Erection loss in association with condom use among young men attending a public STI clinic: potential correlates and implications for risk behaviour

Cynthia A. Graham[A,B,C,J], *Richard Crosby*[C,D], *William L. Yarber*[B,C,E,F], *Stephanie A. Sanders*[B,C,F], *Kimberly McBride*[G], *Robin R. Milhausen*[H] *and Janet N. Arno*[C,I]

[A]Oxford Doctoral Course in Clinical Psychology, Oxford, UK.
[B]The Kinsey Institute for Research in Sex, Gender, and Reproduction, Bloomington, IN, USA.
[C]Rural Center for AIDS/STD Prevention at Indiana University, Bloomington, IN, USA.
[D]College of Public Health at the University of Kentucky, Lexington, KY, USA.
[E]Department of Applied Health Science, Indiana University, Bloomington, IN, USA.
[F]Gender Studies, Indiana University, Bloomington, IN, USA.
[G]Department of Adolescent Medicine, Indiana University School of Medicine, Indianapolis, IN, USA.
[H]Social Justice and Sexual Health Research Lab, Department of Sociology and Anthropology,
University of Windsor, Windsor, Ontario, Canada.
[I]Department of Infectious Diseases, Indiana University School of Medicine, Indianapolis, IN, USA.
[J]Corresponding author. Email: cynthia.graham@hmc.ox.ac.uk

Abstract. *Background:* To assess prevalence of condom-associated erection loss and to identify correlates of erection loss among men attending a sexually transmissible infections (STI) clinic. *Methods:* Men ($n = 278$) attending an STI clinic responded to an anonymous questionnaire aided by a CD recording of the questions. The sample was screened to include only men who had used a condom during penile–vaginal sex at least three times in the past 3 months. Erection loss was assessed for 'the last three times a condom was used'. *Results:* The mean age of the participants was 23.7 years (s.d. = 4.1); 37.1% of the men reported condom-associated erection loss on at least one occasion. Men who had reported condom-associated erection loss were also reported having more frequent unprotected vaginal sex ($P = 0.04$) and were less likely to use condoms consistently ($P = 0.014$) than men without erection loss. Men with erection loss were also more likely to remove condoms before sex was over ($P = 0.001$). Age and race/ethnicity were not associated with erection loss. In multivariate analysis, three significant statistical predictors were identified: low self-efficacy to use condoms ($P = 0.001$); problems with 'fit or feel' of condoms ($P = 0.005$); and having more than three sex partners during the previous 3 months ($P = 0.02$). *Conclusions:* Condom-associated erection loss may be common among men at risk for STIs. This problem may lead to incomplete or inconsistent condom use. Men may be more likely to experience condom-associated erection loss if they lack confidence to use condoms correctly, if they experience problems with the way condoms fit or feel, and if they have sex with multiple partners.

Introduction

Condom use is an important primary prevention strategy that can substantially reduce the likelihood of transmitting and acquiring sexually transmissible infections (STIs).[1–3] Thus, one longstanding challenge in public health practice has involved motivating men to use condoms consistently and correctly.[4] The challenge has proven formidable and therefore requires continued effort. For example, accumulating evidence suggests that men may experience a host of problems related to the correct use of condoms.[5–8] One difficulty that may be especially important to men,

and yet has received surprisingly little attention, is the loss of erection while applying or using condoms. Indeed it is reasonable to predict that men who experience condom-associated erection loss may be reluctant to use condoms and more likely to report incomplete use of condoms (not using condoms from start to finish of sex). If this is the case, studies that identify the correlates of condom-associated erection loss could be an important starting point for behavioural intervention.

Several studies have explored the relationship between loss of erection and condom use. Among a sample of

HIV-positive gay men who had recently seroconverted, erection problems in association with condom use were a common concern.[9] Further, reported inability to achieve or maintain an erection sometimes led to a decision not to use condoms, either occasionally or altogether. In another study involving both HIV-positive and HIV-negative gay men, there was a relationship between reporting erectile problems and sexual risk taking (indexed by number of casual partners with whom condoms were not used).[10] Studies involving college students have consistently found that a proportion (12–32%) of men report erection loss in association with condom use.[5,7,11,13] Male college students who reported loss of erection during condom use were also more likely to report condom slippage.[6] In a recent investigation of incarcerated adolescent males who were interviewed during their intake physical examination, the prevalence of erection loss 'before condom removal' was 18% during 'usual use' and 7% for the last sexual encounter.[13] Last, in a study that assessed the prevalence of condom-related erection problems in the previous year among men attending STI clinics, erection loss during condom application or during intercourse using a condom (before ejaculation) was commonly reported (e.g. less than 40% of men said that this 'never' occurred).[14] No relationship between erection loss and condom breakage or slippage was found. Unfortunately, however, these researchers did not assess whether erection problems were related to incomplete use.

Clearly, men attending an STI clinic are an important population for the study of condom-associated erection loss. Sexually transmissible infection burden may be higher among relatively younger men.[15] Given the advanced and costly sequelae from STIs that occur among women,[15] assessment of men who have sex with women is particularly important. Accordingly, this study was conducted using a sample of relatively young men who have sex with women (MSW) attending an STI clinic. The primary purpose was to assess the prevalence of condom-associated erection loss. Second, the study determined whether erection loss was significantly associated with incomplete use (not using condoms throughout the sexual encounter) or with less consistent use of condoms. Finally, the study identified other history-related correlates of condom-associated erection loss.

Methods

Sample

Data were collected at a large, urban, midwestern, public STD clinic from October 2004 to September 2005. Men attending the clinic were recruited in the waiting area and screened for eligibility in a private room. Inclusion criteria were: (1) 18–35 years of age; (2) English speaking; and (3) reporting male condom use at least three times in the past 3 months for sex (penis in vagina) with a female. Five hundred and sixteen men (516) were screened and 351 met inclusion criteria. Of these, 314 (89.5%) agreed to participate and completed a questionnaire.

Measures

A questionnaire refined through use in several studies involving more than 800 men, including STI clinics attendees, was used to comprehensively assess men's condom-use errors and problems.[5,7,8,16,17] Original questionnaire development was informed by widely cited condom-use guidelines.[18,19] Because accuracy of recall was considered vital,[10] the recall period was limited to the last three times condoms were used within the past 3 months. For each question, men indicated whether the error or problem occurred zero to three times. Sex was defined as 'sexual intercourse, or penis in vagina'.

Erection loss

Two measures assessed erection loss: (1) 'For the last three times you used a condom, did you lose your erection while putting it on?'; and (2) 'For the last three times you used a condom, did you lose your erection after sex had begun while using the condom?' Men indicated whether erection loss had occurred at all and, if so, whether it had occurred on one, two or three occasions.

Association with risk behaviour

Two measures were assessed to determine if erection loss was associated with non-use or incomplete condom use. The first was the frequency of unprotected penile–vaginal sex (UVS) during the past 3 months. Men were asked how many times they had engaged in sex and then asked how many times a condom was used. The latter measure was then subtracted from the former to produce the measure of UVS. The second was the behaviour of removing condoms from the penis before sex was over (incomplete use). Men were asked, 'For the last three times you used a condom, did you start having sex with it on and then take it off before sex was finished?' Response alternatives were 'no', or on one, two or three occasions.

Other history-related correlates

Nine potential correlates were assessed. The first two were age and race/ethnicity (white/non-white). Next, three problems were assessed using the recall period of the last three times condoms were used. These were: (1) breakage, (2) slippage and (3) problems with the 'fit or feel' of condoms. Men also answered an item asking if they had ever been taught how to use condoms. They also indicated how many sex partners they had had sex with in the past 3 months. Men's motivation to use condoms was assessed by the following item, 'I am highly motivated to use condoms correctly'. Responses to this item were provided using a scale ranging from '1' (strongly agree) to '5′' (strongly disagree). Finally, an eight-item index was used to assess men's self-efficacy for the correct application of condoms.[20] These items asked men how 'easy or difficult' it would be for them to perform behaviours related to condom use. For example, one item was: 'How easy or difficult would it be for you to apply condoms correctly?' Response alternatives ranged from '1' (very easy) to '5′' (very difficult). The index produced a satisfactory Cronbach's α of 0.70, suggesting adequate reliability of the measure.

Procedure

After providing written informed consent, volunteers completed a brief self-administered written questionnaire lasting 15–20 min. To reduce problems with literacy, the questions were recorded to a CD that men could choose to play using a portable headset to assist them in providing written answers to the orally presented questions. Each question constituted a single track; thus, men could easily replay a question, just as they would a track of music. Responses were anonymous. Men who completed the questionnaire were paid $10. The Institutional Review Board at Indiana University approved the protocol.

Data analysis

The measure of erection loss was dichotomised as one or more events versus none. Associations between erection loss and UVS were then assessed. First, UVS was treated as a continuous variable and an independent groups *t*-test was used. Next, UVS was dichotomised into consistent condom use (100%) versus less than consistent use. Contingency table analysis was then applied, using prevalence ratios, 95% confidence intervals and their respective *P*-values. Contingency-table analysis was also used to test the association between erection loss and the practice of removing condoms before sex was over (one or more times during the last three times condoms were used).

To identify correlates of condom-associated erection loss, bivariate associations were determined followed by a multivariate test of associations. Age was preserved as a continuous measure and its bivariate association with erection loss was determined by a *t*-test comparing mean age for those reporting erection loss with that for those not reporting erection loss. The remaining correlates were tested using contingency-table analysis. Of note, skewness necessitated dichotomisation of the index measure pertaining to self-efficacy. Scores ranged from the lowest possible (eight, indicating high efficacy) to 35. To achieve a median split, men with scores of 15 and less (high efficacy) were compared with men with scores of 16 or more (low efficacy). Correlates achieving bivariate significance ($P < 0.05$) were entered into a forward stepwise logistic regression model. Multivariate significance was defined by 95% confidence intervals and *P*-values of less than 0.05.

Results

Characteristics of the sample

Despite screening attempts, 36 men provided questionnaire responses that indicated that they were in fact not eligible, thereby leaving an analytic sample of 278 men (88.5% of the 314). The mean age was 23.7 years (s.d. = 4.1). About two-thirds (67.6%) identified as Black or African American, nearly one-quarter (23.7%) as white and the remainder as other minority groups.

Prevalence of condom-associated erection loss

Nearly three of every 10 men (28.1%) reported they had lost their erection on one of the last three times that they applied condoms; none indicated that this happened more than once. Thirty-seven men (13.4%) reported they had lost their erection once while using a condom during vaginal–penile intercourse. Twenty-six men (9.4%) reported that this happened twice and 10 men (3.6%) reported that it had happened on all three occasions. About one of every six men (17.3%) reported both events (i.e. erection loss during application and during use). Combining the two measures, 37.1% of the men reported condom-associated erection loss on at least one occasion. Specifically, 47 men (16.9%) reported experiencing one event of erection loss, 25 men (9.0%) reported two events, 24 (8.6%) reported three events, and seven (2.5%) reported four events.

Association of reports of erection loss with risk behaviour

Those reporting any erection loss engaged in UVS more frequently (mean = 10.6 times) over the past 3 months than

men indicating no erection loss (mean = 7.0 times) ($t = 2.0$ (276), $P = 0.04$). Moreover, men reporting erection loss were more likely to report inconsistent condom use (i.e. less than 100% of the time). Inconsistent condom use was reported by 84.5% of men with erection loss compared with 71.5% among men not reporting erection loss (prevalence ratio (PR) = 1.18; 95% CI = 1.04–1.34; $P = 0.014$). Men reporting erection loss were also significantly more likely to remove condoms before sex was over. Condoms were removed prematurely on at least one (of the past three) occasions by 40.8% of the men reporting erection loss compared with 21.3% of men not reporting this problem (PR = 1.92; 95% CI = 1.33–2.77; $P = 0.001$).

Other history-related correlates of condom-associated erection loss

Age was not significantly associated with erection loss. The mean age of those not reporting erection loss was 23.6 years compared with 24.0 years among those reporting erection loss ($t = 0.95$ (272); $P = 0.34$). Table 1 displays the observed bivariate associations pertaining to the dichotomous correlates and erection loss. As shown, four of the eight correlates achieved bivariate significance. Among men classified as having low self-efficacy for correct condom use, nearly 50% reported erection loss compared with 24% among men with high self-efficacy. Erection loss was also more likely among men who reported at least one condom breakage (47.1%) than men not reporting breakage (32.5%). More than one-half (53.0%) of men indicating problems with 'fit or feel' also had erection loss, in contrast with 30% of men not reporting this problem. Finally, men reporting sex with three or more partners (during the past 3 months) were more likely to have erection loss (45.0%) than men having one or two partners (29.6%).

Table 2 displays the results of a logistic regression model for erection loss. The model was significant (c2 with 3 d.f. = 33.7, $P < 0.0001$), and achieved an excellent fit with the data (goodness of fit c2 with 6 d.f. = 2.88, $P = 0.82$). Three of the four correlates entered retained significance. Compared with men with high self-efficacy, those classified as having low self-efficacy to use condoms were ~2.8 times more likely to report erection loss. Men reporting recent problems with the 'fit or feel' of condoms were ~2.2 times more likely to report erection loss than men not having these problems. Finally, men reporting sex with three or more partners were ~1.9 times more likely than men having fewer partners to report erection loss.

Discussion

The findings suggest that condom-associated erection loss may be a relatively frequent occurrence among MSW attending public STI clinics. Evaluating only the last three times a condom was used during the past 3 months, erection loss while applying condoms and/or during condom-

Table 1.   Bivariate associations between dichotomous correlates and condom-associated erection loss among 278 men attending an STI clinic

Correlates	% with loss[A]	PR[B]	95% CI[C]	P
Racial/ethnic minority				
No (*n* = 66)	40.9	0.88	0.62–1.23	0.46
Yes (212)	35.8			
Motivation to use condoms				
High (158)	33.5	1.23	0.90–1.67	0.19
Low (119)	41.2			
Self-efficacy for correct condom use				
High (134)	23.9	2.06	1.46–2.91	0.001
Low (144)	49.3			
Taught how to use condoms				
Yes (238)	37.8	0.86	0.53–1.38	0.52
No (40)	32.5			
Condom slipped off during sex				
No (238)	35.7	1.26	0.86–1.85	0.26
Yes (40)	45.0			
Condom broke during sex				
No (191)	32.5	1.45	1.07–1.96	0.019
Yes (87)	47.1			
Problems with 'fit and feel' of condoms				
No (195)	30.3	1.75	1.31–2.35	0.001
Yes (83)	53.0			
Three or more sex partners (past 3 months)				
No (142)	29.6	1.52	1.10–2.09	0.008
Yes (131)	45.0			

[A]Defined as experiencing at least one of two types of erection loss during the last 3 times condoms were used.
[B]Prevalence ratio.
[C]Confidence interval.

Table 2.   Multivariate differences between men who did and did not report erection loss

Correlates	AOR[A]	95% CI[B]	P
Low self-efficacy for correct condom use	2.84	1.66–4.84	0.001
Problem with fit or feel of condoms	2.22	1.27–3.87	0.005
Three or more sex partners (past 3 months)	1.87	1.10–3.16	0.02

[A]Adjusted odds ratio – adjusted for the influence of all other variables in the model.
[B]Confidence interval.

protected penile–vaginal sex was reported by nearly four of every 10 men (37.1%). Although erection loss is in itself an important health issue for men, our findings also suggest that condom-associated erection loss may be linked to non-use or incomplete use of condoms. Thus, consistent with previous studies involving gay men,[9,10] for MSW who are at high risk for STIs, condom-associated erection loss may lead to increased risk-taking behaviour through UVS.

There was no significant association between age and condom-associated erection loss. Given the strong positive association between age and experience of erectile difficulties in general,[21] one might expect reports of erection problems

during condom use to be more prevalent among older men. However, the current sample was limited to predominantly young men, aged 18–35 years, making it less likely that a significant association would be found.

The findings from this study have important implications for education and counselling efforts directed towards the promotion of condom use to men at risk of STIs. First, it may be that men who lack confidence in their ability to use condoms correctly would be particularly receptive to receiving clinic- or community-based instruction designed to enhance their condom-use skills. This may be particularly important for men who worry about the possibility of losing their erection when using a condom. Such instruction should be interactive[22] and would ideally involve guided practice applying condoms to a partially rigid penile model. In turn, enhanced ability to apply condoms might reduce the likelihood of erection problems during condom application. Indeed, if one outcome of an education program was greater confidence in erectile ability for male participants, this might lead to more consistent condom use.

Second, the findings suggest that problems related to 'fit and feel' of condoms may be critically important to the issue of condom-associated erection loss. Various negative

outcomes (e.g. condom breakage) have been related to the 'fit and feel' of condoms in previous studies.[8,17] The sensations associated with poorly fitted condoms or those that don't feel 'right' may directly affect erection. Alternatively, it may be that ill-fitting (i.e. too tight or too loose) condoms create anxiety about slippage or breakage and resultant condom failure. This anxiety in turn could detract from sexual pleasure and lead to erection loss. Similarly, it is possible that poorly lubricated condoms become quite dry and cause irritation for either partner. In turn, this irritation may reduce sexual sensation, increasing the likelihood of male erection loss. Alternatively, sensations of dryness might be distracting and may increase the risk of erection loss because of reduced focus on sexual sensations.

Finally, the study found that men having sex with three or more partners had a greater risk of experiencing condom-associated erection loss. It is possible that men who are experiencing erection difficulties may engage in more risk behaviour, and with more female partners, in an effort to heighten their sexual arousal. Alternatively, it may be that negotiating sex with a new partner combined with the challenge of using condoms may be particularly anxiety provoking, thereby making erection loss more likely. As this was a cross-sectional study, we cannot establish which of these two explanations is correct. If having numerous partners does increase the likelihood of experiencing erectile problems, the implication is that education or counselling efforts might target this group of men by teaching them how to discuss condom use with a new partner. Such discussions could be constructed to allow men some delay in the progression of erotic events to pause for condom application or (if condoms become dry) to briefly interrupt coitus to add lubricant to the condom. For example, education might involve informing men that during sexual activity, most penises fluctuate in rigidity, that temporary loss of erection is a common experience (maybe especially when applying condoms) and that if their erection subsides, they should allow time for it to return. Another suggestion might be for couples to try to eroticise condom use e.g. men could consider asking their female partners to apply the condom or to put the condom on during foreplay rather than just before intercourse, which might be experienced as greater interruption of the 'flow' of sexual activity. Indeed, recent evidence suggests that women may commonly apply condoms to their male sex partners,[11] although whether this reduces the likelihood of male partners experiencing erectile problems is not known.

Lastly, the findings also have implications for future research. Assessing erection problems associated with condom use should be a critical component of studies that investigate reasons for non-use or incomplete condom use.[23]

Limitations

This study compared men who reported erection loss during the last three times they used condoms with men who did not report erection difficulties. Because we did not obtain information about erection loss during sexual encounters when condoms were not used, the data collected do not allow any causal conclusions. Additionally, one of our correlates, 'problems with fit and feel' of condoms, may be a proxy for erection difficulties to some extent and thus causal in both directions.

As is true for any study of sexual behaviour, the findings are limited by the validity of the self-reported data. Although we cannot be sure, it is reasonable to expect that the relatively narrow recall period for condom-associated erection loss may have minimised recall error. Generalisability is also limited by the use of a convenience sample.

The findings suggest that more in-depth research should be conducted to better understand the relationship of low self-efficacy for correct condom use and 'fit and feel' problems to condom-associated erection difficulties. Indeed a qualitative study may be an important 'next step' in learning more about condom-associated erection loss.

Conclusions

To our knowledge, this is the first published study that has reported correlates of condom-associated erection loss. Among MSW attending a public STI clinic, condom-associated erection loss may be a relatively common occurrence. This problem may lead men to use condoms less often or to remove condoms before sex is over. Men may be more likely to experience condom-associated erection loss if they lack confidence to use condoms correctly, if they experience problems with the way condoms 'fit or feel' and if they have sex with numerous partners. These correlates are amenable to brief, clinic-based interventions, thereby suggesting that adding such programs to clinic protocols is warranted. In turn this added counselling and education might have an impact on STI incidence rates. Future studies should include assessment of men's confidence in their erectile ability, because men who experience condom-associated erection loss may be those who are more vulnerable to experience erection difficulties in situations not involving condom use.

Conflicts of interest

None declared.

Acknowledgements

References

1 Holmes KK, Levine R, Weaver M. Effectiveness of condoms in preventing sexually transmitted infections. *Bull World Health Organ* 2004; 82: 454–61.

2 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. doi: 10.1097/01.olq.0000187908.42622.fd

3 Centers for Disease Control and Prevention. Sexually transmitted diseases treatment guidelines 2002. *MMWR Morb Mortal Wkly Rep* 2002; 51: 1–60.

4 Crosby R, DiClemente RJ, Holtgrave DR, Wingood GM. Design, measurement, and analytical considerations for testing hypotheses relative to condom effectiveness against non-viral STIs. *Sex Transm Infect* 2002; 78: 228–31. doi: 10.1136/sti.78.4.228

5 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: 367–70. doi: 10.1016/S0749-3797(03)00015-1

6 Yarber WL, Graham CA, Sanders SA, Crosby RA. Correlates of condom breakage and slippage among university undergraduates. *Int J STD AIDS* 2004; 15: 467–72. doi: 10.1258/0956462041211207

7 Crosby RA, Sanders S, Yarber WL, Graham CA, Dodge B. Condom use errors and problems among college men. *Sex Transm Dis* 2002; 29: 552–7.

8 Crosby R, Yarber WL, Sanders SA, Graham CA. Condom discomfort and associated problems with their use among university students. *J Am Coll Health* 2005; 54: 143–8.

9 Richters J, Hendry O, Kippax S. When safe sex isn't safe. *Cult Health Sex* 2003; 5: 37–52.

10 Bancroft J, Janssen E, Strong D, Carnes L, Vukadinovic Z, Long JS. Sexual risk-taking in gay men: the relevance of sexual arousability, mood, and sensation seeking. *Arch Sex Behav* 2003; 32: 555–72. doi: 10.1023/A:1026041628364

11 Sanders SA, Graham CA, Yarber WL, Crosby RA. Condom use errors and problems among young women who put condoms on their male partners. *J Am Med Womens Assoc* 2003; 58: 95–8.

12 Warner L, Clay-Warner J, Boles J, Williamson J. Assessing condom use practices. Implications for evaluating method and user effectiveness. *Sex Transm Dis* 1998; 6: 273–7.

13 Bortot AT, Risser WL, Cromwell PF. Condom use in incarcerated adolescent males: knowledge and practice. *Sex Transm Dis* 2006; 33: 2–4. doi: 10.1097/01.olq.0000187195.51056.2b

14 Richters J, Gerofi J, Donovan B. Why do condoms break or slip off in use? An exploratory study. *Int J STD AIDS* 1995; 6: 11–8.

15 Eng TR, Butler WT, editors. The hidden epidemic: confronting sexually transmitted diseases. Washington, DC: National Academy Press; 1997.

16 Crosby R, Salazar LF, DiClemente RJ, Yarber WL, Staples-Horne M. Accounting for failures may improve precision: evidence supporting improved validity of self-reported condom use. *Sex Transm Dis* 2005; 32: 513–5. doi: 10.1097/01.olq.0000170442.10150.28

17 Crosby RA, Graham CA, Yarber WL, Sanders SA. If the condom fits, wear it: a qualitative study of young African American men. *Sex Transm Infect* 2004; 80: 306–9. doi: 10.1136/sti.2003.008227

18 Centers for Disease Control and Prevention. Facts about condoms and their use in preventing HIV infection and other STDs. Atlanta, GA: Department of Health and Human Resources; 1998.

19 Warner DL, Hatcher RA. Male condoms. In: Hatcher RA, Trussell J, Stewart F, Cates W Jr, Stewart GK, Guest F, Kowal D, editors. Contraceptive technology, 17th edn. New York, NY: Irvington Publishers Inc; 1999. pp. 325–352.

20 Crosby R, DiClemente RJ, Wingood GM, Sionean C, Cobb BK, Harrington K, Davies S, Hook EW 3rd, Oh MK. Correct condom application among African American adolescent females: the relationship to perceived self-efficacy and the association to confirmed STDs. *J Adolesc Health* 2001; 29: 194–9. doi: 10.1016/S1054-139X(01)00273-7

21 Feldman HA, Goldstein I, Hatzichristou DG, Krane RJ, McKinlay JB. Impotence and its medical and psychosocial correlates: results of the Massachusetts male aging study. *J Urol* 1994; 151: 54–61.

22 Kamb ML, Fishbein M, Douglas JM, Rhodes F, Rogers J, Bolan G, *et al*. Efficacy of risk-reduction counseling to prevent human immunodeficiency virus and sexually transmitted diseases: a randomized controlled trial. *JAMA* 1998; 280: 1161–7. doi: 10.1001/jama.280.13.1161

23 Graham CA, Crosby RA, Sanders SA, Yarber WL. Assessment of condom use in men and women. *Annu Rev Sex Res* 2005; 16: 20–52.