex condoms reduces risk for human immunodeficiency virus (HIV) as well as other sexually transmitted infections (STIs).^{1–3} Although most STI/HIV transmission takes place when condoms are not used,^{4,5} and mechanical condom failures are relatively rare,⁶ 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).^{7–9}

Many investigations have focused on associations between sexual risk factors and the consistency of self-reported condom use, but few have reported on problems associated with condoms use.^{3,8} 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.¹⁰ Studies that examined condom use problems have documented a high prevalence of these outcomes.¹¹ For example, Project RESPECT, a study of HIV counseling interventions among sexually transmitted disease (STD) clinic clients, reported high rates of condom use problems; 41% of users experienced at least one problem (i.e., breakage, slippage, leakage during withdrawal, and partial use) during a 3-month follow-up period, and nearly one in 10 condom users involved a condom use problem that could increase STI risk. Further, approximately two-thirds of condom use problems were related to late application or early removal of condoms during intercourse (and were thus potentially modifiable), whereas largely unintentional condom use problems (breakage, slippage, and leakage) accounted for only one-third overall problems.¹² Other studies have reported similar high rates.¹³ 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,^{12,14} poor condom fit,^{15,16} use of oil-based lubricant, difficulties applying and removing condoms after ejaculation, and multiple sex partners.¹⁷

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,⁵ with cohabiting couples less likely to experience breakage or slippage compared with noncohabiting couples. Other studies have documented the association between men's unilateral decision to use condoms (vs. 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.¹³ Better understanding of the prevalence of, and factors associated with, condom use errors by partnership type

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Conflicts of interest and sources of funding: 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.

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Received for publication October 12, 2011, and accepted May 9, 2012. DOI: 10.1097/OLQ.0b013e31825ef325

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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 2 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.¹⁸

Recruitment

Participants were recruited from STD clinics in 3 cities (Denver, CO; Long Beach, CA; and Newark, NJ) 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 to 39 years. A total of 3297 men (54%) and women (46%) were enrolled in the study. 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 2 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 versus 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 they were recoded as main partner versus 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. Although 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 vs. very unlikely), and partner STI history and symptoms previous 3 months. Partnership: how long the couple was acquainted before initiating sex (<1 month vs. >1 month), length of sexual relationship (>1 month vs. <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% vs. <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 ($n = 9465$ sexual partnerships) (Fig. 1). χ^2 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 ($P \leq 0.005$) 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 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 version 9.2 was used 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 ($n = 2900$) 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%). Blacks 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 ($n = 2195$) 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 3940 condoms used (6.0%), and partial use occurred with 8163 condoms used (12.5%). The per-use rates of condom breakage/slippage and partial use among main partnerships were 5.1% and 12.8%, respectively. The per-use rates 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 9304 total main partnerships, 53.1% ($n = 4942$), in which condoms were used at least once (Fig. 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% ($n = 1091$) breakage/slippage, 21.8% ($n =$

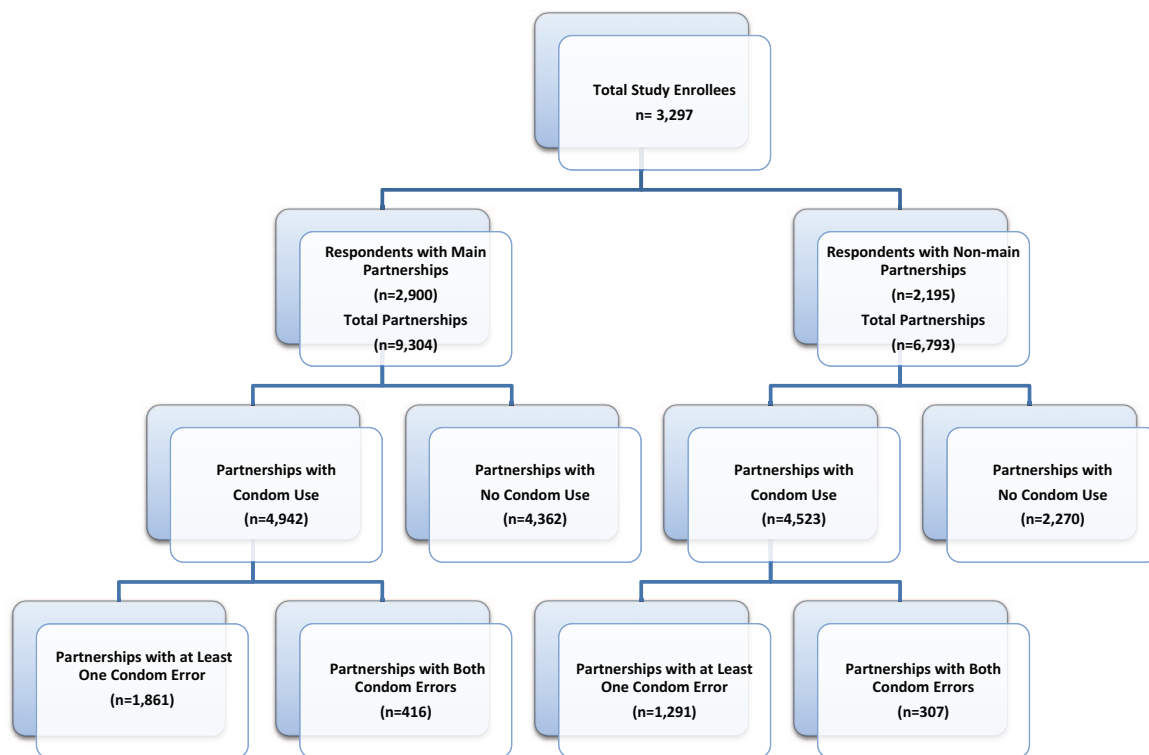


Figure 1. Analytic sample description: partnerships reported in at least one 3-month interval with complete condom use data.

1062) partial use, and 8.7% (n = 416) both types of use problems (Table 2). Respondents reported 6793 total non-main partnerships, 66.6% (n = 4523) in which condoms were used at least once (Fig. 1). Among non-main partnerships in which condoms were used, 29.9% (n = 1291) 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 <1 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 as follows: being in a sexual partnership for 1 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 <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 <1 month, and knowing one’s partner for <1 month before initiating sex.

TABLE 1. Percent of Condom Uses Affected by Different Types of Condom Use Problems by Partnership Type

	Main % of Total Condoms Used (95% CI)	Non-Main % of Total Condoms Used (95% CI)	Total % of Total Condoms Used (95% CI)
Condom breakage/slippage*	2643 (5.1, 4.9–5.3)	1297 (9.4, 8.9–9.9)	3940 (6.0, 5.8–6.2)
Condom partial use*	6574 (12.8, 12.5–13.1)	1589 (11.5, 11.0–12.1)	8163 (12.5, 12.2–12.8)
Total condoms used	51,454	13,780	65,234

*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 [‡]	4839	1091	22.5 (21.4–23.7)	4423	839	19.0 (17.8–20.1)
Condom partial use [†]	4866	1062	21.8 (20.7–23.0)	4412	823	18.7 (17.5–19.8)
Both condom problems [‡]	4763	416	8.7 (7.9–9.5)	4315	307	7.1 (6.3–7.9)
At least 1 condom problem [†]	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.

[†]Percentages are statistically significantly different for main and non-main partnerships ($P < 0.001$).

[‡]Percentages are statistically significantly different for main and non-main partnerships ($P < 0.005$).

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 <1 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 <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 United States; >1 in 3 partnerships where condoms were used experienced condom use problems during the past 3 months. The per-use rates of condom breakage/slippage (1 of 16 condoms used overall) are slightly higher than estimates from other US studies.^{5,16,17,19–21} 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 because of reduced sensation,²² whereas delayed application of condoms may be because of mistaken beliefs that condoms are only important for STI or pregnancy prevention during ejaculation.^{22,23} The high partial use rates found in this study underscores that the STI/HIV prevention interventions should stress the importance of using condoms from start to finish,^{7,22} 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.¹² 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 after 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.^{24–26} 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 vs. casual) to a greater degree than within established relationships.^{25,27} 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 on the methodology used in previous studies by collecting detailed condom use problem data from individual partnerships over time.⁸ 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 before usage (i.e., when opening the packaging and/or applying the condom), which would not confer pregnancy or STI risk.¹⁷

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 dichot-

TABLE 3. GEE Logistic Regression Models: Condom Breakage/Slippage Among Those Who Had Vaginal Sex With a Main Partner (4839 Partnerships) and Non-Main Partner (4420 Partnerships)

Predictors	Main Partners				Non-Main Partners													
	Males (2299 Partnerships)	Females (2540 Partnerships)	Males (2785 Partnerships)	Females (1635 Partnerships)	Odds Ratio	95% CI	Odds Ratio	95% CI	P*	Odds Ratio	95% CI	P*	Odds Ratio	95% CI				
Respondent Education <HS	1.35 Ref	1.21 Ref	1.36 Ref	1.39 Ref	1.35	1.05	1.73	1.21	0.1080	0.96	1.54	1.36	1.07	1.74	1.39	0.0287	1.04	1.88
HS grad+ Respondent had sex while high Ever	1.30 Ref	1.50 Ref	1.82 Ref	1.26 Ref	1.30	1.03	1.64	1.50	0.0005	1.19	1.88	1.82	1.46	2.27	1.26	0.0925	0.96	1.66
Never Respondent had STI symptoms prior 3 mo Yes	1.12 Ref	1.31 Ref	1.04 Ref	1.07 Ref	1.12	0.4279	0.85	1.49	0.0210	1.04	1.64	1.04	N/A	N/A	Ref	N/A	N/A	N/A
No or not known Partner Partner had STI prior 3 mo Yes	1.36 Ref	1.23 Ref	1.68 Ref	1.65 Ref	1.36	0.0297	1.03	1.80	0.1838	0.90	1.68	2.42	1.32	4.44	1.65	0.2203	0.74	3.66
No or not known Partner had STI symptoms prior 3 mo Yes	1.27 Ref	1.06 Ref	1.33 Ref	1.26 Ref	1.27	0.0439	1.01	1.60	N/A	0.6419	1.33	1.26	1.02	1.56	0.93	0.5908	0.71	1.21
No or not known Perceived partner STI risk Very likely, likely, or unlikely Very unlikely Partnership	1.23 Ref	1.42 Ref	2.00 Ref	1.29 Ref	1.23	0.2116	0.89	1.71	0.0444	1.01	2.00	1.29	1.01	1.64	1.63	0.0008	1.22	2.17
How long partners knew each other before initiating sex	1.17 Ref	1.24 Ref	1.53 Ref	1.35 Ref	1.17	0.1594	0.94	1.46	0.0378	1.01	1.53	1.35	1.09	1.68	1.66	<0.0001	1.28	2.14
Less than 1 mo 1 mo or longer Discussed condoms with partner Ever	1.01 Ref	1.01 Ref	1.02 Ref	1.03 Ref	1.01	0.0288	1.00	1.01	<0.0001	1.01	1.02	1.03	1.01	1.05	1.03	0.0934	1.00	1.06
Never or not known Discussed STI with partner Ever	1.05 Ref	0.95 Ref	1.17 Ref	1.21 Ref	1.05	0.6840	0.83	1.32	0.6025	0.76	1.17	1.21	0.97	1.52	1.07	0.66	0.79	1.44
Never or not known No. protected vaginal sex acts Percent protected vaginal sex acts 1%-99% condom use 100% condom use	1.01 Ref	1.01 Ref	1.01 Ref	1.01 Ref	1.01	0.0288	1.00	1.01	<0.0001	1.01	1.02	1.03	1.01	1.05	1.03	0.0934	1.00	1.06
Length of sexual partnership 1 mo or longer <1 mo	1.05 Ref	0.95 Ref	1.17 Ref	1.21 Ref	1.05	0.6840	0.83	1.32	0.6025	0.76	1.17	1.21	0.97	1.52	1.07	0.66	0.79	1.44
	1.01 Ref	1.01 Ref	1.01 Ref	1.01 Ref	1.01	0.0288	1.00	1.01	<0.0001	1.01	1.02	1.03	1.01	1.05	1.03	0.0934	1.00	1.06
	1.05 Ref	0.95 Ref	1.17 Ref	1.21 Ref	1.05	0.6840	0.83	1.32	0.6025	0.76	1.17	1.21	0.97	1.52	1.07	0.66	0.79	1.44
	1.01 Ref	1.01 Ref	1.01 Ref	1.01 Ref	1.01	0.0288	1.00	1.01	<0.0001	1.01	1.02	1.03	1.01	1.05	1.03	0.0934	1.00	1.06
	1.05 Ref	0.95 Ref	1.17 Ref	1.21 Ref	1.05	0.6840	0.83	1.32	0.6025	0.76	1.17	1.21	0.97	1.52	1.07	0.66	0.79	1.44
	1.01 Ref	1.01 Ref	1.01 Ref	1.01 Ref	1.01	0.0288	1.00	1.01	<0.0001	1.01	1.02	1.03	1.01	1.05	1.03	0.0934	1.00	1.06
	1.05 Ref	0.95 Ref	1.17 Ref	1.21 Ref	1.05	0.6840	0.83	1.32	0.6025	0.76	1.17	1.21	0.97	1.52	1.07	0.66	0.79	1.44
	1.01 Ref	1.01 Ref	1.01 Ref	1.01 Ref	1.01	0.0288	1.00	1.01	<0.0001	1.01	1.02	1.03	1.01	1.05	1.03	0.0934	1.00	1.06
	1.05 Ref	0.95 Ref	1.17 Ref	1.21 Ref	1.05	0.6840	0.83	1.32	0.6025	0.76	1.17	1.21	0.97	1.52	1.07	0.66	0.79	1.44
	1.01 Ref	1.01 Ref	1.01 Ref	1.01 Ref	1.01	0.0288	1.00	1.01	<0.0001	1.01	1.02	1.03	1.01	1.05	1.03	0.0934	1.00	1.06
	1.05 Ref	0.95 Ref	1.17 Ref	1.21 Ref	1.05	0.6840	0.83	1.32	0.6025	0.76	1.17	1.21	0.97	1.52	1.07	0.66	0.79	1.44
	1.01 Ref	1.01 Ref	1.01 Ref	1.01 Ref	1.01	0.0288	1.00	1.01	<0.0001	1.01	1.02	1.03	1.01	1.05	1.03	0.0934	1.00	1.06
	1.05 Ref	0.95 Ref	1.17 Ref	1.21 Ref	1.05	0.6840	0.83	1.32	0.6025	0.76	1.17	1.21	0.97	1.52	1.07	0.66	0.79	1.44
	1.01 Ref	1.01 Ref	1.01 Ref	1.01 Ref	1.01	0.0288	1.00	1.01	<0.0001	1.01	1.02	1.03	1.01	1.05	1.03	0.0934	1.00	1.06
	1.05 Ref	0.95 Ref	1.17 Ref	1.21 Ref	1.05	0.6840	0.83	1.32	0.6025	0.76	1.17	1.21	0.97	1.52	1.07	0.66	0.79	1.44
	1.01 Ref	1.01 Ref	1.01 Ref	1.01 Ref	1.01	0.0288	1.00	1.01	<0.0001	1.01	1.02	1.03	1.01	1.05	1.03	0.0934	1.00	1.06
	1.05 Ref	0.95 Ref	1.17 Ref	1.21 Ref	1.05	0.6840	0.83	1.32	0.6025	0.76	1.17	1.21	0.97	1.52	1.07	0.66	0.79	1.44
	1.01 Ref	1.01 Ref	1.01 Ref	1.01 Ref	1.01	0.0288	1.00	1.01	<0.0001	1.01	1.02	1.03	1.01	1.05	1.03	0.0934	1.00	1.06
	1.05 Ref	0.95 Ref	1.17 Ref	1.21 Ref	1.05	0.6840	0.83	1.32	0.6025	0.76	1.17	1.21	0.97	1.52	1.07	0.66	0.79	1.44
	1.01 Ref	1.01 Ref	1.01 Ref	1.01 Ref	1.01	0.0288	1.00	1.01	<0.0001	1.01	1.02	1.03	1.01	1.05	1.03	0.0934	1.00	1.06
	1.05 Ref	0.95 Ref	1.17 Ref	1.21 Ref	1.05	0.6840	0.83	1.32	0.6025	0.76	1.17	1.21	0.97	1.52	1.07	0.66	0.79	1.44
	1.01 Ref	1.01 Ref	1.01 Ref	1.01 Ref	1.01	0.0288	1.00	1.01	<0.0001	1.01	1.02	1.03	1.01	1.05	1.03	0.0934	1.00	1.06
	1.05 Ref	0.95 Ref	1.17 Ref	1.21 Ref	1.05	0.6840	0.83	1.32	0.6025	0.76	1.17	1.21	0.97	1.52	1.07	0.66	0.79	1.44
	1.01 Ref	1.01 Ref	1.01 Ref	1.01 Ref	1.01	0.0288	1.00	1.01	<0.0001	1.01	1.02	1.03	1.01	1.05	1.03	0.0934	1.00	1.06
	1.05 Ref	0.95 Ref	1.17 Ref	1.21 Ref	1.05	0.6840	0.83	1.32	0.6025	0.76	1.17	1.21	0.97	1.52	1.07	0.66	0.79	1.44
	1.01 Ref	1.01 Ref	1.01 Ref	1.01 Ref	1.01	0.0288	1.00	1.01	<0.0001	1.01	1.02	1.03	1.01	1.05	1.03	0.0934	1.00	1.06
	1.05 Ref	0.95 Ref	1.17 Ref	1.21 Ref	1.05	0.6840	0.83	1.32	0.6025	0.76	1.17	1.21	0.97	1.52	1.07	0.66	0.79	1.44
	1.01 Ref	1.01 Ref	1.01 Ref	1.01 Ref	1.01	0.0288	1.00	1.01	<0.0001	1.01	1.02	1.03	1.01	1.05	1.03	0.0934	1.00	1.06
	1.05 Ref	0.95 Ref	1.17 Ref	1.21 Ref	1.05	0.6840	0.83	1.32	0.6025	0.76	1.17	1.21	0.97	1.52	1.07	0.66	0.79	1.44
	1.01 Ref	1.01 Ref	1.01 Ref	1.01 Ref	1.01	0.0288	1.00	1.01	<0.0001	1.01	1.02	1.03	1.01	1.05	1.03	0.0934	1.00	1.06
	1.05 Ref	0.95 Ref	1.17 Ref	1.21 Ref	1.05	0.6840	0.83	1.32	0.6025	0.76	1.17	1.21	0.97	1.52	1.07	0.66	0.79	1.44
	1.01 Ref	1.01 Ref	1.01 Ref	1.01 Ref	1.01	0.0288	1.00	1.01	<0.0001	1.01	1.02	1.03	1.01	1.05	1.03	0.0934	1.00	1.06
	1.05 Ref	0.95 Ref	1.17 Ref	1.21 Ref	1.05	0.6840	0.83	1.32	0.6025	0.76	1.17	1.21	0.97	1.52	1.07	0.66	0.79	1.44
	1.01 Ref	1.01 Ref	1.01 Ref	1.01 Ref	1.01	0.0288	1.00	1.01	<0.0001	1.01	1.02	1.03	1.01	1.05	1.03	0.0934	1.00	1.06
	1.05 Ref	0.95 Ref	1.17 Ref	1.21 Ref	1.05	0.6840	0.83	1.32	0.6025	0.76	1.17	1.21	0.97	1.52	1.07	0.66	0.79	1.44
	1.01 Ref	1.01 Ref	1.01 Ref	1.01 Ref	1.01	0.0288	1.00	1.01	<0.0001	1.01	1.02	1.03	1.01	1.05	1.03	0.0934	1.00	1.06
	1.05 Ref	0.95 Ref	1.17 Ref	1.21 Ref	1.05	0.6840	0.83	1.32	0.6025	0.76	1.17	1.21	0.97	1.52	1.07	0.66	0.79	1.44
	1.01 Ref	1.01 Ref	1.01 Ref	1.01 Ref	1.01	0.0288	1.00	1.01	<0.0001	1.01	1.02	1.03	1.01	1.05	1.03	0.0934	1.00	1.06
	1.05 Ref	0.95 Ref	1.17 Ref	1.21 Ref	1.05	0.6840	0.83	1.32	0.6025	0.76	1.17	1.21	0.97	1.52	1.07	0.66	0.79	1.44
	1.01 Ref	1.01 Ref	1.01 Ref	1.01 Ref	1.01	0.0288	1.00	1.01	<0.0001	1.01	1.02	1.03	1.01	1.05	1.03	0.0934	1.00	1.06
	1.05 Ref	0.95 Ref	1.17 Ref	1.21 Ref	1.05	0.6840	0.83	1.32	0.6025	0.76	1.17	1.21	0.97	1.52	1.07	0.66	0.79	1.44
	1.01 Ref	1.01 Ref	1.01 Ref	1.01 Ref	1.01	0.0288	1.00	1.01	<0.0001	1.01	1.02	1.03	1.01	1.05	1.03	0.0934	1.00	1.06
	1.05 Ref	0.95 Ref	1.17 Ref	1.21 Ref	1.05	0.6840	0.83	1.32	0.6025	0.76	1.17	1.21	0.97	1.52	1.07	0.66	0.79	1.44
	1.01 Ref	1.01 Ref	1.01 Ref	1.01 Ref	1.01	0.0288	1.00	1.01	<0.0001	1.01	1.02	1.03	1.01	1.05	1.03	0.0934	1.00	1.06
	1.05 Ref	0.95 Ref	1.17 Ref	1.21 Ref	1.05	0.6840	0.83	1.32	0.6025	0.76	1.17	1.21	0.97	1.52	1.07	0.66	0.79	1.44
	1.01 Ref	1.01 Ref	1.01 Ref	1.01 Ref	1.01	0.0288	1.00	1.01	<0.0001	1.01	1.02	1.03	1.01	1.05	1.03	0.0934	1.00	1.06
	1.05 Ref	0.95 Ref	1.17 Ref	1.21 Ref	1.05	0.6840	0.83	1.32	0.6025	0.76	1.17	1.21	0.97	1.52	1.07	0.66	0.79	1.44
	1.01 Ref	1.01 Ref	1.01 Ref	1.01 Ref	1.01	0.0288	1.00	1.01	<0.0001	1.01	1.02	1.03	1.01	1.05	1.03	0.0934	1.00	1.06
	1.05 Ref	0.95 Ref	1.17 Ref	1.21 Ref	1.05	0.6840	0.83	1.32	0.6025	0.76	1.17	1.21	0.97	1.52	1.0			

TABLE 4. GEE Logistic Regression Models: Partial Condom Use Among Those Who Had Vaginal Sex With a Main Partner (4865 Partnerships) and a Non-Main Partner (4408 Partnerships)

Predictors	Main Partners				Non-Main Partners					
	Males (2304 Partnerships)		Females (2561 Partnerships)		Males (2776 Partnerships)		Females (1632 Partnerships)			
	Odds Ratio	P*	95% CI	Odds Ratio	P*	95% CI	Odds Ratio	P*	95% CI	
Respondent 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
Never	Ref	N/A	N/A	N/A	Ref	N/A	N/A	N/A	Ref	N/A
Partner										
Partner had STI symptoms prior 3 mo										
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		
Partnership										
Length of the sexual partnership										
1 mo or longer	1.08	0.5667	0.84	1.38	1.27	0.0490	1.00	1.62		
<1 mo	Ref	N/A	N/A	N/A	Ref	N/A	N/A	N/A		
No. protected vaginal sex acts										
Percent protected vaginal sex acts	1.00	0.0654	0.9997	1.01	1.00	0.5861	0.9972	1.01	1.01	0.1433
1%-99% condom use	2.10	<0.0001	1.67	2.64	1.84	<0.0001	1.47	2.30	1.71	<0.0001
100% condom use	Ref	N/A	N/A	N/A	Ref	N/A	N/A	N/A	Ref	N/A
How long partners knew each other before initiating sex										
<1 mo										
1 mo or longer										
Discussed condoms with partner										
Ever										
Never or not known										

omy 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.⁵ Understanding factors associated with condom breakage and slippage are important, as studies have shown these events can be reduced through behavioral counseling.²⁸ 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,²⁹ 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, which 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.^{30,31} 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.

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