

ASSOCIATIONS BETWEEN FORCED SEX, SEXUAL AND PROTECTIVE PRACTICES, AND SEXUALLY TRANSMITTED DISEASES AMONG A NATIONAL SAMPLE OF ADOLESCENT GIRLS

Dawn M. Upchurch, PhD* and Yasamin Kusunoki, MPH

UCLA School of Public Health, Los Angeles, California

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Objective. The main objective of this study is to better understand the associations between forced sex history and history of sexually transmitted disease (STD) infection. Three research questions are investigated. Is history of forced sex associated with risk-taking behaviors? Are these risk-taking behaviors associated with history of STD? Is history of forced sex independently associated with history of STD?

Methods. Information on the sexual and STD histories is obtained from 3,579 sexually active adolescent girls using data from the National Longitudinal Study of Adolescent Health. Weighted logistic and OLS regressions are employed, using techniques that account for the complex sampling design.

Results. Girls with a history of forced sex are significantly more likely to have a greater number of sexual partners, be younger at first sex, and be more likely to use alcohol or drugs at last sex; there is no difference in condom use at last sex. These factors, in turn, are significantly associated with a positive STD history. Condom use at last sex is negatively associated with ever having had an STD. When all five sexual and protective practices are investigated simultaneously, history of forced sex remains significantly associated with STD history (odds ratio [OR] = 1.39, $p = .014$); number of sexual partners and early onset of sex remain significant. Condom use and substance use at last sex reduce to marginal significance.

Conclusions. These results suggest that a history of forced sex is independently associated with a history of STD among sexually active adolescent girls. Programmatic strategies aimed at reducing STDs through encouraging responsible sexual behavior would potentially benefit from also including a component that addresses sexual victimization.

Keywords: Forced sex; Sexually transmitted disease (STD), Sexual behavior; Condom use; Number of sexual partners; Early onset of sex; Substance use; Adolescent females

Introduction

Compared to adults, adolescents are at higher risk for acquiring sexually transmitted diseases (STD), and adolescent girls in particular are disproportionately affected (Centers for Disease Control and Prevention [CDC], 2002). In 2001, adolescent girls had the highest rates of chlamydia and gonorrhea compared to all

other gender and age categories (CDC, 2002). Moreover, adolescent girls have high rates of other sexually transmitted infections such as genital herpes, trichomonas, and bacterial vaginosis that are not reported as part of the CDC surveillance system (Berman & Hein, 1999). These statistics, along with the evidence that many cases of STDs are asymptomatic in women (Biro, Rosenthal, & Kinyalocets, 1995; Farley, Cohen, & Elkins, 2003) and that untreated STDs contribute to long-term reproductive health sequelae (Eng & Butler, 1997), suggest a substantial burden of disease among adolescent girls. STDs, including human

* Correspondence to: Dr. Dawn M. Upchurch, UCLA School of Public Health, 650 Charles Young Drive South, Los Angeles, CA, 90095-1722.

E-mail: upchurch@ucla.edu.

immunodeficiency virus (HIV) infections and acquired immunodeficiency syndrome (AIDS), continue to be a prominent public health priority, and *Healthy People 2010* objectives highlight responsible sexual behavior as a key health indicator and target adolescents as an epidemiologically significant group (U.S. Department of Health and Human Services [USDHHS], 2000).

A complex matrix of behavioral, biological, and social factors contributes to the likelihood of contracting a STD. During adolescence, girls are more likely to engage in riskier sexual and contraceptive practices, are part of sexual networks that increase their risk, and have increased physiologic susceptibility of infection¹ than older women (Berman & Hein, 1999). Sexual and protective practices that have been consistently shown to affect the acquisition of STDs include the number of sexual partners (Eng & Butler, 1997; Miller, Cain, Rogers, Gribble, & Turner, 1999; Tanfer, Cubbins, & Billy, 1995; Upchurch, Brady, Reichart, & Hook, 1990), age at first sexual intercourse (Coker et al., 1994; Greenberg, Magder, & Aral, 1992; Miller et al., 1999), substance use and substance use during sex (Anderson & Dahlberg, 1992; Fergusson & Lynskey, 1996), and condom use (Cates & Stone, 1992; CDC, 1993; Upchurch et al., 1992; Weller, 1993). Number of sexual partners serves as both a direct measure of exposure as well as a proxy for other related risk-taking behaviors and beliefs (Aral, 1994; Eng & Butler, 1997). Similarly, early age at sexual initiation may place girls at greater risk for STDs because they are sexually active for a longer period (a duration effect) and because it may be correlated with other risk-taking behaviors (Aral, 1994; Greenberg, Magder, & Aral, 1992). Alcohol and/or drug use during sexual activity reduces sexual inhibitions, impairs judgment, and reduces the likelihood of engaging in protective behaviors (Caetano & Hines, 1995; Ericksen & Trocki, 1992). Last, condom use is a key protective behavior to reduce risk of STD transmission and acquisition (CDC, 1993; National Institute of Allergy and Infectious Diseases [NIAID], 2001) and increasing condom use is a priority identified in *Healthy People 2010* (USDHHS, 2000). Although measurement of condom behavior is complex, there is growing agreement among researchers that condom use at last sex serves as a reasonable proxy for ongoing behavior and has been shown to give similar results to frequency of use measures (Anderson, Rietmeijer, Wilson, & Barker, 1998). Moreover, respondents are able to report last-time measures more accurately than reconstructing detailed histories (Sudman, Bradburn, & Schwarz, 1996). In the current work, we propose that all of these behaviors influence the likelihood that adolescent girls have ever had an STD.

In addition, a history of forced sex victimization² is associated with an increased risk of having had a STD,

including HIV/AIDS (Eng & Butler, 1997; Hogben et al., 2001; Lechner, Vogel, Garcia-Shelton, Leichter, & Steibel, 1993; Molitor, Ruiz, Klausner, & McFarland, 2000; Wingood & DiClemente, 1997; Wyatt et al., 2002). This is, in part, because women with a history of forced sex are also more likely to engage in risk-taking behaviors such as those described. Women with a history of forced sex are more likely to have a greater number of sexual partners (Fergusson, Horwood, & Lynskey, 1997; Hillis, Anda, Felitti, & Marchbanks, 2001; Lechner et al., 1993; Raj, Silverman, & Amaro, 2000; Stock, Bell, Boyer, & Connell, 1997), have younger ages at first sex (Fergusson, Horwood, & Lynskey, 1997; Miller, Monson, & Norton, 1995; Nagy, DiClemente, & Adcock, 1995), are more likely to have substance use problems or to use alcohol and/or drugs during sex (Hernandez, 1992; Shrier, Pierce, Emans, & DuRant, 1998; Wilsnack, Vogeltanz, Klassen, & Harris, 1997), and are less likely to use condoms (Fergusson, Horwood, & Lynskey, 1997; Shrier et al., 1998; Molitor et al., 2000) than women with no history of forced sex. Thus, we hypothesize that a history of forced sex is associated with these risk-related behaviors. Moreover, we hypothesize that these risk-related behaviors are associated with a positive STD history.

The main objective of this study is to better understand the association between a history of forced sex and ever having had an STD in a national sample of sexually active adolescent girls. Our conceptual framework regards a history of forced sexual intercourse as the focal variable and posits links between forced sex, sexual and protective practices, and STDs. That is, we propose that forced sex is antecedent to having had an STD and that the effects of forced sex can be explained, in part, by a set of variables that characterize sexual and protective practices, which in turn, are associated with STDs. Three related research questions are investigated. First, are girls with a history of forced sex more likely to engage in risky sexual behaviors and less likely to engage in protective ones? Second, to what extent are these sexual and protective practices associated with the likelihood of ever having had an STD? Finally, are girls with a history of forced sex more likely to have had an STD, and does this effect remain after controlling for the set of variables that characterize sexual and protective practices? Because STD risk varies by race and ethnicity as well as other sociodemographic factors (CDC, 2002), we include a comprehensive set of these variables in all of our multivariate models.

Data and Methods

The data used for this analysis are from the first wave (Wave I) of the National Longitudinal Study of Adolescent Health (Add Health), a survey designed to

assess the health status of adolescents in the United States (Bearman, Jones, & Udry, 1997). The sampling frame consists of all U.S. high schools; younger students were sampled from one “feeder” school that included a 7th grade and sent graduates to one of the sampled high schools. Each participating school provided a student roster, which constitutes the student-level sampling frame. From that listing, a baseline sample was drawn consisting of a core sample and several special oversamples. The core sample is a probability sample of 12,105 and is nationally representative of adolescents enrolled in grades 7 through 12 during the 1994–1995 academic year. The oversamples include specific ethnic groups, disabled adolescents, and biologically related adolescents. The combined Wave I sample is 20,745; approximately half of the sample is female (10,480). The data used for this analysis are drawn from this base sample of girls and include sexually active girls only (defined below). Because we are interested in population-based estimates, observations that do not have Wave I sample weights are dropped from our analytic sample. Further drops for consistently poor data quality, missing data on sexual, STD, or forced sex history, or being American Indian or Other races,³ resulted in a final analytic sample of 3,579. (The vast majority of dropped observations were because they were male, not sexually active girls, or did not have a sample weight. Only a small number of observations were dropped because of incomplete or missing data on the variables of interest.)

Variable description and measurement

Respondents were asked by audio-CASI (computer-assisted self-interview) about their sexual, STD, and forced sex histories. Information on STD history, history of forced sex, and other sex-related behaviors is asked only for those who responded affirmatively to ever having had sexual intercourse. Specifically, all respondents were asked, “Have you ever had sexual intercourse? When we say intercourse, we mean when a male inserts his penis into a female’s vagina.” Responses to this item were used to determine the sexually active subsample of adolescent girls.

STD outcome. The dependent variable of interest is lifetime history of any STD. For our purposes, history of STD is operationalized based on the following questions. Respondents were asked, “Have you ever been told by a doctor or nurse that you had . . .” for each of the following STDs: 1) chlamydia, 2) syphilis, 3) gonorrhea, 4) HIV or AIDS, 5) genital herpes, 6) genital warts, 7) trichomoniasis, 8) hepatitis B, and for females, 9) bacterial vaginosis, and 10) nongonococcal vaginitis. The outcome is a binary response and is

coded $Y = 1$ if the respondent reported yes to any of these STDs, $Y = 0$ otherwise.

Sexual and protective practices. Five behaviors are considered. *Lifetime number of sexual partners* is based on information from several questions on romantic relationships and the occurrence of sexual activity outside the context of romantic relationships. From these questions, we were able to create the total number of sexual partners that the respondent had ever had.⁴ Because the distribution of this variable is highly skewed toward 1, the final variable is the natural log of the lifetime number of sexual partners. *Early onset of sexual activity* is based on the question about sexual intercourse (see above) and an additional question on the date of first sex. The final variable is a dichotomy and is operationalized as less than age 14.⁵ *Alcohol and/or drug use during the last sexual encounter* is also measured as a dichotomy. Similarly, *condom use at last sex* is measured as a dichotomy. Last, the measure of *history of forced sex* is based on responses to the following question, “Were you ever physically forced to have sexual intercourse against your will?” It is also coded as a dichotomy.

Control variables. Age is measured in years and is a continuous variable. We created a race/ethnicity composite measure that gives priority to any mention of being Hispanic, with the following categories: 1) non-Hispanic white; 2) non-Hispanic African American; 3) Hispanic; and 4) non-Hispanic Asian American. This polytomy enters into the regressions as a set of dummy variables with non-Hispanic whites as the reference category. Family structure is coded into eight categories: 1) two biological parents, 2) biological mother and stepfather, 3) biological father and stepmother, 4) biological mother and cohabiting partner, 5) biological father and cohabiting partner, 6) biological mother only, 7) biological father only, and 8) other situations. Again, this polytomous variable enters into the regressions as a set of dummy variables, with two biological parents as the reference category. Mothers’ and fathers’ education are coded as years of school completed.⁶ The logarithm of the 1994 household income is also included.⁷

Analytic strategy

To address our three research questions, we employ three related analyses using the sexually active sample of girls. First, we investigate the effects of forced sex history on each of the sexual and protective practices of interest. Four separate regression models are estimated. OLS regression is used to estimate the effects of forced sex on the (logged) lifetime number of sexual partners. For early onset of sex, substance use at last sex, and condom use at last sex, each outcome is a

binary response and is coded $Y = 1$ if yes and $Y = 0$ if no; logistic regression is used for these outcomes. For the second analysis, we examine the effects of each of the sexual and protective practices, including forced sex, on the odds of ever having had a STD; again, logistic regression is employed. Five separate models are estimated with each behavior of interest analyzed separately. For the third analysis, we include all five behaviors of interest simultaneously to examine whether the effects of history of forced sex on STD history are diminished after controlling for number of sexual partners, early onset of sexual intercourse, substance use at last sex, and condom use at last sex, using logistic regression. For all three analyses, we control for age, race and ethnicity, family structure, parents' education, and household income. Also, all analyses are weighted and the standard errors of the coefficients are adjusted for the complex sample design (Chantala & Tabor, 1999) using Stata 8 (Stata-Corp, 2003). For ease of presentation and interpretation, we present the adjusted odds ratios (OR) and 95% confidence intervals (CI) for the key variables of interest.

Results

Table 1 shows the sociodemographic characteristics and sexual and protective behaviors for the sexually active sample of adolescent girls in the Add Health survey. The average age of girls in the sample is 16.4 years (range 12 to 21). Two-thirds of the sample is white, 22.5% is African American, 10.2% is Hispanic, and only 1.9% is Asian American. Slightly over 40% of girls live with both biological parents, another 24.5% live with their biological mother only, 11.7% live in stepfamilies, and the remaining live with a biological parent and parent's cohabiting partner (7.8%), with biological father only (3.0%), or in other situations (12.1%). Among girls with a resident mother and/or father, the mean number of years of schooling for each parent corresponds to slightly more than high school completion. The average household income for 1994 is \$37,936.⁸

On average, girls report 3.4 sexual partners in their lifetime. Over one in five girls (21.3%) reported an age at first sexual intercourse younger than age 14. Eight percent report using alcohol and/or drugs at last intercourse and almost half (49.7%) of them report using a condom at last intercourse. Last, 20.3% of sexually active girls report that they had ever been forced to have sexual intercourse and 11.2% report they have ever had an STD.

Table 2 presents the adjusted ORs and 95% CI for the effects of forced sex on each of the four variables that characterize the sexual and protective practices of interest. All four models control for age, race and

Table 1. Descriptive statistics of sexually active adolescent girls, Add Health

Variable	Percentage or mean
Age at Wave I (mean)	16.4
Race and ethnicity	
White	65.4
African American	22.5
Hispanic	10.2
Asian American	1.9
Family structure	
Two biological parents	40.9
Biological mother/stepfather	10.1
Biological father/stepmother	1.6
Biological mother/cohabiting partner	6.9
Biological father/cohabiting partner	.9
Biological mother only	24.5
Biological father only	3.0
Other situations	12.1
Parents' education	
Mother's education (mean years)	12.8
Father's education (mean years)	12.9
1994 household income	\$37,936
Lifetime number of sexual partners (mean)	3.4
Age at first sex younger than 14	21.3
Used alcohol or drugs at last sex	8.0
Used a condom at last sex	49.7
Ever forced to have sex	20.3
Ever had a STD	11.2
N	3,579

Note: N is unweighted; percentages and means are weighted. N = 3,579, except for maternal and paternal education, for which Ns are appropriately reduced for girls living in families lacking a mother or father.

ethnicity, family structure, parents' education, and household income.⁹ Girls with a history of forced sex have significantly higher odds of having a greater number of lifetime partners than those with no history. Moreover, girls with a history of forced sex are significantly more likely to report an age at first sex that is younger than age 14 and are significantly more likely to have used alcohol and/or drugs during their last sexual encounter. Although not significant, girls with a history of forced sex are less likely to have used a condom at last sex. Overall, this set of results

Table 2. Adjusted OR and 95% CI for effects of forced sex on each sexual and protective practice among sexually active adolescent girls, Add Health (N = 3,579)

Sexual and protective practices (outcome)	Odds		
	ratio for forced sex	95% CI	p-value
Lifetime number of sexual partners (ln)	1.56	(1.43, 1.70)	.000
Age at first sex younger than 14	2.11	(1.58, 2.83)	.000
Used alcohol or drugs at last sex	1.72	(1.17, 2.51)	.006
Used a condom at last sex	0.84	(0.68, 1.04)	.110

Note: Results represent four separate regressions for each of the four risk behaviors. All models control for age, race/ethnicity, family structure, parents' education, and household income. Abbreviations: CI, confidence interval; OR, odds ratio.

Table 3. Adjusted OR and 95% CI for each sexual and protective practice associated with history of STD among sexually active girls, Add Health ($N = 3,579$)

Sexual and protective practices	OR	95% CI	<i>p</i> -value
Lifetime number of sexual partners (ln)	2.18	(1.89, 2.53)	.000
Age at first sex younger than 14	2.30	(1.59, 3.34)	.000
Used alcohol or drugs at last sex	2.33	(1.49, 3.63)	.000
Used a condom at last sex	0.67	(0.49, 0.91)	.011
Forced sex	1.99	(1.57, 2.52)	.000

Note: Results represent five separate logistic regressions for each of the five risk behaviors. All models control for age, race/ethnicity, family structure, parents' education, and household income.

Abbreviations: CI, confidence interval; OR, odds ratio; STD, sexually transmitted disease.

generally supports our hypothesis that a history of forced sex is associated with increased odds of engaging in higher risk sexual behaviors and lower odds of engaging in the protective behavior we examined (i.e., condom use), although not significant.

In Table 3, we present the adjusted ORs for each of the sexual and protective practices that we hypothesize are associated with ever having had an STD. All five models control for age, race and ethnicity, family structure, parents' education, and household income. As expected, as the number of lifetime partners increases, the odds of a positive history of STD significantly increase. Similarly, girls with younger ages at first sex have significantly higher odds of positive STD history than those with older ages. Girls who used alcohol and/or drugs at last sex have significantly higher odds of positive STD history than those who did not. In contrast, girls who used a condom at last sex have significantly lower odds of positive STD history. Last, girls with a history of forced sex have significantly higher odds of ever having had an STD than those with no history ($OR = 1.99$). These results support our hypothesis that each of these sexual and protective practices is associated with ever having had an STD.

Table 4 presents the results from the full model that includes forced sex and all sexual and protective practices simultaneously as well as the sociodemographic control variables. Here, we also present the findings for age and race and ethnicity.¹⁰ When all five behaviors are included in the model, the effects are reduced for each behavior and reduced to only marginal significance for two of the behaviors (alcohol and/or drug use at last sex and condom use at last sex). Number of lifetime sexual partners is significantly associated with history of STD; as the number of partners increases, so does the odds of ever having an STD. Also, girls with a young age of onset of sexual intercourse have significantly higher odds of ever having had an STD than those who delay. Similarly, history of forced sex remains significantly associated

Table 4. Adjusted OR and 95% CI for sexual and protective practices and sociodemographic characteristics associated with history of STD among sexually active girls, Add Health ($N = 3,579$)

Covariates	OR	95% CI	<i>p</i> -value
Lifetime number of sexual partners (ln)	1.94	(1.65, 2.28)	.000
Age at first sex younger than 14	1.44	(1.01, 2.05)	.045
Used alcohol or drugs at last sex	1.49	(0.94, 2.35)	.086
Used a condom at last sex	0.76	(0.56, 1.03)	.072
Forced sex	1.39	(1.07, 1.81)	.014
Age	1.41	(1.26, 1.59)	.000
Race/ethnicity (white)			
African American	3.45	(2.50, 4.77)	.000
Hispanic	1.16	(0.63, 2.15)	.635
Asian American	2.67	(1.16, 6.17)	.022

Note: Results based on final full model that includes all risk factors simultaneously and controls for family structure, parents' education, and household income.

Abbreviations: CI, confidence interval; OR, odds ratio; STD, sexually transmitted disease.

with history of STD after controlling for all other sexual and protective practices: girls with a history of forced sex are more likely to ever have a STD ($OR = 1.39$) than those who do not. (To better highlight the temporal sequencing of the report of forced sex and STD acquisition, we performed an additional analysis, constrained in the following manner. We examined whether a history of forced sex reported at the Wave I interview was predictive of incident STD reported at Wave II. We found that girls with a history of forced sex reported at Wave I were significantly more likely to report incident STD at Wave II [$OR = 1.52, p = .04$] compared to girls with no history of forced sex [results not shown].) As expected, the odds of having a positive STD history significantly increase with age. Compared to whites, African American girls have significantly higher odds of ever having had an STD, as do Asian American girls.

Discussion

Overall, our key hypotheses are confirmed by the findings from this study. Girls with a history of forced sex are more likely to engage in riskier sexual practices and marginally less likely to use condoms than girls who do not have a history of forced sex. In turn, these riskier practices increase the likelihood of ever having had an STD and condom use marginally decreases the likelihood of ever having a STD. Moreover, the associations between forced sex history and ever having had an STD persist after controlling for the other sexual and protective practices. Thus, the association between history of forced sex and history of STD are only partially explained by differences in numbers of sexual partners, early onset of sex, substance use during sex, and condom use.

Our findings confirm that multiple sexual and pro-

tective practices are associated with STDs, in the expected directions. Girls with greater numbers of sexual partners or who began sexual activity at younger ages are more likely to have a positive STD history when compared to girls with fewer partners or who delayed onset. Although we did not attempt to disentangle the extent to which these variables are measuring “exposure” or “selection” effects, we suspect that they are capturing both. Girls with multiple partners are more likely to be part of sexual networks with multiple concurrent partnerships linking them to chains of infection that increase their risk of acquiring an STD (Eng & Butler, 1997; Morris, 1997).¹¹ Girls with multiple partners may also exhibit psychosocial traits that characterize them as greater risk takers than girls with fewer partners (Basen-Engquist & Parcel, 1992; Boyer et al., 2000; Millstein & Moscicki, 1995). (We also examined the effects of number of recent [past 18 months] sexual partners on STD history; the results were similar.) Similarly, early onset of sexual activity may reflect both a duration effect as well as other underlying risk-taking propensities (Aral, 1994; Greenberg, Magder, & Aral, 1992). We note, however, that we control for current age in all models, suggesting that the effects of early onset on sexual activity may be tapping into a portion of this risk-taking dimension.

Girls who used alcohol or drugs during their most recent sexual experience are also more likely to have had an STD, although this effect reduces to marginal significance when all sexual and protective behaviors are simultaneously included in the model. Several possible explanations have been proposed, although there is no clear consensus on a definitive causal mechanism linking substance use, risky sexual behavior, and STDs (for a review see Leigh & Stall [1993]). Some argue that the relationship can be explained as a result of the disinhibiting effects of alcohol and drugs, which may encourage sexual experimentation (e.g., Ericksen & Trocki, 1992; Strunin & Hingson, 1992), whereas others argue that individuals who believe that alcohol and drugs promote risky sexual behaviors are more likely to engage in these behaviors when intoxicated (Dermen, Cooper, & Agocha, 1996). Still others find no relationship between substance use (in this case alcohol) and engaging in risky sexual behaviors (Morrison et al., 2003). Because this was not the focus of our analysis, we choose to remain somewhat agnostic on the issues of causality; additional analysis is necessary to more fully elaborate the relationship between substance use during sex and risk of STDs. With respect to condom use at last sex, we find that girls who used condoms are less likely to have had an STD, but this effect also reduces to marginal significance in the full model. Issues of measurement are a continuing concern among researchers attempting to assess condom effectiveness and STD risk (NIAID,

2001; Weller, 1993). In fact, our measure of condom use (last sex) is probably consequent to the majority of reported STD infections. We chose to use this particular measure because it references a specific sex act, has been shown to correlate well with ongoing behavior, and yields results that are similar to frequency of use measures (e.g., Anderson et al., 1998; Anderson, Wilson, Doll, Jones, & Barker, 1999; Santelli et al., 1997). Also, we chose to measure condom use at last sex because of our interest in examining the relationship between forced sex and subsequent condom use. Thus, given the literature and the multiple research questions addressed in this work, we believe condom use at last sex is a reasonable measure. Nevertheless, we acknowledge the multidimensionality of condom use behavior and note that it is often relationship specific (Katz, Fortenberry, Zimet, Blythe, & Orr, 2000; Upchurch et al., 1990). Further elaborating the patterns of condom use and the ways in which these patterns influence risk of STD is part of our ongoing research.¹²

Sexually active African American girls are substantially more likely to have a positive history of STD than sexually active white girls after controlling for multiple sexual and protective behaviors; these results have been demonstrated by others (CDC, 2002; Miller et al., 1999; Tanfer, Cubbins, & Billy, 1995). Other research suggests that African American girls do not necessarily engage in higher risk behaviors than white girls,¹³ rather their increased risk is due to higher prevalence rates of STDs in their sexual networks because the networks are somewhat more “closed” than those of other race and ethnic groups (Ellen, Aral, & Magder, 1998; Eng & Butler, 1997; Ford & Norris, 1997; Laumann & Youm, 1999). We also find that sexually active Asian American girls are significantly more likely to have a positive history of STD than sexually active white girls, again after controlling for differences in sexual and protective practices. Although Asian American girls are less likely than white girls to be sexually active (Hou & Basen-Engquist, 1997; Schuster, Bell, Nakajima, & Kanouse, 1998; Upchurch, Mason, & Kusunoki, 2003), once they are sexually active they are more likely to acquire an STD, in part, because they are somewhat more likely to engage in higher risk behaviors (CDC, 2002; Hou & Basen-Engquist, 1997; Schuster et al., 1998). The persistent race and ethnic differences in risk for STDs suggest the importance of investigating the influences of factors beyond individual behaviors, including relationship characteristics, partner concurrency, sexual networks, and underlying disease prevalence (Howard, Fortenberry, Blythe, Zimet, & Orr, 1999; Katz et al., 2000; Laumann & Youm, 1999; Morris, 1997; Zenilman, Elish, Fresia, & Glass, 1999) on the risk of STDs.

Last, we find that girls with a history of forced

sexual activity are more likely to engage in riskier sexual behaviors that may place them at an increased risk of acquiring an STD and that the association between forced sex history and history of STD remains after controlling for a set of variables characterizing sexual and protective practices. Girls with a history of forced sex are more likely to have greater numbers of lifetime partners, earlier ages at first intercourse, and are more likely to have used alcohol or drugs at last sex. The effect of forced sex on condom use at last sex is not significant, but is in the expected direction. Other studies report similar findings (Fergusson, Horwood, & Lynskey, 1997; Miller, Monson, & Norton, 1995; Nagy, DiClemente, & Adcock, 1995; Shrier et al., 1998; Wilsnack et al., 1997), but most often used information obtained from convenience or regional samples or did not investigate the effects of forced sex history on numerous sexual risk-taking behaviors, as we have done here. Our results suggest that the effects of having been forced to have sex may operate through multiple pathways that can adversely affect the reproductive lives of adolescent girls. Victims of sexual violence appear to be at increased risk of engaging in numerous behaviors (above and beyond those considered here) that potentially increase their risk of acquiring an STD, including chronic destructiveness and deliberate self-harm (Boudewyn & Liem, 1995). In addition, there are psychological consequences of forced sexual activity, including depression and low self-esteem (Briere & Runtz, 1993; Zweig, Barber, & Eccles, 1997), which may also contribute to increased sexual risk taking, resulting in increased risk of STDs. Our results, along with those of other studies, suggest that there may be multiple and often enduring consequences of sexual violence against women.

Although our research provides new information regarding the relationship between forced sexual activity and history of STD in a nationally representative sample of sexually active adolescent girls, it is not without limitations. First, we must underscore that we examined sexually active girls only (defined as ever having had vaginal intercourse). As noted, additional analyses revealed systematic differences between sexually active girls and virgins (see footnote 8). We therefore cannot generalize to all girls—rather, only those who are sexually active as we have defined here. Second, the sample is nationally representative of students, not all adolescents. The extent to which high school drop out is correlated with STD risk will result in potential bias; thus our findings probably underestimate the prevalence of STD and the effects of risky behaviors. Even though this population may be characterized as low risk, we still find that over 1 in 10 sexually active girls have ever had a STD (as we have defined). In a national sample of young adults, using a similar measure of STD, Tanfer, Cubbins, & Billy, (1995) found a lifetime prevalence of 15.8% among

young women. In another national study of women, a lifetime prevalence of STD (defined as gonorrhea or chlamydia) of 6% was reported (Miller et al., 1999). Taken together, these results demonstrate that adolescent girls are disproportionately affected by STDs and underscore the importance of continuing public health efforts to reduce their burden of disease (USDHHS, 2000). Third, our measure of STD history is based on self-report, and although audio-CASI techniques were employed to collect this information, it is possible that girls underreported infection, misremembered or forgot, or were not aware that they had ever had a STD. In fact, studies using convenience and/or high-risk samples in which STD self-report and biomarker assessments are compared show mixed results with respect to the validity of self-report (Clark, Brasseur, Richmond, Getson, & D'Angelo, 1997; Harrington et al., 2001; Orr, Fortenberry, & Blythe, 1997). Findings from our related research suggest, however, that self-reports of STD have a high face validity and can be used as markers to assess relative differences in the likelihood of infection (Upchurch & Mason, 2002). Fourth, the available measure of sexual victimization is problematic. Girls were asked (again, using audio-CASI) only about sexual victimization that involved physical force to engage in sexual intercourse. Clearly, there are other forms of sexual victimization, including psychological coercion, that can be highly traumatic (Zweig, Crockett, Sayer, & Vicary, 1999). In addition, the data do not contain information on when the forced sex experience occurred, if it occurred multiple times, or any information about the context within which it occurred (including lack of information on the perpetrator). Furthermore, forced sex history was only asked of those who reported that they had ever had sex and therefore girls who had been forced to have sex who may not have considered themselves sexually active were not included in our analytic sample. Although undoubtedly an underestimate, our finding that one in five sexually active girls report they have ever been physically forced to have sex against their will demonstrates that sexual victimization is relatively common. These results have also been confirmed by others (Raj, Silverman, & Amaro, 2000) and highlight the need for continued programmatic efforts in this area. Last, although we attempted to elaborate a conceptual framework that articulated antecedent and intermediate variables that influence risk of STD, our model was a simplification of the complex interrelationships between the key variables of interest. For example, a greater number of sexual partners may also be a consequence of early onset of sexual activity (e.g., Santelli, Brener, Lowry, Bhatt, & Zabin, 1998). In addition, forced sex may be a consequence of early sexual activity and may have occurred at first intercourse (Abma, Driscoll, & Moore, 1998). Elaboration of theoretical models that more compre-

hensively characterize these complex interrelationships is warranted.

In sum, our findings suggest that programmatic strategies aimed at reducing STDs among adolescents through encouraging responsible sexual behaviors would potentially benefit from also including a component that addresses sexual victimization. For example, such programs could incorporate strategies that increase adolescents' ability to prevent and contend with sexual coercion and violence and to develop healthy dating relationships (see, for example, Kalmuss, Davidson, Cohall, Laraque, & Cassell, 2003). Given that adolescents who report a history of forced sexual intercourse also report other sexual risk behaviors, program planners must be aware of the associations between multiple risk factors and accordingly adopt a more comprehensive framework aimed at reducing both sexual victimization and risky sexual practices.

Notes

1 Although not the focus of this research, the heightened physiologic risk is because of increased cervical ectopy present in adolescent girls (Eng & Butler, 1997).

2 Throughout the remainder of the paper, *forced sex victimization* is defined as ever being physically forced to have sexual intercourse against ones' will. We acknowledge that this definition captures only a portion of all sexual victimization.

3 Adolescents who identified as American Indian or Other races are excluded from this analysis because of the limited number of cases and the heterogeneity of the Other race category.

4 Respondents who were sexually active but were missing data on this variable were assigned the race/ethnic and gender-specific mean number of sexual partners.

5 Because we were concerned about losing cases in which there was missing information on date of first intercourse, for all analyses, we include a flag for cases with incomplete or missing date information, thus keeping all observations in the analysis. The flag was never significant in any of the analyses.

6 For a resident parent whose education was not reported, the missing value was imputed using weighted mean education, stratified by the gender of the parent and the race/ethnicity of the adolescent (parental race/ethnicity was not available).

7 Where missing, values were imputed using OLS regression that included mother's and father's education, family structure, the number of hours worked by the father and/or mother, and whether or not the mother and/or father received public assistance.

8 Because the sample includes only those girls who were sexually active by the Wave I interview, we investigated how these girls differ from the full sample of girls. Sexually active girls were significantly more likely to be older, African American (compared to white), live in stepfamilies (compared to living with two biological parents), and have parents with less education. Compared to white girls, sexually active girls were significantly less likely to be Hispanic or Asian American. (Results are available from the authors.)

9 The full set of estimates for all tables is available from the authors.

10 Although we also control for family structure, parents' education, and household income, none of these variables were significantly associated with ever having had a STD.

11 Although we believe that concurrency is an important risk

behavior and is associated with increased risk of STDs, we were unable to obtain a comprehensive measure of concurrency using the Add Health data because respondents were only asked about dates of sexual relationships for some of their relationships.

12 Because one reviewer was concerned that our measures of substance and condom use at last sex were behaviors that occurred subsequent to STD infection, we conducted two additional analyses. We first omitted these two variables from our original specification; the results for number of sexual partners and early onset remained unchanged. In a third specification, we replaced these measures with substance and condom use at first sex; the results were essentially the same. (Results are available from the authors.)

13 We performed additional analyses that, overall, support this statement. African American girls were not significantly different than whites in their numbers of sexual partners, were significantly more likely to use condoms at last sex, and were significantly less likely to use alcohol and/or drugs at last sex. They were, however, significantly more likely than white girls to have begun sex at younger ages. (Results are available from the authors.)

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Author Description

Dawn Upchurch is a Professor of Public Health at UCLA. She has a long-standing interest in adolescent and young women's reproductive health. More recently, she is studying complementary and alternative medicine (CAM) and women's health, especially Traditional Chinese Medicine and women's reproductive health during midlife.

Yasamin Kusunoki is a doctoral student at the UCLA School of Public Health. She is currently using the Add Health data to characterize adolescent sexual relationships and their effects on sexual risk taking behaviors.
