ARTICLE

The Effect of Correct and Consistent Condom Use on Chlamydial and Gonococcal Infection Among Urban Adolescents

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Objective: To evaluate the relationship between self-reported correct and consistent condom use and chlamydial and gonococcal infection.

Design: Cross-sectional study.

Setting: An urban adolescent health care clinic.

Patients: A total of 509 adolescent girls tested for *Chlamydia trachomatis* and *Neisseria gonorrhoeae* infection by urine nucleic acid amplification tests.

Main Outcome Measure: Effect of condom use on infection rates of chlamydia and gonorrhea. Consistent condom use was defined as using condoms for every act of vaginal sex and correct use as consistent use without any of the following: beginning sex without a condom, taking it off before finishing sex, flipping it over, condom breakage, or condom slippage.

Results: A total of 95% of the participants were African American, with a mean age of 16.6 years. Chlamydia prevalence was 21% (105/509) and gonorrhea prevalence was 7% (36/509). Condom errors were reported by 316 (71%) of 442 participants who had reported using a condom at least once in the previous 3 months. Consistent use was reported by 176 patients (35%); however, both correct and consistent use was reported by only 80 patients (16%). After adjusting for confounders, correct and consistent use was protective for chlamydia (odds ratio, 0.4; 95% confidence interval, 0.2-1.0) and highly protective for gonorrhea (odds ratio, 0.1; 95% confidence interval, 0-0.7).

Conclusion: Our findings indicate that assessing both correctness and consistency of use is important for evaluation of condom effectiveness.

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In the United States, approximately 18.9 million new cases of sexually transmitted infections (STIs) occur annually, of which 50% are among persons aged 15 to 24 years.[1] Infections with *Chlamydia trachomatis*, estimated at 2.8 million per year, and *Neisseria gonorrhoeae*, estimated at 700 000 cases per year, are the leading causes of pelvic inflammatory disease and may also lead to ectopic pregnancy, infertility, and chronic pelvic pain.[1] The group with the highest prevalence of chlamydia and gonorrhea is females aged 15 to 24 years.[2] Because of the cost and serious sequelae, prevention of these infections among adolescents is of great public health importance.

Many studies, as well as a recent National Institutes of Health report, have evaluated the effectiveness of condoms to prevent STIs.[3-13] Many have shown that lack of condom use increases the risk of infection with chlamydia and gonorrhea.[4-7,10-13] However, methods used to measure condom effectiveness in many of these studies have been suboptimal. For example, inconsistency of or no condom use was assessed during unknown periods as a risk factor for infection, neither consistency of condom use nor condom use for each act of vaginal sex was assessed, and errors were not measured. Even if condoms are used consistently and correctly, slippage and breakage can occur. Studies[14-17] demonstrate that slippage or breakage occurs between 1% and 4% of the time. Therefore, based on these studies, only limited conclusions about the effectiveness of condoms to protect women from chlamydia or gonorrhea can be made. Recently, recommendations have been made for measurement of condom use.[18-20] These recommendations include measurement of condom use specific to each act of vaginal sex, prospective data collection, assessment of both correct and consistent condom use, and measurement of slippage and breakage. In a group of sexually active adolescent girls, we ascertained correctness and consis-

tency of condom use and tested for *C trachomatis* and *N gonorrhoeae* with nucleic acid amplification tests performed on urine samples to evaluate the effectiveness of condom use in preventing infection.

METHODS

Enrollment for this study took place within a larger longitudinal sexually transmitted disease (STD) study with multiple diagnostic and epidemiologic objectives. Participants were recruited at an adolescent health care clinic at a public pediatric hospital in Atlanta, Ga. Nonpregnant, human immunodeficiency virus (HIV)–negative, sexually active girls 13 to 19 years old were eligible if a pelvic examination was indicated. The indications were no Papanicolaou smear performed within 1 year, symptoms that required evaluation, or patient request. Those who had received antibiotics in the previous month were excluded. After being informed about and agreeing to participate in the study, adolescents younger than 18 years provided assent and a parent or guardian provided consent; adolescents 18 or 19 years old provided their own consent. The study was reviewed and approved by the Institutional Review Boards at the Centers for Disease Control and Prevention and Emory University. Reimbursement was provided for time involved in study participation.

DATA COLLECTION

Data collected at the first visit among participants enrolled between January 1999 and August 2002 were used in this analysis. Trained interviewers administered a structured, face-to-face questionnaire in private before the physical examination. They obtained data on demographics, sexual and reproductive history, peer norms, attitudes toward and actual condom use, self-esteem, mental health, alcohol and other drug use, and partner characteristics. Detection of *C trachomatis* and *N gonorrhoeae* from first-catch urine was performed with ligase chain reaction (LCx; Abbott Laboratories, Abbott Park, Ill) or strand displacement assay (BDProbeTec ET assay; Becton Dickinson Microbiology Systems, Cockeysville, Md).

DESCRIPTION OF CONDOM VARIABLES

Participants were asked about vaginal, anal, and oral sex for each of the partners they had had in the previous 90 days. The following questions were asked: "In the previous 90 days, how many times did you have vaginal sex with partner A?" and "Of the X times you had vaginal sex with partner A, how many times did you use a condom?" These questions were repeated for each partner and for vaginal, anal, and oral sex. We limited our analysis to vaginal intercourse. Participants were also asked a series of questions on possible condom errors (eg, "During the past 90 days did a condom ever slip off during withdrawal?"). Possible condom errors included (1) starting sexual intercourse without a condom and then putting one on, (2) using a condom but taking it off before finishing sex, (3) putting a condom on inside out and flipping it over to put it on correctly, (4) condom breakage, and (5) condom slippage. Condom errors were not partner specific. The information on condom use per sexual act was categorized into 3 groups: no use of condoms, inconsistent use, and consistent use (condom use for every act of vaginal sex); after finding no difference between no use and inconsistent use, these 2 groups were combined. We evaluated the association between consistent condom use and infection and the association between each condom error and infection. All condom errors were then combined into 1 variable, and the interaction of correct use with consistent use was evaluated. We then created a new condom variable that incorporated information on consistency of condom use and condom errors and categorized it in 3 groups: inconsistent or no use, consistent but not correct use, and consistent and correct use. Consistent and correct use included those with consistent condom use who reported none of the 5 assessed condom errors; consistent but not correct use included those who used condoms for every act of vaginal intercourse but reported 1 or more condom errors; and inconsistent use of condoms was defined as no use or some use but less than 100%.

DATA ANALYSES

We conducted separate analyses to determine risk factors for gonorrhea and chlamydia detection. We were specifically interested in assessing the effect of certain behaviors, such as correct and consistent condom use, drug use, and other contraceptive use, to evaluate their effect on infection status. The condom use variables were considered as potentially protective against infection. Adolescents who reported vaginal sex in the 3 months before their first study visit were included in the analyses. We describe the prevalence of infection and sexual behaviors among the study population. Tests for associations among categorical variables were performed using the χ^2 statistic. Analyses of continuous variables were assessed using the independent, 2-sample *t* test. Univariate associations were summarized with odds ratios (ORs) and 95% confidence intervals (CIs).

Multivariate logistic regression was used to calculate the adjusted OR for the association between possible predictors and infection. We fit separate models for chlamydia and gonorrhea. The multivariate logistic regression models were developed by identifying, as potential predictors, all variables that attained a statistical significance level (*P* value) of .10 or less in the univariate analyses. We used backward stepwise elimination to remove variables that did not remain statistically significant from the model. In the last stage of model development, we addressed the possibility of interactions among the variables that remained in the final model. Correct and consistent condom use was entered into the model as a categorical variable for which we arbitrarily assigned 0 to irregular or no use, 1 to consistent but not correct use, and 2 to correct and consistent condom use. The number of partners was retained in the model irrespective of significance to adjust for sexual activity. SAS statistical software, version 8.01 (SAS Institute Inc, Cary, NC) was used for all analyses. PROC LOGISTIC was used to develop the multivariable model for both *C trachomatis* and *N gonorrhoeae*; however, the exact option was used for the *N gonorrhoeae* model owing to one cell size of 0.

RESULTS

A total of 591 adolescents were enrolled in the study from January 1999 to August 2002. All 509 female participants (86%) who reported having sex in the previous 3 months were included in this analysis. The mean age was 16.6 years (median age, 17 years), and 95% were African American. Mean age of first sexual experience was 14.2 years, 83 (16%) reported ever having been pregnant, and 26 (5%) reported ever having had an abortion. Most adolescents (78%) reported using some method of birth control. The mean number of lifetime partners was 5.8; the mean number of sex partners was 1.8 in the last 3 months (**Table 1**).

In this group, 442 (87%) reported using a condom at least once in the previous 3 months. Only 176 (35%) re-

Table 1. Demographics and Sexual Behaviors of Adolescent Study Participants*

Characteristic	Participants (N = 509)
Age, mean ± SD (median), y	16.6 ± 1.5 (17)
Race	
African American	484 (95)
Other	23 (5)
Education	
Not in school	59 (13)
Night school	32 (7)
Grades 6-9	133 (28)
Grades 10-12 or higher†	243 (52)
Ever pregnant	83 (16)
Ever had children	56 (11)
Ever had an abortion	26 (5)
Current birth control method	
Condoms	181 (36)
Hormonal contraceptives	184 (36)
Other	28 (6)
None	110 (22)
Age at first sex, mean ± SD (median), y	14.2 ± 1.5 (14.0)
No. of lifetime sex partners, mean ± SD (median)	5.8 ± 8.7 (4.0)
No. of sex partners in last 3 mo, mean ± SD (median)	1.8 ± 1.2 (1.0)
No. of sex acts in last 3 mo, mean ± SD (median)	16.6 ± 2.7 (8.0)

*Data are number (percentage) of participants unless otherwise indicated; totals may differ because of missing values.

†Only 9 participants had attained educational levels higher than the 12th grade.

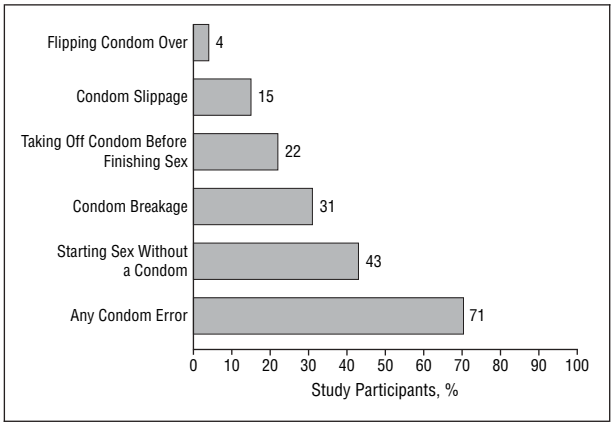

Figure 1. Prevalence of condom errors reported by adolescent study participants in the 3 months before the interview (N=509).

ported using condoms consistently and 80 (16%) reported consistent use with no condom errors (correct use). Among condom users, at least 1 condom error was reported by 316 (71%); the most common errors were starting sex without a condom and condom breakage (**Figure 1**). Consistent and correct users were younger, reported fewer partners, reported fewer vaginal acts, were less likely to report alcohol use, and were less likely to report ever having been pregnant (**Table 2**).

STD PREVALENCE

Chlamydia trachomatis was detected in 105 participants (21%) and *N gonorrhoeae* in 36 (7%); 22 (4%) had both infections. Prevalence with either infection or both did not vary by age or race. Adolescents who were not attending school had a higher prevalence of chlamydia and gonorrhea; however, this finding was not statistically significant (**Table 3**).

We examined whether the consistency of condom use was related to infection. The prevalence of chlamydia with no use of condoms, inconsistent use, and consistent use was 25%, 23%, and 16%, respectively ($P=.15$); the prevalence of gonorrhea was 7%, 9%, and 4%, respectively ($P=.12$). We then examined the correct use of condoms; none of the individual condom use errors was significantly associated with chlamydia or gonorrhea infection except putting a condom on after starting sex, which was associated with chlamydia (OR, 1.6; 95% CI, 1.0-2.6; $P=.04$). When combining all of the errors into 1 variable (any error vs correct use), correct use was associated with a significant reduction in chlamydia ($P=.04$) and gonorrhea ($P=.05$). There was no interaction between correct use and consistent use (Cochran-Mantel-Haenszel $P=.12$). Consistent and correct condom use was significantly protective for both chlamydia (OR, 0.4; 95% CI, 0.2-0.8; $P=.01$) and gonorrhea (OR, 0.1; 95% CI, 0-0.5; $P=.003$). Other variables significantly associated with an increased risk of chlamydial infection in univariate analysis were having had a child or children (OR, 2.9; 95% CI, 1.6-5.2; $P=.001$), exchange of sex for money or drugs (OR, 1.6; 95% CI, 1.0-2.6; $P=.05$), number of lifetime partners (OR, 1.8; 95% CI, 1.2-2.9; $P=.01$), ever douched (OR, 1.6; 95% CI, 1.0-2.6; $P=.04$), marijuana use (OR, 1.6; 95% CI, 1.0-2.5; $P=.03$), and having sold drugs (OR, 2.7; 95% CI, 1.1-6.2; $P=.01$). Having used drugs before having sex (OR, 2.3; 95% CI, 1.2-4.4; $P=.01$) was also associated with a greater risk of chlamydial infection; however, information on this variable was only available for two thirds of participants. Almost all participants (96%) who reported having used drugs before sex also reported marijuana use ($P<.001$). Variables significantly associated with gonorrhea were having had 4 or more partners in the past 3 months (OR, 2.5; 95% CI, 1.0-6.4; $P=.05$), ever douched (OR, 2.9; 95% CI, 1.3-6.8; $P=.01$), use of marijuana (OR, 2.2; 95% CI, 1.1-4.4; $P=.02$), and used drugs before sex (OR, 6.7; 95% CI, 2.6-17.0; $P=.01$).

MULTIVARIATE ANALYSIS

Based on the findings from univariate analysis, the following variables were selected for the chlamydia model: age, number of lifetime partners, number of vaginal sex acts, having a child or children, ever douched, exchange of money or drugs for sex, having sold drugs, marijuana use, and correct and consistent condom use. The introduction of other behavioral risk factors showed that after adjustment, correct and consistent condom use significantly reduced the risk of chlamydia (OR, 0.4; 95% CI, 0.2-1.0; $P=.04$). The number of lifetime partners (OR, 1.04; 95% CI, 1.01-1.08; $P=.003$) and having had a child or children (OR, 3.1; 95% CI, 1.7-5.9; $P<.01$) were still associated with a higher risk of chlamydia. Variables selected for the gonorrhea model were age, number of partners in the last 3 months, ever douched, number of vaginal sex acts, and correct and consistent condom

Table 2. Characteristics of 509 Adolescent Study Participants by Levels of Condom Use

Characteristic	Inconsistent or No Use	Consistent Use	Consistent and Correct Use	*P* Value
Age, mean ± SD (median), y	16.4 ± 1.4 (17.0)	16.1 ± 1.4 (16.0)	15.7 ± 1.4 (16.0)	<.001
No. of partners during lifetime, mean ± SD (median)	6.9 ± 10.20 (5.0)	4.4 ± 5.0 (3.0)	2.9 ± 2.3 (2.0)	<.001
No. of partners in previous 3 mo, mean ± SD (median)	1.9 ± 1.3 (1.0)	1.6 ± 1.1 (1.0)	1.3 ± 0.6 (1.0)	<.001
No. of vaginal sex acts in previous 3 mo, mean ± SD (median)	21.2 ± 30.9 (11.0)	9.9 ± 15.6 (4.5)	5.4 ± 7.5 (3.0)	<.001
Proportion who used alcohol in previous 3 mo, %	50.5	41.7	35.0	.03
Proportion ever pregnant, %	19.8	14.6	3.8	.002

use. The final model showed that correct and consistent condom use significantly reduced the risk of gonorrhea (OR, 0.1; 95% CI, 0-0.7; *P* = .01). Gonorrhea remained associated with douching (OR, 2.6; 95% CI, 1.1-7.3; *P* = .02) (**Table 4**).

COMMENT

This study evaluated the relationship between self-reported correct and consistent condom use and chlamydial and gonococcal infection among high-risk adolescents. We found that consistent and correct use of condoms provided significant protection against both chlamydia and gonorrhea. In fact, no adolescent girls were infected with gonorrhea if they and their partner(s) used condoms consistently and correctly.

We also found that douching was associated with gonorrheal infection. Douching has been found to be a risk factor for other STDs, including human papillomavirus, and recent douching has been associated with endometritis[21] in several cross-sectional studies.[22-25] The association may reflect increased susceptibility to infection because of alterations in the vaginal pH, microflora, or cervical mucus,[26-29] or it may be a proxy for another unmeasured risk. More prospective studies are needed to better define the relationship between douching and STIs.

Having a child was associated with a higher risk of chlamydia. Higher rates of STIs among pregnant teens have also been reported previously.[30] A US study[31] found a higher incidence of chlamydia and gonorrhea among teens in the postpartum period compared with never-pregnant adolescents. They also documented that pregnant or recently pregnant adolescents were more likely to report having a new partner and higher numbers of lifetime partners. The higher STD rates could also be related to contraceptive choice, since many adolescents with a history of pregnancy are encouraged to use a hormonal contraceptive that does not protect against STDs.[31]

National surveys in the United States that monitor contraceptive behaviors have documented increases in condom use throughout the 1980s and 1990s at the same time that HIV prevention efforts increased. Moreover, the groups in which condom use increased most rapidly were those at greatest risk for STIs (ie, adolescents, young adults, and ethnic minorities).[32-34] Although condoms are considered to be protective for HIV, some controversy exists about the level of protection they provide for other STDs. In 2001, the US National Institutes of Health released a report that summarized a federal interagency workshop on the scientific evidence for condom effectiveness in preventing STDs.[3] The report concluded that condoms protected against HIV in men and women and gonorrhea in men, but evidence was insufficient to evaluate the degree of benefit of condoms against other sexually transmitted diseases. Some of the controversy around condom effectiveness derives from the difficulty in measuring relevant exposures and behaviors and the limitations of studies in the literature.[7]

We found that correct and consistent use of condoms reduced the risk of gonorrhea by 90%. Several other studies[7-11] have found that condom use has a protective effect against gonorrhea in women (10%-90%), whereas others have failed to show a significant association.[4,7,30,31] However, none of these studies evaluated sex act–specific correct use of condoms. A prospective study[8] among commercial sex workers in Amsterdam, the Netherlands, reported that women who always used condoms had a 60% lower risk of gonorrhea compared with women who mainly or seldom used them. Baeten et al[9] found a significant decreased risk of gonorrhea among Kenyan commercial sex workers who reported consistent condom use (hazard ratio, 0.6; 95% CI, 0.4-0.8). Among STD clinic attendees, Rosenberg et al[10] found an adjusted 39% reduction in the risk of gonorrhea among condom users. Our study found that correct and consistent use of condoms, not consistent use by itself, was protective against gonorrhea and that no participants who used condoms consistently and correctly were infected. Gonorrhea is easily transmissible from men to women. Following a single exposure to an infected male, the probability of infection is 0.2, increasing to 0.6 to 0.8 with 4 exposures[35]; therefore, correct and consistent use of condoms is especially important for this STD. This study adds to the data available on the protective effect of condoms against gonorrhea among women and provides new data on the importance of assessing both consistency and correctness of condom use.

We found that correct and consistent use of condoms reduced the risk of chlamydial infection by 60%. Protection from chlamydia for women is biologically plausible; the urethral opening of the penis is the main site from which chlamydia can be transmitted from an infected man to a woman, and correct use of a condom could easily provide a barrier during sexual intercourse. Several prevalence and incidence studies[6,8,9,12,13] have shown a statistically significant relationship between condom

Table 3. Demographic and Behavioral Risk Factors for Chlamydial and Gonococcal Infection Among Adolescent Girls*

Characteristic	Positive for Chlamydia, No. (%) (n = 105)	Crude OR (95% CI)	Positive for Gonorrhea, No. (%) (n = 36)	Crude OR (95% CI)
Age, y				
12-15	27 (18)	1.0	9 (6)	1.0
16-17	64 (24)	1.4 (0.8-2.3)	17 (6)	1.0 (0.5-2.4)
18-19	13 (14)	0.6 (0.3-1.3)	9 (10)	1.5 (0.6-4.1)
Race				
Other	7 (30)	1.0	1 (8)	1.0
African American	96 (20)	0.6 (0.2-1.4)	34 (7)	1.7 (0.2-12.7)
Education				
≥High school education	46 (19)	1.0	16 (7)	1.0
Grades 6-9	28 (21)	1.0 (0.6-1.7)	8 (6)	0.8 (0.4-1.8)
Night school	8 (25)	1.3 (0.6-3.0)	2 (6)	0.9 (0.2-3.8)
Not in school	18 (30)	1.8 (1.0-3.3)	8 (14)	2.4 (1.0-5.5)
Ever pregnant				
No	83 (19)	1.0	30 (7)	1.0
Yes	22 (27)	1.5 (0.9-2.6)	6 (7)	1.0 (0.4-2.6)
Ever had a child or children				
No	83 (18)	1.0	31 (7)	1.0
Yes	22 (39)	2.9 (1.6-5.2)	5 (9)	1.3 (0.5-3.9)
No. of lifetime sex partners				
0-3	35 (15)	1.0	11 (5)	1.0
≥4	69 (25)	1.8 (1.2-2.9)	25 (9)	1.9 (0.9-4.1)
No. of sex partners in previous 3 mo				
0-3	94 (20)	1.0	30 (6)	1.0
≥4	11 (27)	1.5 (0.7-3.0)	6 (15)	2.5 (1.0-6.4)
No. of vaginal sex acts				
<10	54 (18)	1.0	22 (7)	1.0
≥10	51 (25)	1.5 (1.0-2.3)	14 (7)	1.1 (0.5-2.2)
Ever douched				
No	32 (16)	1.0	7 (4)	1.0
Yes	72 (24)	1.6 (1.0-2.6)	29 (10)	2.9 (1.3-6.8)
Exchange of money or drugs for sex				
No	29 (16)	1.0	11 (6)	1.0
Yes	76 (23)	1.6 (1.0-2.6)	25 (8)	1.3 (0.6-2.7)
Sold drugs				
No	95 (20)	1.0	32 (7)	1.0
Yes	10 (40)	2.7 (1.1-6.2)	4 (16)	2.7 (0.9-8.3)
Marijuana use				
No	59 (18)	1.0	17 (5)	1.0
Yes	46 (26)	1.6 (1.0-2.5)	19 (11)	2.2 (1.1-4.4)
Use of drugs before having sex†				
No	54 (17)	1.0	10 (3)	1.0
Yes	18 (32)	2.3 (1.2-4.4)	10 (18)	6.7 (2.6-17.0)
Use of alcohol				
No	50 (18)	1.0	17 (6)	1.0
Yes	55 (23)	1.4 (0.9-2.1)	19 (8)	1.3 (0.7-2.6)
Start sex without a condom				
No	42 (17)	1.0	14 (6)	1.0
Yes	48 (25)	1.6 (1.0-2.6)	18 (9)	1.7 (0.8-3.6)
Consistency of condom use				
No use	17 (25)	1.0	5 (7)	1.0
Irregular use	60 (23)	0.9 (0.5-1.6)	24 (9)	1.2 (0.5-3.4)
Consistent use	28 (16)	0.6 (0.3-1.1)	7 (4)	0.5 (0.2-1.7)
Correctness and consistency of condom use				
Irregular or no use	77 (23)	1.0	29 (9)	1.0
Not correct but consistent use	20 (21)	0.9 (0.5-1.5)	7 (7)	0.8 (0.3-2.0)
Correct and consistent use	8 (10)	0.4 (0.2-0.8)	0	0.1 (0-0.5)

Abbreviations: CI, confidence interval; OR, odds ratio.
*The interview period covered the previous 3 months. Totals may differ because of missing values. The 1.0 indicates referent.
†More than 30% of respondents did not answer this question; therefore, this variable was not considered for the multivariate model.

use (or lack thereof) and chlamydial infection. In a cross-sectional study in London, England, Evans et al[36] found that consistent condom use significantly reduced (90%) the risk of chlamydial infection among women who attended a genitourinary medicine clinic and who used condoms consistently with their regular partners. In an in-

cidence study in Kenya, Baeten et al[9] found that consistent condom use protected against new chlamydial infection (hazard ratio, 0.6; 95% CI, 0.4-0.9) among commercial sex workers. Other studies have varied in their assessment of condom use; most assessed the risk of no condom use, and none assessed sex act–specific condom consistency or condom errors.[5-10,12,13] Therefore, this is the first study, to our knowledge, to evaluate the protective effect against chlamydia of correct and consistent condom use among women.

The most prevalent condom error reported by adolescents in our study was starting sex without a condom, reported by more than 40% of condom users. Adolescents who reported this error had a higher risk of chlamydial infection. Other studies[16,37] have reported prevalence of this error from 8% to 38% among university students. Most transmission risks could be preventable if condoms are put on before genital contact, used throughout intercourse, and not removed until after ejaculation. Other errors, such as condom breakage and slippage, are also highly prevalent.[14-17,19,37] These errors could be reduced with increasing familiarity with using condoms correctly.

Our study had some limitations. We used cross-sectional data for this analysis and were, therefore, not able to calculate incident infections or determine the temporal relationship between infection and condom use. Male partners who experience problems with condoms may fail to communicate this information to their sexual partners; therefore, our female participants might not have been aware of all condom errors. As in other studies of condom use, reports of condom use could have been inflated owing to social desirability bias. However, this would be a form of nondifferential misclassification that would tend to bias results to the null and underestimate the protective effect of condoms. We did not have information on infection status of partners, so we were not able to know if coital acts evaluated actually carried an STD risk.[7]

This is one of the few studies that examined correct and consistent condom use with biological outcomes using a sensitive test; further studies on condom use should collect similar data to accurately assess the protective effect of condoms. Studies that do not account for whether participants used condoms correctly may underestimate condom effectiveness. Various forms of incorrect use would suggest that user failure, rather than product failure, may contribute to the observed lack of condom effectiveness.[37,38]

We believe that condoms must be used correctly and consistently to achieve their protective effect. However, condom use cannot guarantee complete protection against STDs and are not equally protective for every STD.[37] Nevertheless, condoms remain the best STD and HIV prevention approach for persons whose sexual behaviors place them at risk for STDs. Although messages directed at adolescents should encourage delaying initiation of sexual activity, many are already sexually active, and STDs are particularly common among this group. Thus, aggressive condom promotion must remain a key to reducing STDs and HIV.

Table 4. Risk Factors for Chlamydia and Gonorrhea Infection: Multivariate Models*

Covariates	Adjusted OR (95% CI)
Chlamydia Multivariate Model	
Condom use	
Irregular or no use	1.0
Consistent but not correct use	0.9 (0.5-1.6)
Consistent and correct use	0.4 (0.2-1.0)
No. of lifetime sex partners	1.04 (1.01-1.08)
Having had a child or children	
No	1.0
Yes	3.1 (1.7-5.9)
Age, y	
13-15	1.0
16-17	1.1 (0.7-1.9)
18-19	0.5 (0.2-1.0)
Gonorrhea Multivariate Model	
Condom use	
Irregular or no use	1.0
Consistent but not correct use	0.9 (0.3-2.3)
Consistent and correct use	0.1 (0-0.7)
No. of partners in previous 3 mo	
1-3	1.0
≥4	2.1 (0.7-5.8)
Douching	
No	1.0
Yes	2.6 (1.1-7.3)

Abbreviations: CI, confidence interval; OR, odds ratio.
*The 1.0 indicates referent.

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