Association Between Condom Use at Sexual Debut and Subsequent Sexual Trajectories: A Longitudinal Study Using Biomarkers

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Objectives. We compared subsequent sexual behaviors and risk of sexually transmitted infections among adolescents who did and did not use a condom at their sexual debut.

Methods. We derived data from the National Longitudinal Study of Adolescent Health, which followed a sample of 4018 sexually active adolescents between 1994 and 2002. During waves I, II, and III of the study, data on sexual behavior were gathered, and at wave III urine specimens were collected to test for sexually transmitted infections.

Results. Among interviewed adolescents, those who reported condom use at their debut were more likely than those who did not use condoms at their debut to report condom use at their most recent intercourse (on average 6.8 years after sexual debut), and they were only half as likely to test positive for chlamydia or gonorrhea (adjusted odds ratio = 0.50; 95% confidence interval = 0.26, 0.95). Reported lifetime numbers of sexual partners did not differ between the 2 groups.

Conclusions. Adolescents who use condoms at their sexual debut do not report more sexual partners, are more likely to engage in subsequent protective behaviors, and experience fewer sexually transmitted infections than do adolescents who do not use condoms at their sexual debut. (*Am J Public Health.* 2007; 97:1090–1095. doi:10.2105/AJPH.2005.068437)

Rates of sexually transmitted infections (STIs) are higher among adolescents and young adults than among any other age group in the United States,[1] and almost half of all new HIV infections in the United States occur among those younger than 25 years old.[2] Other than abstinence, condom use is one of the few proven effective means available for reducing transmission of STIs.[3–7] However, there is concern on the part of some that providing comprehensive sexual education, including discussions of condom use, will lead to increased sexual activity and that encouraging early condom use will result in sexual risk taking among adolescents.

Despite the recognized effectiveness of condoms for disease prevention, many sexually active young people use them only sporadically or not at all.[8] Previous studies have examined the factors that influence whether or not sexually active adolescents use condoms. These studies show that condom use among adolescents is influenced both by stable traits, including gender and race/ethnicity, and by time-varying factors, including perceived risk of disease or unintended pregnancy, attitudes toward contraception, self-efficacy in negotiating condom use with sexual partners, and having previously suffered a negative consequence of unprotected intercourse such as an STI or unintentional pregnancy.[9–30]

In addition to these factors, several studies of condom use among adolescents have shown that early condom use is associated with subsequent condom use.[9–11,31–34] In a previous study in which we used data from wave I of the National Longitudinal Study of Adolescent Health (Add Health), we found that sexually active adolescents who reported using a condom at their sexual debut were more than twice as likely as adolescents who did not use a condom at their sexual debut to report using a condom during their most recent sexual intercourse (average age at debut: 15 years; average interval between first and most recent intercourse: 23 months). This association remained after we controlled for potentially confounding factors.[9]

Building from previous studies, we hypothesized that early condom users would have less risky sexual profiles over time—even after possible selection effects had been controlled—than would their peers who were not early condom users. Our reasoning was that early use of condoms associates sexual activity with condom use, a cognitive linkage that may lead to the development of a persistent habit of condom use and healthier sexual decisionmaking.[9] We used data from waves I, II, and III of Add Health to compare respondents who did and did not use a condom at their sexual debut on 3 important dimensions of subsequent sexual behavior: condom use at most recent sexual intercourse (average of 6.8 years after debut), total lifetime number of sexual partners, and current infection with a bacterial STI (measured through urine testing at wave III).

METHODS

National Longitudinal Study of Adolescent Health

Add Health is a nationally representative, longitudinal survey designed to study adolescent health in the United States. The survey sample was a clustered and multistage stratified sample of adolescents attending schools across the country; specific minority groups were oversampled. Add Health began with a stratified random sample of 80 US high schools; among the 90 000 students attending these schools and selected feeder schools, 27 745 students in 7th through 12th grade were identified for wave I in-home interviews (September 1994–December 1995). During wave II (n = 14 738), which took place 1 year later (May 1996–August 1996), all wave I participants completed follow-up in-home interviews, with the exception of high school seniors who had since graduated.

More than 75% (14 322) of the original wave I sample (18 924) completed the wave III in-home interview and provided urine specimens. 6 to 8 years later (August

2001–April 2002). Researchers at the Carolina Population Center, who conducted the study, and the Survey Research Unit at the University of North Carolina investigated nonresponse in wave III of Add Health and concluded that the wave III sample was representative of the wave I sample when the provided sampling weights were included in computations of population estimates.

The comprehensive in-home interviews conducted at each wave covered a broad range of topics, and audio computer-assisted self-interview techniques were used for sensitive topics such as criminal activity, illicit drug use, and sexuality. At wave III, participants provided urine specimens that were screened for *Neiserria gonorrhoeae* and *Chlamydia trachomatis* using ligase chain reaction (LCR) testing. (Additional details on the Add Health study design and methodology are available at http://www.cpc.unc.edu/addhealth/design.)

Study Sample

Our sample was restricted to respondents who participated in all 3 waves of Add Health, who reported sexual activity (defined as vaginal intercourse), and whose sexual debut had occurred by wave II. These restrictions produced a sample of 4018 adolescents and young adults. At wave III, the participants ranged in age from 18 to 26 years; the average interval between sexual debut and most recent sexual intercourse was almost 7 years (82 months).

Analysis Strategy

We used simple and multiple logistic and linear regression equations to estimate the effect of condom use at sexual debut on 3 variables measured at wave III that captured important aspects of sexual behavior and sexual health among young adults: condom use at most recent sexual intercourse (model 1), log of lifetime number of sexual partners (model 2), and *C trachomatis* or *N gonorrhoeae* infection detected using LCR assays of urine specimens (model 3). (We used the natural log of number of sexual partners as our dependent variable because the distribution was skewed to the right.[35])

The simple models were used to estimate the overall effect of early condom use on subsequent sexual behavior; multiple regression models adjusted for factors known to influence either condom use at debut or subsequent sexual behaviors and outcomes. The adjusted models allowed us to assess whether the observed direct effects were attributable to confounding.

We accounted for Add Health's complex sampling design by including school and region as clustering variables in the survey estimation routines in Stata version 8 (Stata Corp, College Station, Tex). In addition, we applied poststratification sampling weights to account for loss to follow-up.

Variables

Our predictor of interest was condom use at sexual debut, an indicator variable taken from either wave I or wave II depending on when the respondent's sexual debut had occurred. To correctly specify our adjusted models, we used data proximate to sexual debut (either wave I or wave II) to measure factors that may have influenced condom use at sexual debut. These factors were risk taking (assessed on a 5-point scale measuring bike helmet and seatbelt use), negative feelings (assessed on a 5-point depressive symptoms scale), self-efficacy (assessed on a 5-point scale measuring birth control negotiation with one's partner), personal motivation to use birth control (assessed on a 5-point scale), maternal approval of birth control use (assessed on a 5-point scale), use of hormonal contraception at sexual debut (oral contraceptive pill or Depo-Provera; yes or no), and intoxication at sexual debut (yes or no).

Two variables measuring relatively stable factors were drawn from wave I only. The first was family socioeconomic status (assessed on a 10-point scale measuring parental educational achievement and family income), and the second was exposure to some type of sexual education in school (HIV or pregnancy prevention).

We used data from all 3 waves to calculate the time interval between sexual debut and most recent sexual encounter and to ascertain whether respondents had ever been diagnosed with an STI (self-reported by respondents) or had ever regretted a sexual encounter that occurred after alcohol use. We used data from wave III to measure other factors proximate to most recent sexual activity, including demographic characteristics (highest educational level, income, intelligence score, marital status), sexual activity level (frequency of sexual intercourse), and contraception and condom use in the past 12 months.

RESULTS

Sample Descriptive Statistics

Table 1 provides an overview of the study sample. More than half of the respondents were women (52%), and their average age at wave III was 22.2 years. Almost two thirds of the respondents identified themselves as White (64%), and slightly more than one fifth reported being married (22%). Average age at sexual debut was 15.2 years, and the median interval between sexual debut and most recent sexual intercourse was 6.8 years (range: 4.4–15.6 years). Sixty-two percent of the respondents reported having used a condom at their sexual debut, whereas 38% reported having used a condom during their most recent sexual intercourse. Median lifetime number of sexual partners was 5, and 6% of respondents had tested positive for either *N gonorrhoeae* or *C trachomatis*.

Differences Between Condom Users and Nonusers

There were differences in the demographic and behavioral characteristics of adolescents who did and did not use a condom at their sexual debut (Table 1). Condom users had somewhat more advantaged sociodemographic and educational profiles than did nonusers, and they engaged in fewer high-risk behaviors and more protective behaviors (including use of hormonal birth control at their sexual debut) than did nonusers. However, at wave III the 2 groups did not differ in terms of number of partners or frequency of sexual intercourse during the past year.

Condom Use at Most Recent Sexual Intercourse

Table 2 presents estimated odds ratios (ORs) derived from simple and multiple logistic regressions of condom use during most recent sexual intercourse on condom use at debut. The odds ratios were not appreciably different in the 2 models, suggesting that control

TABLE 1—Descriptive Sample Profile: National Longitudinal Study of Adolescent Health, 1994–2002

Characteristic	Full Sample (N = 4018)	Used Condom at Sexual Debut (n = 2491)	Did Not Use Condom at Sexual Debut (n = 1527)
Condom use at sexual debut, %[a]	62	100	0
Condom use during most recent sexual intercourse, %	38	40	34
Median lifetime no. of sexual partners[b] (range: 1–50)	5.00	5.00	5.00
Positive gonorrhea or chlamydia test, %	6	5	8
Women, %	52	50	53
Mean age, y (range: 18–26)	22.22	22.22	22.22
Race/ethnicity, %			
White	64	66	61
Black	21	22	21
Hispanic	12	10	14
Asian	2	2	2
Native American	1	0	2
Married, %	22	20	26
Mean family socioeconomic status score (wave I only; range: 1–10)	5.37	5.42	5.28
Mean Picture Vocabulary Test (IQ) score (range: 7–122)	98.22	99.21	96.62
Mean highest educational level, y (range: 6–22)	12.68	12.87	12.36
Exposed to sex education, % (wave I only)	86	87	84
Mean risk-taking scale score[a] (range: 0–4)	1.29	1.26	1.34
Mean negative feelings scale score[a] (range: 0–2.4)	0.57	0.54	0.63
Mean self-efficacy scale score[a] (range: 1–5)			
With partner and birth control	4.22	4.34	4.04
Motivation to use birth control	3.86	3.98	3.67
Mean maternal approval of birth control scale score[a] (range: 1–5)	3.56	3.60	3.51
Mean age at sexual debut, y (range: 10–20)	15.18	15.35	14.91
Use of oral contraceptive pill or Depo-Provera at sexual debut, %[a]	15	22	4
Median no. of sexual partners in past 12 mo (range: 0–45)	1.00	1.00	1.00
Median frequency of sexual encounters in past 12 mo (range: 0–900)	40.00	40.00	40.00
Use of birth control during most recent sexual intercourse, %	65	68	59
Alcohol or drug use at sexual debut, %	10	9	13
Median interval between sexual debut and most recent sexual intercourse, y[b] (range: 4.4–15.6)	6.83	6.75	7.00
Ever diagnosed with sexually transmitted disease, %[c]	24	22	27
Ever regretted sexual activity after alcohol use, %[c]	36	34	40

[a]As reported in wave I or II, depending on when sexual debut occurred.
[b]Calculated from data collected during wave at which sexual debut occurred (i.e., wave I or wave II) and during wave III.
[c]As reported in waves I, II, and III.

TABLE 2—Logistic Regression of Condom Use During Most Recent Sexual Intercourse on Condom Use at Sexual Debut: National Longitudinal Study of Adolescent Health, 1994–2002 (n = 4018)

	Odds Ratio (95% Confidence Interval)
Unadjusted model	1.30** (1.09, 1.55)
Adjusted model[a]	1.36** (1.09, 1.70)

Note. The median interval between sexual debut and most recent sexual intercourse was 82 months.
[a]Adjusted for gender, age, race/ethnicity, marital status, family socioeconomic status, IQ score, educational level, exposure to sex education, age at sexual debut, hormonal contraception use at sexual debut, intoxication at sexual debut, self-efficacy, motivation to use birth control, maternal approval of birth control, risk taking, and negative feelings.
**$P < .01$.

TABLE 3—Linear Regression of Log of Lifetime Number of Sexual Partners on Condom Use at Sexual Debut: National Longitudinal Study of Adolescent Health, 1994–2002 (n = 4018)

	b (95% Confidence Interval)
Unadjusted model	–0.07 (–0.15, 0.02)
Adjusted model[a]	–0.02 (–0.12, 0.08)

[a]Adjusted for gender, age, race/ethnicity, marital status, age at sexual debut, hormonal contraception use at sexual debut, intoxication at sexual debut, self-efficacy, motivation to use birth control, maternal approval of birth control, risk taking, negative feelings, condom or birth control use during most recent sexual intercourse, lifetime diagnosis of sexually transmitted disease, and regret associated with having sex after alcohol use.

for relevant stable straits and time-varying factors did not account for the rate of subsequent condom use among early users. Seven years after their sexual debut, those who had used a condom at their debut were approximately 36% more likely than those who had not used a condom at their debut to have used a condom during their most recent sexual activity.

Lifetime Number of Sexual Partners

Table 3 presents estimates from simple and multiple linear regressions of the log of lifetime number of sexual partners on condom use at sexual debut. In both models, the coefficient associated with condom use at debut was statistically indistinguishable from zero, indicating that there was no difference between those who did and did not use a condom at their sexual debut in terms of subsequent number of sexual partners.

Positive Urine Test for Gonorrhea or Chlamydial Infection

Table 4 reports ORs from simple and multiple logistic regressions of gonorrhea or chlamydia infection on condom use at debut and selected confounders. The adjusted model showed that respondents who reported using a condom at their sexual debut were half as likely as respondents who did not report using a condom at their debut to test positive for

TABLE 4—Logistic Regression of Gonorrhea or Chlamydial Infection at Wave III on Condom Use at Sexual Debut: National Longitudinal Study of Adolescent Health, 1994–2002 (n=4018)

	Odds Ratio (95% Confidence Interval)
Unadjusted model	0.67* (0.45, 1.00)
Adjusted model[a]	0.50* (0.26, 0.95)

[a]Adjusted for gender, age, race/ethnicity, marital status, family socioeconomic status, IQ score, educational level, exposure to sex education, age at sexual debut, lifetime number of sexual partners, hormonal contraception use at sexual debut, intoxication at sexual debut, self-efficacy, motivation to use birth control, maternal approval of birth control, risk taking, and negative feelings.
*$P < .05$.

gonorrhea or chlamydial infection at wave III (adjusted OR=0.50; 95% confidence interval [CI]=0.26, 0.95), even though the 2 groups reported similar numbers of sexual partners (and similar frequencies of sexual activity).

DISCUSSION

Adolescents who used condoms at their sexual debut later used condoms at substantially higher rates than did adolescents who did not use condoms at their debut, and this was the case even after 7 years. It might be argued that this association stemmed from the influence of other factors associated with both early and later condom use; for example, those who use condoms at their sexual debut typically take fewer risks than those who do not. However, 2 findings from this study counter this line of reasoning.

First, adjusting for both stable and time-varying characteristics did little to influence the estimated effect of early condom use on subsequent condom use. Second, those who used condoms at their sexual debut had the same number of sexual partners (and a similar frequency of sexual intercourse) as their counterparts who did not use a condom at their sexual debut. Although there were demographic and behavioral differences between the 2 groups, these differences do not explain the interesting pattern of subsequent sexual behavior observed in our study.

Therefore, the most important finding of our study is that despite similarities in self-reported sexual activity, those who used a condom at their sexual debut were half as likely as those who did not to have a positive urine LCR test for gonorrhea or chlamydial infection at the time of the wave III interview. Few condom use studies involving adolescents have included STI biomarkers to validate self-reported behaviors,[31,32] and we found no longitudinal studies with biomarkers that followed adolescents over a long period of time. Our findings that the association between early condom use and condom use during subsequent sexual activity persisted many years after debut and that, despite relatively active sexual lives, early condom users were less likely to have an STI at follow-up were consistent with our hypothesis that early condom use per se may help establish healthy and protective sexual habits among adolescents.

In the wake of the substantial increases over the past decade in government funding for abstinence-only education, some have raised the question of whether these programs follow the basic principle of medical ethics: do no harm.[36] No randomized trials have convincingly shown that these programs are effective in delaying sexual debut, decreasing unintended pregnancies, or reducing the incidence or prevalence of STIs among adolescents.[37]

We know of no prospective cohort studies showing that individuals exposed to abstinence-only education are at lower subsequent risk of STIs than those not exposed to abstinence-only education. In fact, a recent study involving Add Health data showed that STI frequencies (measured at wave III) were similar among adolescents who had previously signed a virginity pledge and adolescents who had not made such a pledge.[38] Together with our findings, this result suggests that failing to provide adolescents with information about contraception and disease prevention may be deleterious to their health: if young people choose to engage in sexual intercourse despite abstinence-only messages and are not familiar with safe-sex practices, they may be at increased risk for negative health outcomes.[37,39,40] Our findings demonstrate the importance of early experiences with condoms as an independent factor associated with healthier outcomes even 7 years after adolescents' sexual debut.

This study involved both limitations and strengths. Our measures of condom use and sexual activity relied on respondents' self-reports, although bias was reduced by the use of audio–computer-assisted self-interview techniques[41–43] during all 3 waves of the study. The use of STI biomarkers from wave III provided an objective measurement of sexual risk taking. The Add Health study design is longitudinal, but many items were retrospective in nature, potentially introducing recall bias and measurement error. Although every effort was made to contact participants for follow-up waves, there was 20% loss to follow-up by wave III. Poststratification weights were used to adjust for nonresponse among those lost to follow-up and those declining to participate in wave III. However, the possibility remains that the sample was selective.

Furthermore, although Add Health's unusually rich data set allowed us to include many of the factors that may have influenced the outcomes of interest in our analytic models, variables omitted or not measured here may have played a key role in shaping respondents' subsequent sexual activity trajectories. For instance, partnership characteristics represent an important determinant of condom use.[16,17,19,21,26,29,30] Although we included marital status, number of partners in the past 12 months, and (in model 1 and model 3) lifetime number of partners in our models, other characteristics—such as duration of relationship, age differential, and type of relationship—may also play a role in sexual decisionmaking, risk, and behavior. Finally, because this was an observational study, we make no claims about causal relationships between factors.

Despite these limitations, this study is important and unusual because we relied on a nationally representative longitudinal investigation of adolescent sexual behavior that included measurements of STI status made using biomarkers. The longitudinal study design offered us a rare opportunity to follow adolescent sexual health and behavior from sexual debut into late adolescence and young adulthood and to relate these characteristics to other events important in the lives of adolescents.

Although abstinence-only messages are being promoted in some parts of the United States today, 62% of high school students report that they have had sexual intercourse by their senior year.[8] Our study demonstrates that adolescents and young adults who used condoms at their sexual debut were no more—or less—sexually active than their peers who did not use a condom at their sexual debut. Rather, early condom users were more likely than nonusers to practice safe sex as young adults and were less likely to have an STI.

Reduced STI prevalence among early condom users improves health at an individual level but also represents a social benefit in terms of a smaller overall disease burden, decreased costs associated with STI care, and reduced transmission of infection to others. Moreover, adolescents and young adults with STIs who do not use condoms put their future sexual partners at risk. Early establishment of a habit of condom use is associated with continuation of this protective behavior long after sexual debut, which will benefit all, even those who abstain from sexual activity until adulthood. ■

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Contributors

T. Shafii originated the study and was responsible for data analysis and interpretation and preparation of the article. K. Stovel provided statistical and theoretical expertise and played an instrumental role in study conception, interpretation, and article preparation and revision. K. Holmes provided mentorship and guidance in study conception, data analysis, interpretation, and critical revision of the article.

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Human Participation Protection

This study was approved by the institutional review board of the University of Washington. Participants provided informed consent.

References

1. Alexander LL, Cates JR, Herndon N, et al. *Sexually Transmitted Diseases in America: How Many Cases and at What Cost?* Research Triangle Park, NC: Henry J. Kaiser Family Foundation; 1998.

2. *Healthy People 2010: Understanding and Improving Health.* Washington, DC: US Department of Health and Human Services; 2001.

3. Davis KR, Weller SC. The effectiveness of condoms in reducing heterosexual transmission of HIV. *Fam Plann Perspect.* 1999;31:272–279.

4. Sanchez J, Gotuzzo E, Escamilla J. Sexually transmitted infection in female sex workers: reduced by condom use but not by a limited periodic examination program. *Sex Transm Dis.* 1998;25:82–89.

5. Weller SC. A meta-analysis of condom effectiveness in reducing sexually transmitted HIV. *Soc Sci Med.* 1993;36:1635–1644.

6. Wald A, Langenberg A, Link K, et al. Effect of condoms on reducing the transmission of herpes simplex virus type 2 from men to women. *JAMA.* 2001; 285:3100–3106.

7. Holmes K, Levine R, Weaver M. Effectiveness of condoms in preventing sexually transmitted infections. *Bull World Health Organ.* 2004;82:454–461.

8. Centers for Disease Control and Prevention. Youth risk behavior surveillance—United States, 2003. *MMWR Morb Mortal Wkly Rep.* 2004;51(SS-4):17–20.

9. Shafii T, Stovel K, Davis R, Holmes K. Is condom use habit-forming? Condom use at sexual debut and subsequent condom use. *Sex Transm Dis.* 2004;31: 366–372.

10. Miller KS, Levin ML, Whitaker DJ, et al. Patterns of condom use among adolescents: the impact of mother-adolescent communication. *Am J Public Health.* 1998;88:1542–1544.

11. Sneed CD, Morisky DE, Rotheram-Borus MJ, et al. 'Don't know' and 'didn't think of it': condom use at first intercourse by Latino adolescents. *AIDS Care.* 2001; 13:303–308.

12. Crosby RA, DiClemente RJ, Wingood GM, et al. HIV/STD-protective benefits of living with mothers in perceived supportive families: a study of high-risk African American female teens. *Prev Med.* 2001;33: 175–178.

13. Brown LK, DiClemente RJ, Park T. Predictors of condom use in sexually active adolescents. *J Adolesc Health.* 1992;13:651–657.

14. Leland NL, Barth RP. Gender differences in knowledge, intentions, and behaviors concerning pregnancy and sexually transmitted disease prevention among adolescents. *J Adolesc Health.* 1992;13: 589–599.

15. DiClemente RJ, Lodico M, Grinstead OA, et al. African-American adolescents residing in high-risk urban environments do use condoms: correlates and predictors of condom use among adolescents in public housing developments. *Pediatrics.* 1996;98:269–278.

16. Laraque D, McClean DE, Brown-Peterside P, et al. Predictors of reported condom use in central Harlem youth as conceptualized by the Health Belief Model. *J Adolesc Health.* 1997;21:318–327.

17. Svare EI, Kjaer SK, Thomsen BL, et al. Determinants for non-use of contraception at first intercourse: a study of 10,841 young Danish women from the general population. *Contraception.* 2002;66:345–350.

18. Wellings K, Nanchahal K, Macdowall W, et al. Sexual behavior in Britain: early heterosexual experience. *Lancet.* 2001;358:1843–1850.

19. Narring F, Wydler H, Michaud PA. First sexual intercourse and contraception: a cross-sectional survey on the sexuality of 16–20-year-olds in Switzerland. *Schweiz Med Wochenschr.* 2000;130:1389–1398.

20. Kraft P, Rise J, Traeen B. The HIV epidemic and changes in the use of contraception among Norwegian adolescents. *AIDS.* 1990;4:673–678.

21. Wilson MD, Kastrinakis M, D'Angelo LJ, et al. Attitudes, knowledge and behavior regarding condom use in urban black adolescent males. *Adolescence.* 1994;29:13–26.

22. Kahn JA, Kaplowitz RA, Goodman E, et al. The association between impulsiveness and sexual risk behaviors in adolescent and young adult women. *J Adolesc Health.* 2002;30:229–232.

23. Leigh BC. Alcohol and condom use: a meta-analysis of event-level studies. *Sex Transm Dis.* 2002;29: 476–482.

24. Orr DP, Langefeld CD, Katz BP, et al. Factors associated with condom use among sexually active female adolescents. *J Pediatr.* 1992;120:311–317.

25. DiClemente RJ, Wingood GM, Crosby RA, et al. A prospective study of psychological distress and sexual risk behavior among black adolescent females. *Pediatrics.* 2001;108:1–6.

26. Crosby RA, DiClemente RJ, Wingood GM, et al. Correlates of unprotected vaginal sex among African-American female adolescents. *Arch Pediatr Adolesc Med.* 2000;154:893–899.

27. Tyden T, Bjorkelund C, Odlind V, et al. Increased use of condoms among female university students: a 5-year follow-up of sexual behavior. *Acta Obstet Gynecol Scand.* 1996;75:579–584.

28. Baele J, Dusseldorp E, Maes S. Condom use self-efficacy: effect on intended and actual condom use in adolescents. *J Adolesc Health.* 2001;28:421–431.

29. Lugoe WL, Klepp KI, Skutle A. Sexual debut and

predictors of condom use among secondary school students in Arusha, Tanzania. *AIDS Care.* 1996;8:443–452.

30. Manning WD, Longmore MA, Giordano P. The relationship context of contraceptive use at first intercourse. *Fam Plann Perspect.* 2000;32:104–110.

31. Bolu O, Lindsey C, Kamb M, et al. Is HIV/sexually transmitted disease prevention counseling effective among vulnerable populations? A subset analysis of data collected for a randomized, controlled trial evaluating counseling efficacy. *Sex Transm Dis.* 2004;31:469–474.

32. DiClemente R, Wingood G, Harrington K, et al. Efficacy of an HIV prevention intervention for African American adolescent girls: a randomized controlled trial. *JAMA.* 2004;292:171–179.

33. St. Lawrence JS, Scott CP. Examination of the relationship between African American adolescents' condom use at sexual onset and later sexual behavior: implications for condom distribution programs. *AIDS Educ Prev.* 1996;8:258–266.

34. Robertson A, Levin ML. AIDS knowledge, condom attitudes, and risk-taking sexual behavior of substance-abusing juvenile offenders on probation or parole. *AIDS Educ Prev.* 1999;11:450–461.

35. Bland JM, Altman DG. Transforming data. *BMJ.* 1996;312:770.

36. Wiley D. The ethics of abstinence-only and abstinence-plus-sexuality education. *J Sch Health.* 2002;72:164–167.

37. Perrin K, DeJoy S. Abstinence-only education: how we got here and where we're going. *J Public Health Policy.* 2003;24:445–459.

38. Bruckner H, Bearman P. After the promise: the STD consequences of adolescent virginity pledges. *J Adolesc Health.* 2005;36:271–278.

39. Haignere C, Gold R, McDanel HJ. Adolescent abstinence and condom use: are we sure we are really teaching what is safe? *Health Educ Behav.* 1999;26:43–54.

40. Thomas M. Abstinence-based programs for prevention of adolescent pregnancies: a review. *J Adolesc Health.* 2000;26:5–17.

41. Turner CF, Ku L, Rogers SM, et al. Adolescent sexual behavior, drug use, and violence: increased reporting with computer survey technology. *Science.* 1998;280:867–873.

42. Des Jarlais DC, Paone D, Milliken J. Audio-computer interviewing to measure risk behavior for HIV among injection drug users: a quasi-randomized trial. *Lancet.* 1999;353:1657–1661.

43. Newman JC, Des Jarlais DC, Turner CF. The differential effects of face-to-face and computer interview modes. *Am J Public Health.* 2002;92:294–297.