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Condom use problems during anal sex among men who have sex with men (MSM): findings from the Safe in the City Study

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Abstract

Our research aims were to: 1) assess the prevalence of two condom use problems: breakage or slippage and partial use (delayed application or early removal) among men who have sex with men (MSM) seeking services in urban U.S. STD clinics; and 2) examine the association between these condom use problems and participant, partner and partnership characteristics. Analysis is restricted to HIV-negative MSM who reported having anal sex at least once in the preceding 3 months and who completed both the baseline and 3-month follow-up assessments. Two models were fitted using the GEE approach. A total of 263 MSM (median age=32 years) reported 990 partnerships. Partnerships with no condom use 422 (42.6%) were excluded. Thus, 207 MSM and 568 partnerships were included. Among condom users, 100% use was reported within 454 partnerships (79.9%) and <100% within 114 (20.1%), and 21(3.7%) reported both condom use problems, 25 (4.4%) reported only breakage, 67 (11.8%) reported only partial use, and 455 (80.1%) reported no errors. The breakage or slippage and partial use rates per condom used were 3.4% and 11.2%, respectively. A significantly higher rate of breakage or slippage occurred among non-main partnerships. Characteristics associated with increased odds for condom breakage or slippage were: lower education level (OR=2.78; CI: 1.1-7.5), non-main partner status (OR=4.1; CI: 1.5-11.7), and drunk or high during sex (OR=2.0; CI: 1.1-3.8), and for partial use: lower education level (OR=2.6; CI: 1.0-6.6), perceived partner STI risk (OR=2.4; CI:1.3-4.2), and inconsistent condom use (OR=3.7; CI:2.0-6.6). A high percentage of MSM partnerships reported no condom use and among condom users, a sizable proportion did not use them consistently or correctly. MSM may benefit from interventions designed to increase proficiency for condom use with a particular focus on the behaviors of inconsistent and partial condom use.

Introduction

Men who have sex with men (MSM) bear the overwhelming burden of the U.S. HIV epidemic (Sullivan, Salazar, Buchbinder, & Sanchez, 2009) with especially high incidence rates among young and minority MSM (Prejean et al., 2011). Although incidence of HIV and bacterial sexually transmitted infections (STI) declined substantially in U.S. MSM from the 1980s through the mid-1990s, increased rates of early syphilis, gonorrhea, chlamydial infection and unsafe sexual behaviors have been reported since that time (Kent et al., 2005;

Mayer, Klausner, & Handsfield, 2001) and are attributed to a reduction in perceived consequences likely resulting from advances in HIV therapy, increased access to sexual networks through social media, and an increase in use of recreational drugs (Golden, Stekler, Hughes, & Wood, 2008; Klausner & Wong, 2003).

Anal sex is a particularly efficient method for HIV transmission (Kalichman, Simbayi, Cain, & Jooste, 2009). Although condoms are widely available, inexpensive, and offer an effective HIV prevention strategy when used consistently (Weller & Davis, 2002), condom use problems (i.e., breakage, slippage, or partial use (delayed application or early removal)) jeopardize condom effectiveness. One study found that almost half the 2614 MSM reported delayed condom application during insertive anal sex (Allman et al., 2009). Another study reported that delayed application of condoms during receptive anal sex was an independent risk factor for HIV infection (Calzavara et al., 2003).

Previous investigations have identified several factors associated with condom breakage or slippage among MSM including: lower educational achievement, inexperience and infrequent condom use, prior condom breaks, inappropriate use of lubrication, longer duration of intercourse and “powerful thrusting,” and amphetamine and heavy alcohol use (Calzavara, et al., 2003; Golombok, Harding, & Sheldon, 2001; Golombok, Sketchley, & Rust, 1989; Stone et al., 1999; Thompson, Yager, & Martin, 1993). Delayed condom application has been associated with prior condom breakage or slippage, recreational drug use, and the beliefs that pre-ejaculatory fluid poses no or minimal risk for HIV/STI transmission, or that only rectal trauma poses HIV risk resulting in the false sense of security that brief penetration without protection is a safe behavior (Allman, et al., 2009; Calzavara, et al., 2003).

Recent research has focused on developing a better understanding of the factors associated with condom use inconsistency and problems among U.S. MSM (Allman, et al., 2009; Calzavara, et al., 2003; Crosby, Diclemente, Yarber, Snow, & Troutman, 2007; Stupiansky et al., 2010; Sullivan, et al., 2009). Our study extends this body of knowledge by: 1) Assessing the prevalence of condom use problems among HIV-negative MSM seeking services in urban U.S. STD clinics; and 2) Examining the association between two condom use problems: breakage or slippage and partial use (delayed application or early removal) during anal sex and participant, partner and partnership characteristics, including condom use behaviors, knowledge, perceived self-efficacy, and partner support.

Materials and Methods

Data were analyzed from the *Safe in the City* behavioral study, a nested component of a larger trial evaluating the effects of a video-based waiting room intervention (*Safe in the City*), modeling couples overcoming barriers to safer sexual behaviors, on STI incidence among all patients (N=38,635) attending participating clinics (Warner et al., 2008).

Recruitment

Participants in the nested behavioral study (n=1609) were patients other than those enrolled in the larger STI trial. Participants were recruited from STD clinics in 3 cities (Denver, Long Beach, and San Francisco) between June 2004 and May 2005. Eligible patients were at least 18 years of age, not diagnosed with a condition that required multiple follow-up visits (e.g., genital herpes, HIV/AIDS), not previously exposed to the intervention, in the clinic waiting room for at least 20 minutes, and sexually active in the previous three months. Prospective participants were identified through medical chart review. Audio computer-assisted self-interview (ACASI) surveys were conducted immediately following the initial clinical exam (“index visit”) and at 3-months follow-up. Both assessments measured behaviors during the

previous 3 months. Men who reported sex with another man at either assessment were included in the current analysis. Up to 3 partnerships (main and non-main) where anal sex occurred were considered at both assessments. Two anal sex behaviors (receptive or insertive sex by the respondent) were considered for each MSM partnership.

Measures

Condom use problems were measured with the following two questions: “*Of the # times you used a condom with (partner name), how many times did the condom break or completely fall off during anal intercourse or withdrawal?*” and, “*Of the # times you used a condom with (partner name), how many times was the condom put on after you started having anal sex, or taken off during sex but before ejaculation?*” These variables were dichotomized into zero times vs. one or more times.

Respondents were asked, “*Would you consider your most recent sex partner a main partner? By main partner, we mean a partner to whom you feel committed to above anybody else, like a boyfriend, husband, or lover.*” For respondents who reported more than one sex partner in the previous 3-month period, the same question was asked about their second partner. For the two most recent partners who were non-main, respondents were asked to identify each as any of the following: *Casual partner, a friend I know and have sex with, but don’t think of him as a main partner; Someone I know and have sex with, but he is not a friend or main partner; Someone I had sex with for money or drugs; Stranger or someone I didn’t know before we had sex; and Other.* These types of partnerships were recoded as “non-main.” The third most recent partner was included in the analysis only if he was named as a main 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.

The following independent variables were examined to assess their relationships with each condom use problem (Table 4): *Respondent-level variables*: Intervention condition (waiting room video intervention or control); study site (Denver, Long Beach, or San Francisco); time of interview (index or follow-up); participant age; race/ethnicity; education level; whether or not the participant (or his partner) was drunk or high when having sex in the past 3 months; number of sex partners in the past 3 months, participant STI history (past 3 months); condom application knowledge (4 items dichotomized as 100% correct responses=yes, and less than 100% correct=no). *Partner-level variables*: Perceived partner risk for STI; perceived partner HIV status; whether or not the partner’s sex partners had other sex partners during the same 3-month period. *Partnership-level variables*: number of times a condom was used for anal sex acts; percent of anal sex acts using a condom (100% v.<100%); anal sex behavior (insertive v. receptive); perceived condom use self-efficacy was assessed separately for each partner with five items using a five-point (0-4) strongly disagree to strongly agree format. For example, “When you want to have sex with [partner name], you can use a condom even if [partner name] does not want to.” Higher values indicated greater self-efficacy. Partner support for condom use was also assessed separately for each partner, with seven items using the same response format. Four of these items were reverse coded so that higher scores indicated greater partner support. A sample item is, “I think that [partner name] would be mad at me if I asked to use condoms.”

Analysis

Statistical analysis was conducted among MSM partnerships with valid information where condoms were used for anal sex (n=568 sexual partnerships). Chi-square tests were carried out to determine individual-level predictors associated separately with breakage or slippage and partial use. Two models were fitted, modeling the probability of condom breakage or slippage and partial use. Additionally, the same models were fitted, stratified by partnership

type (main v. non-main), but main partnership models are not reported due to lack of significance. The models were developed using the generalized estimating equations (GEE) approach (Proc *genmod* in SAS[®] version 9.2, Cary, NC) to account for possible correlations among the multiple partnerships of each study participant, multiple condom uses among individuals, and two time intervals. The backwards elimination procedure was used to gradually remove insignificant predictors. However, key variables of interest were forced to be in the model, such as consistency of condom use, support and efficacy.

RESULTS

The sample for this analysis was restricted to 263 (median age=32 years) men who completed both the baseline and follow-up surveys, and reported having anal sex at least once in the preceding 3 months. A total of 990 MSM partnerships were reported; condoms were reportedly never used within 422 (42.6%) partnerships. These partnerships were excluded leaving a total of 207 respondents; 53.6% were white, 21.3% Hispanic, 5.8% African American, and 19.3% were another race. The education level was high; 88.4% attained more than a high school-level education. The majority (78.7%) reported two or more sexual partners during the prior three month period and the respondent was the insertive partner in 58.5% of these partnerships.

Of the 568 partnerships, condoms were used consistently (100% of the time) within 454 partnerships (79.9%) and inconsistently (<100%) within 114 (20.1%). Significantly higher rates of consistent condom use were reported within 361 non-main partnerships compared to 93 main partnerships (88.3% v. 58.5%, respectively, $p<0.0001$). (Table 1) Within all 568 partnerships where condoms were used, 21 (3.7%) reported both condom use problems, 25 (4.4%) reported only breakage or slippage, 67 (11.8%) reported only partial use, and 455 (80.1%) reported no problems. Among all condom users, the per-condom use rates of both condom use problems in main and non-main partnerships were 3.4% and 11.2%, respectively, with a significantly higher rate of breakage or slippage occurring among non-main partnerships (6.1% v. 0.8%). (Table 2) However, among those who used condoms consistently, condom use problems did not differ significantly by partnership type. (Table 3)

Bivariate Results

Lower education level (high school education or less), non-main partnership status, and having sex while either partner was drunk or high were associated with condom breakage or slippage. Factors associated with partial condom use included Latino ethnicity, lower education level, respondent STI diagnosis, low perceived condom-use self-efficacy, low perceived partner support for using condoms, having sex while either partner was drunk or high, and inconsistent condom use. (Table 4) Also, partial condom use occurred in 25.9% of all partnerships ($n=43$) in which the respondent reported the partner may have exposed the respondent to an STI ($p<0.0001$) as compared to 10.8% in the other partnerships. (Table 4)

Multivariable Results

Multivariable analysis revealed the following characteristics associated with increased odds for condom breakage or slippage for all partnerships: lower education level (OR=2.78; 95% CI: 1.1-7.5), non-main partner status (OR=4.1; 95% CI: 1.5-11.7), and having sex while either partner was drunk or high (OR=2.0; 95% CI: 1.1-3.8). (Table 5) The characteristics associated with increased odds for partial condom use for all partnerships were: lower education level (OR=2.6; 95% CI: 1.0-6.6), perceived partner STI risk (OR=2.4; 95% CI: 1.3-4.2), inconsistent condom use (OR=3.7; 95% CI: 2.0-6.6). Respondent behavior (insertive or receptive) was unrelated to condom use problems. (Table 6)

In stratified analysis, having sex while either partner was drunk or high was significantly associated with increased odds for breakage or slippage (OR=2.2; 95% CI: 1.1-4.4). (Table 5) In both types of partnerships, inconsistent condom use was a significant predictor for condom partial use, with nearly 4 to 6 times the odds for this condom use problem occurring in main and non-main partnerships (OR=3.7; 95% CI:2.1-6.8 and OR=5.8; 95% CI:2.8-12.0, respectively). In non-main partnerships only, having lower education (OR=2.9, 95% CI: 1.0-8.2) and a partner who had perceived risk for an STI in the past 3 months (OR=2.9; 95% CI: 1.4-5.9), were also associated with increased odds for condom partial use. (Table 6)

DISCUSSION

Among this sample of MSM who were seeking STD clinic services, no condom use was reported within a large proportion (42.6%) of partnerships, and by approximately 20% of participants. Among condom users, inconsistent condom use was reported in more than 11% of partnerships for anal sex in the previous three months. This finding is disconcerting following three decades of disparate HIV/AIDS-related morbidity and mortality experienced by MSM and public health efforts targeted to this population.

No condom use problems were reported in a large percentage of partnerships (80.1% among all users, and 84.4% among consistent users). This is a markedly higher percentage than observed in our previous work analyzing condom use problems among heterosexual couples where we found almost 40% of main partnerships (n=2900) and 30% of non-main partnerships (n=2195) experienced one or more condom use problems during vaginal sex in a three-month period (D'Anna et al., under review). Notably, however, 15-20% of all MSM partnerships did report condom use problems, which may confer high HIV risk among MSM engaging in anal sex.

Partial use of condoms was the most common problem experienced by both inconsistent and consistent users. Further, inconsistent use was a significant predictor for partial use, which may support the observation across studies that increased experience results in enhanced condom use effectiveness. This finding may indicate an attempt at risk reduction based on misinformation about the exact mechanisms for HIV/STI transmission (i.e., the belief that no risk is posed if the insertive partner has not ejaculated), an informed willingness to risk exposure possibly influenced by current biomedical advances in treatment or not witnessing the early years of the HIV/AIDS epidemic (men who reported that their partner had an STI in the past 3 months had significantly elevated risk for experiencing partial condom use), difficulties in consistently modifying sexual behaviors even when risk aware, or a combination of all these factors.

We noted differences in condom use behaviors by sexual partnership type (main v. non-main partners). Consistent condom use was significantly higher within non-main partnerships, indicating that heightened risk for HIV/STIs was perceived in less steady partnerships; a finding that has been reported previously (Azariah & Perkins, 2010; Franssens, Hospers, & Kok, 2009). However, the per-condom use rate for condom breakage or slippage was also significantly higher in non-main partnerships, suggesting that although additional measures were taken to increase protection, the risk may not have been successfully mitigated. Markedly higher per-use rates of breakage or slippage among non-main partners were also observed in our analysis involving heterosexual partners during vaginal sex (D'Anna, et al., under review).

Alcohol and drug use have been identified as risk factors for condom use problems among MSM (Allman, et al., 2009; Calzavara, et al., 2003; Harawa et al., 2004; Stone, et al., 1999). This relationship was also observed in our study, but was only associated with significantly

increased odds for condom breakage or slippage. This may indicate that alcohol/drug impairment has a particular effect on the proficiency of condom application (i.e., leaving adequate space at the tip of the condom, unrolling the condom during application, but not before, etc.), but not on the timing of condom application or removal.

Our study had several strengths. We were able to make comparisons between types of partnerships, specific sexual behaviors (insertive and receptive anal sex) and specific condom use problems. This study improves upon the methodology used in previous studies by collecting detailed condom use and problem data from individual partnerships over time (Noar, Cole, & Carlyle, 2006). The measures of breakage or slippage used in this study were designed to ask about condom use problems occurring during anal sex, 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 STI risk. (Grady & Tanfer, 1994)

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. Another caveat is that our dichotomy of main versus non-main partnerships is not necessarily mutually exclusive; many respondents with main partners also had non-main partnerships and were represented within both samples. Finally, our results are not generalizable to all MSM, particularly HIV-positive MSM and men who did not perceive themselves to be at risk for STI and were not seeking services from an STD clinic. Finally, our findings are subject to the limitations associated with participant self-report and recall.

Conclusion

Additional research is needed to better understand the barriers to consistent and correct condom use among at-risk MSM. This presents a formidable challenge, considering that at-risk men who are motivated to protect themselves by using condoms may reduce the effectiveness of their efforts by applying the condom after initiating or before completing anal sex, or by applying and using condoms in a way that increases the opportunities for breakage and slippage. Future research should include more in-depth elicitation questions about condom use problems to mitigate potential difficulties in respondent recall and to enhance the description of the situational, behavioral, partner and partnership-specific barriers and facilitators to consistent and correct condom use. Specifically, analyzing event-specific condom use problems among MSM (i.e., approaches such as those used in daily sexual diary studies) would be an ideal research priority.

In summary, in spite of the gains that have been made in reducing transmission of HIV and extending and improving quality of life among certain groups at risk for and living with HIV, additional efforts are needed in the areas of correct condom use education and skills building among MSM. MSM may benefit from interventions designed to increase condom use proficiency with a particular focus on the behaviors of inconsistent and partial condom use. Further, the robust relationship between alcohol and substance use and condom use problems highlight additional opportunities to engage bars, alcohol suppliers and manufacturers in efforts to promote correct condom use. Finally, future research should explore the relationships between partnership characteristics and behaviors, and condom use knowledge, self-efficacy, and partner support as they relate to non-condom use among MSM.

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Table 1

Frequencies of Partnerships with 100% and <100% Condom Use by Partnership Type Among MSM Participating in a Nested Behavioral Study, Safe in the City ($p<0.0001$)

	Main Partnerships (N=159)	Non-main Partnerships (N=409)	Total (N=568)
Number of partnerships with 100% condom use	93(58.5%)	361(88.3%)	454(79.9%)
Number of partnerships with <100% condom use	66(41.5%)	48(11.7%)	114(20.1%)

* Chi squared test for equality of proportions is used.

Table 2

Rate of Condom Use Problems Per Condom Used by Partnership Type Among MSM Participating in a Nested Behavioral Study, Safe in the City

	Number of Condoms Used		<i>P</i> [*]	Total (N=1,650)
	Main Partnerships (N=843)	Non-main Partnerships (N=807)		
Number of broken or slipped condoms	7 (0.8%)	49 (6.1%)	<0.0001	56 (3.4%)
Number of partially used condoms	82 (9.7%)	102(12.6%)	0.0603	184(11.2%)

* Chi squared test for equality of proportions is used.

Table 3

Frequencies of Partnerships with 100% Condom Use and Different Use Problems by Partnership Type Among MSM Participating in a Nested Behavioral Study, Safe in the City

100% condom use	Main Partnerships (N=93)	Non-main Partnerships (N=361)	P*	Total (N=454)
Number of partnerships with no errors	78(83.9%)	305(84.5%)	0.8839	383(84.4%)
Number of partnerships with breakage/slippage	3 (3.2%)	31 (8.6%)	0.0798	34 (7.5%)
Number of partnerships with partial use error	12(12.9%)	36(10.0%)	0.4124	48(10.6%)

* Chi squared test for equality of proportions is used.

Table 4

Crosstabs of covariates with condom breakage/slippage and partial use among MSM Participating in a Nested Behavioral Study, Safe in the City

RESPONDENT CHARACTERISTICS	Total Partnerships (N=568) Breakage/Slippage		Total Partnerships (N=568) Partial Use		P
	Yes(N=46)	No(N=522)	Yes(N=88)	No(N=480)	
Site					0.6560
Denver	13 (9.7)	121 (90.3)	24 (17.9)	110 (82.1)	
Long Beach	9 (6.0)	141 (94.0)	23 (15.3)	127 (84.7)	
San Francisco	24 (8.5)	260 (91.5)	41 (14.4)	243 (85.6)	
Arm					0.6448
Intervention	24 (8.1)	273 (91.9)	48 (16.2)	249 (83.8)	
Control	22 (8.1)	249 (91.9)	40 (14.8)	231 (85.2)	
Race/Ethnicity					0.0143
White	25 (8.0)	288 (92.0)	40 (12.8)	273 (87.2)	
Black	2 (9.1)	20 (90.9)	2 (9.1)	20 (90.9)	
Hispanic	14 (11.6)	107 (88.4)	30 (24.8)	91 (75.2)	
Other	5 (4.5)	107 (95.5)	16 (14.3)	96 (95.7)	
Education					0.0008
High school or less	11 (18.6)	48 (81.4)	18 (30.5)	41 (69.5)	
More than high school	35 (6.9)	474 (93.1)	70 (13.8)	439 (86.2)	
Knowledge about condoms					0.1731
Yes	33 (7.1)	429 (92.9)	67 (14.5)	395 (85.5)	
No	13 (12.3)	93 (87.7)	21 (19.8)	85 (80.2)	
Number of reported partners in the past 3 months					0.3873
1	6 (6.5)	86 (93.5)	17 (18.5)	75 (81.5)	
2 or more	40 (8.4)	436 (91.6)	71 (14.9)	405 (85.1)	
STI in the past 3 months	N=566				<0.0001
Yes or not known	0 (0.0)	23 (100.0)	11 (47.8)	12 (52.2)	
No	46 (8.5)	497 (91.5)	77 (14.2)	466 (85.8)	

PARTNER CHARACTERISTICS	Total Partnerships (N=568)		Breakage/Slippage		Total Partnerships (N=568) Partial Use		P
	Yes(N=46)	No(N=522)	P	No(N=522)	Yes(N=88)	No(N=480)	
Partner number							0.4054
1	23 (7.0)	307 (93.0)	0.2647		52 (15.8)	278 (84.2)	
2	23 (10.1)	205 (89.9)			33 (14.5)	195 (85.5)	
3	0 (0.0)	10 (100.0)			3 (30.0)	7 (70.0)	
Perceived risk for partner STI	N=568		0.0627				<0.0001
Had STI or not known	19 (11.5)	147 (88.5)			43 (25.9)	123 (74.1)	
No STI	27 (6.8)	373 (93.2)			43 (10.8)	357 (89.2)	
Perceived partner HIV status	N=568		0.1032				0.2259
HIV Positive or not known	13 (11.9)	96 (88.1)			21 (19.3)	88 (80.7)	
HIV Negative	33 (7.2)	426 (92.8)			67 (14.6)	392 (85.4)	
Reported partner is the main partner			0.0185				0.1001
Yes	6 (3.8)	153 (96.2)			31 (19.5)	128 (80.5)	
No	40 (9.8)	369 (90.2)			57 (13.9)	352 (86.1)	
Partner had sex with others			0.5113				0.5149
Yes or not known	32 (8.7)	338 (91.3)			60 (16.2)	310 (83.8)	
No	14 (7.1)	184 (92.9)			28 (14.1)	170 (85.9)	
Partner-specific condom use efficacy (mean ± stdev)	3.2 ± 0.7	3.4 ± 0.8	0.1777		2.9 ± 0.9	3.4 ± 0.7	<0.0001
Perceived partner support for condom use (mean ± stdev)	3.0 ± 0.7	3.1 ± 0.7	0.1618		2.8 ± 0.8	3.2 ± 0.7	<0.0001
Had sex while either partner drunk or high			0.0086				0.0045
Yes	24 (12.2)	172 (87.8)			42 (21.4)	154 (78.6)	
No	22 (5.9)	350 (94.1)			46 (12.4)	326 (87.6)	
Study interval			0.4692				0.0125
Baseline	26 (8.9)	266 (91.1)			56 (19.2)	236 (80.8)	
At 3 months	20 (7.3)	256 (92.7)			32 (11.6)	244 (88.4)	

	Total Partnerships (N=568) Breakage/Slippage		Total Partnerships (N=568) Partial Use		P
	Yes(N=46)	No(N=522)	Yes(N=88)	No(N=480)	
Condom use consistency					<0.0001
0% < use < 100%	12 (10.5)	102 (89.5)	40 (35.1)	74 (64.9)	
100% use	34 (7.5)	420 (92.5)	48 (10.6)	406 (89.4)	
Type of sex act for the respondent					0.2879
Insertive "top"	29 (8.7)	303 (91.3)	55 (16.6)	277 (83.4)	0.5097
Receptive "bottom"	17 (7.2)	219 (92.8)	33 (14.0)	203 (86.0)	
Number of acts with condom (mean \pm stdev)	3.2 \pm 3.7	2.9 \pm 5.9	3.9 \pm 7.7	2.7 \pm 5.3	0.1935

No condom use was reported in 422 (43%) of 990 total MSM partnerships.

Table 5

Multivariable Models for Condom Breakage/Slippage: All Partnerships and Non-Main Partnerships among MSM Participating in a Nested Behavioral Study, Safe in the City

	Condom Breakage or Slippage		Condom Breakage or Slippage: Non-main Partnerships		P [†]			
	Adjusted OR	[95% CI]	Adjusted OR	[95% CI]				
RESPONDENT CHARACTERISTICS								
Education								
High school or less	2.78	1.03	7.48	0.0432	2.92	0.95	8.94	0.0603
More than high school	Ref	N/A	N/A	N/A	Ref	N/A	N/A	N/A
PARTNER CHARACTERISTICS								
Partner had STI prior 3 months								
No	Ref	N/A	N/A	N/A	Ref	N/A	N/A	N/A
Yes or not known	1.84	0.84	4.02	0.1296	1.93	0.83	4.51	0.1264
Partner is HIV positive								
No	Ref	N/A	N/A	N/A	Ref	N/A	N/A	N/A
Yes or not known	1.31	0.57	3.03	0.5239	1.27	0.50	3.24	0.6221
Reported partner is main partner								
No	4.14	1.47	11.68	0.0073	N/A	N/A	N/A	N/A
Yes	Ref	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Partner had sex with others								
No	Ref	N/A	N/A	N/A	Ref	N/A	N/A	N/A
Yes or not known	0.82	0.40	1.68	0.5879	1.25	0.49	3.19	0.6418
Partner-specific condom use efficacy								
	0.93	0.61	1.43	0.7493	0.87	0.53	1.42	0.5718
Perceived partner support for condom use								
	1.02	0.63	1.67	0.9217	1.09	0.57	2.10	0.7939
PARTNERSHIP CHARACTERISTICS								
Had sex while either partner drunk or high								
No	Ref	N/A	N/A	N/A	Ref	N/A	N/A	N/A
Yes	2.01	1.07	3.79	0.0299	2.19	1.08	4.44	0.0289

	Condom Breakage or Slippage		Condom Breakage or Slippage: Non-main Partnerships		<i>P</i> [†]
	Adjusted OR	[95% CI]	Adjusted OR	[95% CI]	
Condom use consistency					
0% < use < 100%	1.62	0.69	3.79	0.2656	0.2237
100% use	Ref	N/A	N/A	N/A	N/A
Number of acts with condom	1.01	0.97	1.05	0.5611	0.9559

* GEE is used. Characteristics are significantly associated with condom breakage/slippage if $p < 0.05$. All models are adjusted by study time frame (baseline versus follow-up) and intervention condition (video intervention versus control).

Table 6

Multivariable Models for Condom Partial Use: All Partnerships and Non-Main Partnerships among MSM Participating in a Nested Behavioral Study, Safe in the City

Predictors	Partial Condom Use		Partial Condom Use: Non-Main Partnerships		<i>p</i> [†]			
	Adjusted OR	[95% CI]	Adjusted OR	[95% CI]				
RESPONDENT CHARACTERISTICS								
Education								
High school or less	2.61	1.04	6.55	0.0411	2.89	1.02	8.20	0.0460
More than high school	Ref	N/A	N/A	N/A	Ref	N/A	N/A	N/A
Knowledge about condom application								
No	1.31	0.64	2.66	0.4614	1.61	0.74	3.54	0.2324
Yes	Ref	N/A	N/A	N/A	Ref	N/A	N/A	N/A
Number of reported partners in the past 3 months								
1	2.02	0.93	4.43	0.0773	1.67	0.48	5.81	0.4201
2 or more	Ref	N/A	N/A	N/A	Ref	N/A	N/A	N/A
PARTNER CHARACTERISTICS								
Partner had STI prior 3 months								
No	Ref	N/A	N/A	N/A	Ref	N/A	N/A	N/A
Yes or not known	2.36	1.32	4.22	0.0036	2.92	1.44	5.90	0.0029
Partner is HIV positive								
No	Ref	N/A	N/A	N/A	Ref	N/A	N/A	N/A
Yes or not known	0.83	0.37	1.89	0.6629	0.81	0.28	2.36	0.7046
Reported partner is main partner								
No	1.35	0.58	3.13	0.4810	N/A	N/A	N/A	N/A
Yes	Ref	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Partner had sex with others								
No	Ref	N/A	N/A	N/A	Ref	N/A	N/A	N/A
Yes or not known	1.35	0.79	2.31	0.2789	1.81	0.80	4.13	0.1565

Predictors	Partial Condom Use		Partial Condom Use: Non-Main Partnerships		<i>p</i> [†]
	Adjusted OR	[95% CI]	Adjusted OR	[95% CI]	
Partner-specific condom use efficacy	0.77	0.53 1.11	0.71	0.48 1.04	0.0756
Perceived partner support for condom use	0.82	0.53 1.26	0.94	0.52 1.69	0.8365
PARTNERSHIP CHARACTERISTICS					
Had sex while either partner drunk or high					
No	Ref	N/A N/A	Ref	N/A N/A	N/A N/A
Yes	1.40	0.82 2.39	1.26	0.66 2.39	0.4845
Condom use consistency					
0% < use < 100%	3.66	2.04 6.57	5.82	2.82 12.00	<.0001
100% use	Ref	N/A N/A	Ref	N/A N/A	N/A N/A
Type of sex act for the respondent					
Receptive (bottom)	0.75	0.47 1.19	0.93	0.51 1.68	0.8076
Insertive (top)	Ref	N/A N/A	Ref	N/A N/A	N/A N/A

* GEE is used. Characteristics are significantly associated with partial condom use if $p < 0.05$. All models are adjusted by study time frame (baseline versus follow-up) and intervention condition (video intervention versus control).