Peer Selection and Socialization Effects on Adolescent Intercourse Without a Condom and Attitudes About the Costs of Sex

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This study investigated peer selection and socialization effects on sexual behavior and attitudes using 1,350 15- to 18-year-old students participating in two waves of the National Longitudinal Study of Adolescent Health. Regarding socialization effects, friends’ intercourse without condoms predicted later individual intercourse without condoms positively. Friends’ attitudes about the costs of sex predicted later individual attitudes positively and intercourse without condoms negatively. The latter relation was stronger for females than for males. Regarding selection effects, individual attitudes predicted later friends’ attitudes positively, but the strength of this effect varied by ethnicity. The results suggest that adolescents socialize friends to have similar sexual attitudes and behavior but tend to select friends based on similar attitudes rather than similar behaviors.

Peer influences can increase risk for alcohol, tobacco, and other drug use among adolescents (Ennett & Bauman, 1996; Ozer, Weinstein, Maslach, & Siegel, 1997; Perkins & Wechsler, 1996; Wood, Nagoshi, & Dennis, 1992). Peers also influence the initiation and frequency of sexual intercourse (Billy & Udry, 1985; Marmer, 1999; Udry & Billy, 1987). Although the importance of peers for understanding risk is widely acknowledged, there is disagreement about the processes involved in peer effects. Social control theorists (e.g., Hirschi, 1969) suggest that peers affect one another through selection (i.e., adolescents tend to select friends who are similar to themselves). On the other hand, models of peer influence (Dishion, Patterson, & Griesler, 1994; Sutherland & Cressey, 1974) suggest that socialization (i.e., peer groups exert an influence on group members) is the primary process involved.

This study explores the role of peer influences in sexual behavior, focusing on how peers’ attitudes about sex influence sexual behavior, and in which direction influence flows. The analyses use data from the National Longitudinal Study of Adolescent Health (Add Health; Udry, 2003), a national study that explores health-related behaviors of adolescents in grades 7–12. The Add Health sample provides data to answer such questions as how peer attitudes and behaviors influence sexual risk (Brown, Dolcini, & Leventhal, 1997), and whether peer influences are similar for males and females. In this study we focus on the contribution of peer variables to risk for sexually transmitted diseases (HIV/STD), defining such risk as having intercourse without using a condom in comparison with not having intercourse, or only using a form of contraception other than a condom. We selected this definition because only abstinence and condom use protect against HIV/STD infection.

Selection versus socialization is an enduring theoretical and empirical question in peer relations.
Selection and socialization are alternative explanations for the observation that adolescents and their peers tend to have similar levels of delinquent behavior and substance use. Selection refers to adolescents gravitating to friends who are similar to them (Wills & Cleary, 1999). Selection processes begin as early as kindergarten (Cairns & Cairns, 1994, p. 108), appear to be a driving mechanism in forming peer groups, and should be considered when studying peer influences (Brown et al., 1997; Kandel, 1978). Similarity indicators such as gender and race are primary organizing characteristics of peer groups (Cairns & Kroll, 1994). Similarity among group members is related to many outcomes and characteristics including academic achievement, attractiveness, aggression, substance use, and other behaviors (Cairns & Cairns, 1994, pp. 112–113; Eiser, Morgan, Gammage, Brooks, & Kirby, 1991).

Socialization, or social influence, explains individual–peer similarity by the process of peers exerting influence on the behavior of the individual (Wills & Cleary, 1999). Several studies have documented the risk associated with deviant peer influences (Brook, Whiteman, Gordon, & Cohen, 1986; Dishion, Patterson, & Reid, 1988; Elliott, Huizinga, & Ageton, 1985; Hawkins, Lithner, & Catalano, 1985; Hawkins, Catalano, & Miller, 1992; Klein, Forehand, Armistead, & Brody, 1994). For example, Dishion, Spracklen, Andrews, and Patterson (1996) found, using videotaped conversations, that delinquent adolescents offered advice on deviant activities and rewarded their friends with nonverbal and verbal indications of approval when the friends talked about deviant activities. They termed this process “deviancy training.”

Manski (1995) noted the difficulty inherent in assessing simultaneous processes involved in peer influence, and Berndt (1992) suggested that pathways of influence between individuals and peers are mutual rather than unidirectional. Some studies of delinquency and substance use indicate significant effects for both processes (Keenan, Loeber, Zhang, Stouthamer-Loeber, & Van Kammen, 1995; Luthar & D’Avanzo, 1999). Others have found significant effects for either selection (Farrell & Danish, 1993) or socialization (Wills & Cleary, 1999), but not both.

Despite the health consequences (e.g., STDs, HIV) associated with having multiple sex partners and failing to use condoms, the question of selection versus socialization has not been studied in relation to sexual intercourse without condoms among adolescents. However, studies have found evidence consistent with socialization influences on condom use intentions. Adolescents who perceived peer support for condom use were up to three times more likely to intend to use condoms than were those who did not perceive such peer support (Brown, DiClemente, & Park, 1992; Murphy, Rotheram-Borus, & Reid, 1998). Walter, Vaughan, Gladis, and Ragin (1993) found that the primary predictor of intercourse among urban, minority youth was the extent to which individuals believed intercourse was common and acceptable among peers. In a longitudinal study controlling for pubertal development, age, attractiveness, family structure, school performance, delinquency, and attitudes about sex, Udry and Billy (1987) found that a predictor of sexual intercourse was whether participants’ same- and cross-sex friends had sex. Marmer (1999), in a cross-sectional study, found that among White and Hispanic adolescents (but not among African American adolescents), friends’ initiation of intercourse was associated with individual initiation of intercourse.

It is also important to explore the roles of attitudes versus behavior in selection and socialization. Do adolescents select friends based on their attitudes or behaviors? Are adolescents socialized by their friends’ attitudes (Brown et al., 1992), by the sexual behaviors their friends describe, or by the sexual behaviors believed to be prevalent among their friends (Walter et al., 1993)? Models of health-related change suggest a pivotal role for attitudes. The Health Belief Model (Sheeran & Abraham, 1996) includes dimensions of perceived susceptibility, severity, and costs of the target behavior (Rosenstock, 1974). The Decisional Balance Model (Janis & Mann, 1977) includes an attitudinal dimension, postulating that individuals make decisions about behavior by assessing and comparing benefits and costs. Both models predict that adolescents concerned about the costs of sex would abstain or use protection when having intercourse. Research on the decisional balance model supports this contention (Grimley, Riley, Bellis, & Prochaska, 1993; Prochaska, Redding, Harlow, Rossi, & Velicer, 1994), leading proponents to view attitudes as important avenues for intervention.

It is possible that peers influence one another through their descriptions of sexual behavior rather than their attitudes about the costs of sex. Adolescents of both sexes talk about sex with their peers, although the contents of these conversations may differ by gender (Gilfoyle, Wilson, & Brown, 1993; Gilmore, 1996). Hearing such descriptions of sexual behavior might facilitate adolescents selecting friends who engage in similar behaviors or provide the opportunity to model peers’ behavior (Bandura, 1986).

Gender differences in peer influence may occur because the potential costs of sex, such as pregnancy
and risk of contracting STDs, are greater for females than males. Our focus on intercourse without condoms in this study negates the female advantage of being able to avoid pregnancy risk with birth control pills. Nevertheless, friends’ attitudes about the costs of sex may influence females to a greater extent than males. Previous studies have found a stronger association between peer and individual sexual behavior for females than males (Marmer, 1999; Udry & Billy, 1987). These studies, however, did not assess the role of friends’ attitudes in gender differences. Therefore, we examine differential selection and socialization effects by gender in this study.

Other variables may obscure, mediate, or moderate selection or socialization effects. For example, involvement in mixed-gender friendship networks is associated with higher levels of sexual activity (Mott, Fondell, Hu, Kowaleski-Jones, & Menaghan, 1996; Rowe & Rodgers, 1991), making it important to control for the gender composition of each adolescent’s friendship network. Sexual activity is likely to become more normative as adolescents grow older, suggesting that it is advisable to control for age and to evaluate its potential moderating effect.

African American adolescents have been found to be at greater risk than either non-Hispanic White or Hispanic adolescents for contracting STDs (Crosby, Leichliter, & Brackbill, 2000; Ford & Lepkowski, 2004). However, previous research (Marmer, 1999) suggests that peer influences regarding sex may be weaker among African American adolescents than among White and Hispanic adolescents. Crosby et al. (2000) found that Asian adolescents had a lower risk of STDs than other minority adolescents, but studies have not evaluated the role of peer influences among Asian adolescents (cf. Ford & Lepkowski, 2004). For these reasons, we control for multiple ethnic identifications and include an analysis of ethnicity as a potential moderator of adolescent sexual behavior in this study.

**Method**

We examined the role of two characteristics of friends in adolescent sexual behavior: their attitudes about the costs of sex, and their numbers of partners in intercourse without condoms. Throughout the analyses, we controlled for gender, age, ethnicity, and the proportion of Wave 1 friends who were the same gender as the respondent. We also controlled for the proportion of Wave 2-nominated friends who did not attend the same school as the respondent. Doing so accounted for differences in the proportion of friends in Wave 2 on which friends’ scores were based. Finally, we examined the possibility that effects were moderated by gender, ethnicity, and age.

**Participants**

The data are drawn from the Add Health longitudinal survey. The analyses used data from Waves 1 and 2 in-home interviews. Wave 1 interviews were conducted between April and December 1995, and Wave 2 interviews were conducted between April and September, 1996. Respondents participated in Wave 2 only if they had participated in Wave 1. Twelfth graders in Wave 1 did not participate in Wave 2. The mean time lag between interviews in the sample for this study was 334.4 days, with a standard deviation (SD) of 45 days. The length of time between interviews did not correlate with either Wave 1 or Wave 2 measurements of intercourse without condoms or costs attitudes. The Wave 2 interview was generally similar to that used in Wave 1.

The sample for the current study included 1,350 students in nine high schools who completed both waves of the Add Health in-home survey and nominated at least one friend in each wave (Berman, Jones, & Udry, 1997). This sample represents 68.2% of 1,979 students who were in grades 9–11 in Wave 1 and who had nonmissing intercourse and costs attitudes measures in Waves 1 and 2. The Add Health study did not administer measures of attitudes about sex to students younger than 15 years of age. Students were included if they nominated at least one identifiable friend (who was not identified by Add Health as a romantic partner) and had data in both waves. The subjects in this sample attended schools in which all students took part in the Add Health study.

The sample had an average age of 16.7 years ($SD = 0.91$) in Wave 1 and was 48.9% female. Subjects reported their ethnic identifications using items similar to those subsequently used in the 2000 U.S. census. We collapsed these designations into five mutually exclusive racial/ethnic categories for analysis: African American (12.4%), Asian (17.14%), White (50.2%), Hispanic (19.4%), and other (0.9%). Those included in the final sample ($N = 1,350$) were an average of 3 months younger, $t(1,977) = 10.8, p < .01$, and were less likely to be African American, $\chi^2(1, N = 1,979) = 15.45, p < .01$, than the students who were excluded ($n = 629$) because of inadequate peer nomination data. Those included in the sample were also less likely to report having engaged in intercourse without condoms in Wave 1 (5.3% vs. 9.3%), $\chi^2(1, N = 1,979) = 4.45, p < .05$. 
Procedures

The Add Health study reports that the interviews took between 1 and 2 hours to complete, depending on the participant’s age and experiences. The majority of interviews took place in the respondents’ homes with parents or other family members not in the same room. All data were recorded on laptop computers. For sensitive sections, the respondent listened to prerecorded questions through earphones and entered the answers directly (audio-CASI). In addition to maintaining data security, this method minimized the potential for interviewer or parental influence and social desirability bias. The Add Health data set covers a range of topics including health, sex, and contextual experiences. Care was taken to ask respondents questions appropriate for their ages and experiences.

Friendships

The in-home survey asked each student to nominate up to five male and five female friends in order of preference. Although students could nominate any friends, study identification numbers were assigned only to nominated friends who attended either the same school or a sister school (a middle school or junior high school in the same town) as the nominator. Because Add Health included identity protection of romantic partners, data from romantic partners could not be used to calculate friends’ variables.

We used adolescents nominated by each subject as the individual’s friendship network. This procedure excluded fewer subjects from the analysis than had we relied on reciprocated nominations or network analysis. As Kiesner, Poulin, and Nicotra (2003) have noted, nonreciprocated nominations provide information about subjects’ desired and actual friendships, and may more accurately represent the influence of friends than reciprocated nominations. In addition, Schoeny, Henry, Deptula, and Slavick (2004) found that nonreciprocated friendship nominations provided much of the same information as either reciprocated friendship nominations or networks formed through social network analysis. To arrive at the friendship network variables, we calculated the means of the nominated friends’ attitudes about the costs of sex and number of partners in intercourse without condoms, excluding the subject. Among subjects who had both reciprocated and nonreciprocated nominations, we compared the demographics of those nominated in reciprocated nominations with those nominated in unreciprocated nominations. The two groups did not differ in gender composition and mean age. Those nominated in unreciprocated nominations were marginally less likely to have engaged in intercourse without a condom (8.6% vs. 9.9%), $t(972) = 1.82, p < .10$, and had significantly higher mean costs attitudes (2.49 vs. 2.42), $t(972) = 6.49, p < .01$, than those whose nominations were reciprocated.

Of 8,895 peer nominations in Wave 1, we excluded 3,550 (39.9%) for the following reasons: 232 (2.6%) were nominated as romantic partners, 1,969 (22.1%) did not attend the participant’s school or a sister school, 460 (5.2%) were reported to attend the respondent’s school but had names that were not on the list used to link nominated friends to the respondent, and 889 (10.0%) did not complete the Wave 1 in-home assessment. Of 8,572 peer nominations in Wave 2, we excluded 3,872 (45.2%) from calculations of network data for the following reasons: 279 (3.3%) were nominated as romantic partners, 2,017 (27.0%) did not attend the participant’s school or a sister school, 737 (8.6%) were reported to attend the respondent’s school but had names that were not on the list used to link nominated friends to the respondent, and 839 (9.8%) did not complete the Wave 2 in-home assessment.

The number of nominated friends in Wave 1 ranged from 1 to 10, with a mean of 6.27 (SD = 2.74). Wave 1 friendship networks consisted primarily, but not exclusively, of same-sex friends (mean proportion = 0.67, SD = 0.27). Approximately 1% of subjects nominated no same-sex friends, and 27.2% nominated all same-sex friends. Males and females nominated the same proportion of same-sex friends, $t(1,348) = 1.3$, ns.

In Wave 2, subjects nominated an average of 6.02 (SD = 2.52) friends each. The mean proportion of nominated same-sex friends was 0.70 (SD = 0.29). Approximately 5% of subjects nominated no same-sex friends, and 39.0% nominated all same-sex friends. As in Wave 1, the proportion of same-sex friend nominations did not vary by gender, $t(1,348) = 1.7$, ns. We found a modest but significant correlation between age and the proportion of nominated friends not in the same school as the subject, $r = .15, p < .01$.

The friendships were modestly stable between waves; 38.4% of the nominations from Wave 1 were also nominated in Wave 2. The demographic characteristics of nominated friends were also relatively stable across waves.

Measures

For this study, the outcome variable of interest is the number of cross-sex partners with whom the adolescent engaged in sexual intercourse without
using a condom, termed intercourse without a condom for this study. Use of a condom is the only form of contraception that provides protection against STDs and HIV, and intercourse without a condom with multiple partners increases the risk for contraction of HIV or other STD. We assessed intercourse without a condom using Add Health participants’ reports of up to three relationships and three nonrelationship heterosexual encounters in the preceding year. Adolescents defined romantic relationships themselves, but answered specific questions about kissing, holding hands, and expressing affection for people outside their families to define nonrelationship encounters. For each encounter of either type, respondents reported on events that involved sexual behavior. If the respondent was male, he was asked, “When you had sexual intercourse with (initials of partner), did you insert your penis into her vagina?” If the respondent was female, she was asked, “When you had sexual intercourse with (initials of partner), did he insert his penis into your vagina?” For each instance of intercourse, using a condom was coded 0 and all other instances of having intercourse were considered to be unprotected from a health perspective and were coded 1. Each subject’s score on intercourse without a condom was the number of partners coded 1. Because the survey queried only six partners (three relationships and three nonrelationship encounters), individual scores of intercourse without a condom ranged from 0 to 6.

For this study, the term costs attitudes refers to attitudes about the costs of sex. We assessed costs attitudes using a measure derived from section 17 (Motivations to Engage in Risky Behavior) of the Add Health survey (Deptula, Henry, Schoeny, & Slavick, 2006). Adolescents’ responses to all items ranged from 1 to 5, indicating strong agreement to strong disagreement. We formed the scale score by averaging the reversed item scores; high scores represented higher levels of perceived costs. Details about the construction of these scales are available elsewhere (Deptula et al., 2006).

The nine items in the costs attitudes scale appear in the Appendix A. In the Wave 1 Add Health data, the internal consistency reliability of the scale was .77 by Cronbach’s α. The Wave 2 reliability was similar (α = .79). Deptula et al. (2006) found that each unit increase in costs was associated with a significant decrease in risk for having had intercourse.

Data Analysis

This study explores the longitudinal association between intercourse without a condom and attitudes about the costs of sex among individuals and their peers. Peer socialization is modeled by the effects of Wave 1 friends’ variables on Wave 2 individual variables, controlling for Wave 1 levels of the individual variables, and peer selection is modeled by the effects of Wave 1 individual variables on Wave 2 peer variables, controlling for Wave 1 levels of the peer variables.

The approach used in this study is a longitudinal cross-lagged analysis, which enables stronger inferences about causal direction to be drawn than either contemporaneous cross-lagged models or univariate longitudinal models. The latter two approaches do not test the reciprocal effects of multiple variables (Lorenz, Conger, Simons, & Whitbeck, 1995). Cross-lagged models are most useful when it is unknown whether multiple variables are related in a causal chain (A1 → B2) or in a feedback loop (A1 → B2 and B1 → A2). Cross-lagged estimates represent the expected effect of a predictor (A) on change in the outcome (B), by modeling the effect of a predictor (A1) on an outcome variable (B2), controlling for preexisting levels of the outcome variable (B1). Cross-lagged analysis using the Add Health data set allows for longitudinal study of both selection and socialization effects, as well as the reciprocal effects of attitudes and behavior between adolescents and their friends.

We used generalized linear models (McCullagh & Nelder, 1989; Nelder, 1961) for the cross-lagged analyses. These models allow analysis of data for a variety of distributions through error and link functions. Because intercourse without a condom was measured by counts of partners, we used a Poisson probability distribution for these analyses with a logarithmic link function. We used a generalized linear model with a normal probability distribution and an identity link function when analyzing the outcome variable of attitudes about costs of sex. A separate model was fit for each of the four Wave 2 variables: (1) individual intercourse without a condom (number of partners), (2) individual attitudes about the costs of sex, (3) friends’ intercourse without a condom (mean number of partners), and (4) friends’ mean attitudes about the costs of sex. The equation for each Wave 2 outcome variable was as follows:

\[
Y = B0 + B1 (\text{gender}) + B2 (\text{age}) + B3 (\text{other ethnicity}) + B4 (\text{African American}) + B5 (\text{Asian}) + B6 (\text{Hispanic}) + B7 (W1 \text{ proportion of same-sex nominated friends})
\]
+ $B_9$ (proportion of W2 friends not in respondents school)  
+ $B_9$ (individual W1 intercourse without condom)  
+ $B_{10}$ (individual W1 costs)  
+ $B_{11}$ (friends W1 intercourse without condom)  
+ $B_{12}$ (friends W1 costs) + e,

where $Y$ is individual or peer costs attitudes or the log of the number of individual or peer intercourse partners, $B_0$ is an intercept, and $e$ is an error term. $B_1$ estimates the effect of gender, which was coded $−.5$ for female and $.5$ for male, so that the overall effect estimates could be interpreted as the average effects across genders. Ethnicity was effect coded with non-Hispanic White as the comparison level; thus, the other estimates represent the effect for the average of all ethnicities. $B_8$ controls for the proportion of W2 nominated friends who were not in the respondent’s school or a sister school. For the Wave 2 individual variables, $B_{11}$ and $B_{12}$ estimate the cross-lagged effects, and $B_9$ and $B_{10}$ estimate the cross-lagged effects for the Wave 2 peer variables. Taken together, the four models allowed evaluation of the cross-lagged longitudinal relations between individual and peer attitudes about the costs of sex and intercourse without a condom.

To test for the moderating effects of gender, age, and ethnicity, we fit models with the interactions between these terms and the individual and friends’ predictors. Each moderated analysis also included the main effects for the predictors, gender, and the control variables. Gender was dummy coded (0 = female, 1 = male) for the moderated analysis by gender. Ethnicity was effect-coded for the moderated analyses and differences in slopes among different ethnicities were evaluated using contrasts.

## Results

### Summary Statistics

Approximately two thirds of the sample in each wave reported that they had a romantic relationship in the preceding year. Females were more likely than males to report a romantic relationship in Wave 1 (68.8% vs. 63.5%, $p<.05$) and in Wave 2 (70.2% vs. 63.8%, $p<.05$).

Table 1 shows the proportion of the sample in Waves 1 and 2 that reported engaging in no intercourse, and any intercourse with and without a condom. It also shows McNemar tests of the differences between the Waves 1 and 2 proportions, which reveal a pattern of increasing intercourse between waves. This, however, is expected due to the increasing age of the subjects. A logistic generalized linear model of Wave 2 intercourse on Wave 1 intercourse and gender found that the percentage of subjects who engaged in intercourse increased to a greater extent among females than males, $B = −.45$; standard error (SE) = .13; $\chi^2(1, N = 1,350) = 11.50; p < .01$; relative risk for male = .63. Furthermore, 2.2% of females, versus 0.4% of males, reported having intercourse without a condom with two or more partners in Wave 2 ($p < .05$). Same-sex relationships were excluded from the analyses. One and one-half percent (1.5%) of participants reported that at least one relationship or nonrelationship romantic partner was of the same sex. The proportion of females reporting at least one romantic partner of the same sex (1.9%) was significantly greater than that reported by males (1.1%), ($p < .05$). Among those who reported sexual intercourse in Wave 1 ($n = 449$), we also cross tabulated the binary indicator of any intercourse without a condom and the number of partners, regardless of condom use. The relation between these variables was strong and significant, $r_s = .58, p < .01$, suggesting that those with more partners were less likely to use condoms.

Table 2 reports the means, SDs, and correlations among the primary variables used in the cross-lagged analyses. Attitudes about the costs of sex were strongly correlated between waves ($r = .63$). Scores on the measure of attitudes about the costs of sex were normally distributed, with absolute values of skewness and kurtosis <1.0. We found no evidence for floor or ceiling effects that would have limited the amount of measurable attitude change. Repeated-measures analyses of variance with gender by time

### Table 1

<table>
<thead>
<tr>
<th>Variable</th>
<th>W1 (%)</th>
<th>W2 (%)</th>
<th>McNemar tests of W1 – W2 difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>No intercourse</td>
<td>Female</td>
<td>75.04</td>
<td>61.31</td>
</tr>
<tr>
<td></td>
<td>Male</td>
<td>70.87</td>
<td>63.73</td>
</tr>
<tr>
<td>Only intercourse with a condom</td>
<td>Female</td>
<td>19.58</td>
<td>31.47</td>
</tr>
<tr>
<td></td>
<td>Male</td>
<td>22.84</td>
<td>30.81</td>
</tr>
<tr>
<td>Any intercourse without a condom</td>
<td>Female</td>
<td>5.41</td>
<td>7.01</td>
</tr>
<tr>
<td></td>
<td>Male</td>
<td>6.30</td>
<td>5.46</td>
</tr>
</tbody>
</table>

Note. *$p<.05$; **$p<.01$. 


interactions found a small but significant negative change in average individual attitudes about the costs of sex between Waves 1 and 2, \( F(1, 1323) = 15.64, p < .01, \text{d} = -.22, \) and friends’ attitudes about the costs of sex between Waves 1 and 2, \( F(1, 1323) = 5.70, p < .05, \text{d} = -.13. \) We found no differences in attitude change over time by gender.

Results of the Cross-Lagged Analyses

Table 3 reports the regression coefficients, \( SEs, \) significance tests, and effect sizes for the individual and friends’ predictors. Effect sizes in the table appear in units of Pearson’s \( r, \) representing the expected unit increase in the outcome variable per unit increase in the predictor. Significant cross-lagged effects from individuals to friends and from friends to individuals occurred over time.

We tested for effects consistent with socialization by predicting Wave 2 individual intercourse without a condom and Wave 2 individual attitudes about the costs of sex by Wave 1 friends’ variables, controlling for Wave 1 levels of the outcomes. Friends’ Wave 1 predictors were often associated with individual Wave 2 outcomes. Having friends in Wave 1 who had more frequent intercourse without a condom was associated with higher levels of individual intercourse without a condom in Wave 2. Having friends in Wave 1 with stronger beliefs in the costs of sex was associated with lower levels of individual intercourse without a condom in Wave 2. Finally, higher attitudes about the costs of sex among friends in Wave 1 were associated with higher perceived costs among individuals in Wave 2.

We tested for effects consistent with selection by predicting Wave 2 friends’ intercourse without condoms and Wave 2 friends’ costs attitudes by Wave 1 individual variables, controlling for Wave 1 levels of the outcomes. Youth who perceived higher costs in Wave 1 tended to have friends in Wave 2 who also perceived higher costs of sexual intercourse. This was the strongest cross-lagged effect in these analyses (\( r = .17 \)). Because selection involves both selection of new friends and deselection or retention of existing friends, we conducted follow-up analyses to determine the extent to which these results were due to selection versus influence on retained friends. These analyses focused on two subsamples: one that excluded those nominating only new friends in Wave 2 (retained friends subsample), and the other excluding those who, in Wave 2, nominated only friends who had also been nominated in Wave 1 (new friends subsample). We calculated friends’ intercourse without a condom and costs attitudes in Wave 2 by taking the mean values of the retained and new friends. We fitted models for selection effects related to intercourse without a condom and attitudes using each of these subsamples. The results, reported in Table 4, were similar to those obtained with the full sample. Individual costs attitudes significantly influenced both retained and new friends’ costs attitudes in Wave 2 by taking the mean values of the retained and new friends. We fitted models for selection effects related to intercourse without a condom and attitudes using each of these subsamples. The results, reported in Table 4, were similar to those obtained with the full sample. Individual costs attitudes significantly influenced both retained and new friends’ costs attitudes in Wave 2, and influenced intercourse without a condom among retained, but not new friends in Wave 2. The effect of individual attitudes on intercourse without a condom was significant when retained friends’ attitudes were tested. This relation had not been significant in the main analysis.

Moderated Analyses

The models for testing the moderating effects of age and ethnicity were identical to the models for the main analyses, except that they included interactions
each model controlled for individual gender, ethnicity, age, the gender composition of the friendship network, and the proportion of W1 friends no longer in school in W2. Effect sizes are expressed in units of Pearson’s r with the signs retained to communicate the directions of the effects.

Note. W1 = Wave 1; W2 = Wave 2.

The analysis testing the moderating effect of age did not return any significant interaction terms, but the moderated analysis for ethnicity returned significant interactions indicating ethnic differences in selection effects. Contrasts showed that, compared with Hispanic subjects, African American and non-Hispanic White subjects had stronger positive Waves 1–2 effects of individual costs attitudes on friends’ costs attitudes, \( B = .12, \ SE = .06, \) \( \Pi_2 \ (1, N = 1,350) = 4.26, p < .05 \) for African American subjects, and \( B = .10, \ SE = .04, \) \( \Pi_2 \ (1, N = 1,350) = 4.85, p < .05 \) for non-Hispanic White subjects.

To test for gender differences in the effects, we constructed a series of models that included interactions between the predictor variables and gender. These analyses found gender differences between Wave 1 friends’ attitudes about the cost of sex and Wave 2 individual intercourse without a condom, \( B = .81, \ SE = .41, \chi^2(1, N = 1,350) = 3.82, p = .05 \). For females, Wave 1 friends’ attitudes about the costs of sex predicted individual intercourse without a condom significantly and negatively, \( B = -1.01, \ SE = .41, \chi^2(1, N = 1,350) = 6.07, p < .05, r = -.07 \), but this relation did not hold for males, \( B = -.21, \ SE = .41, \chi^2(1, N = 1,350) = 0.26, ns, r = -.01 \). Figure 1 graphs this effect. Although individual costs attitudes predicted individual intercourse without a condom in these moderated analyses, \( B = -.59, \ SE = .14, \chi^2(1, N = 1,350) = 17.79, p < .01, r = -.11 \), there was no evidence of differential effects of individual attitudes on subsequent individual intercourse without a condom by gender, \( B = .21, \ SE = .27, \chi^2(1, N = 1,350) = 0.58, ns \).

We conducted three variations on all analyses: (1) with a data set in which missing values had been imputed using multiple imputation (Schafer & Graham, 2002), (2) with a data set using reciprocated rather than nonreciprocated nominations, and (3) with a measure of costs attitudes including only
nonpregnancy items. The magnitude, but not statistical significance, of some effects differed when using imputation, suggesting that using listwise deletion rather than imputing missing data would not change the study conclusions. Using reciprocated nominations also did not substantially change the results, and required the exclusion of many more subjects than were excluded when using nonreciprocated nominations. The analyses using nonpregnancy costs also returned effects similar to the analyses with the full costs attitudes scale. Friends' costs attitudes predicted individual intercourse without a condom marginally, $B = .27$, $SE = .14$, $\chi^2(1, N = 1,350) = 3.75, p < .10$, but the interaction between gender and friends' costs attitudes, although similar in direction to that found in the main analyses, was not significant, $B = .38$, $SE = .24$, $\chi^2(1, N = 1,350) = 2.63, ns$. The effects of friends' costs attitudes on individual costs attitudes were significant and similar in magnitude to those in the main analyses, as were the effects of individual costs attitudes on friends' costs attitudes. Because the results were similar to those using the measure of costs that included the pregnancy items, and because the full measure possessed a higher internal consistency, we used the full scale for the main analyses.

Discussion

Overall, the picture that emerges from this study is one of a small but potentially important risk to adolescent health in which peers play a modest but significant part. In this study, approximately 6% of adolescents had intercourse without a condom at least once in Wave 2, and those with more sexual partners were less likely to have used condoms than those with fewer partners. Inconsistent condom use and multiple sexual partners have been associated

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**Table 4**

Cross-Lagged Selection Effect Sizes Using Subsamples Reporting New and Retained Friends at W2

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Retained friends</th>
<th>New friends</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$N = 868$</td>
<td>$N = 885$</td>
</tr>
<tr>
<td>Selection: W2 friends' intercourse without a condom*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>W1 individual intercourse without a condom*</td>
<td>.01</td>
<td>.01</td>
</tr>
<tr>
<td>W1 individual costs attitudes</td>
<td>$-.07^*$</td>
<td>$-.05$</td>
</tr>
<tr>
<td>W1 friends' intercourse without a condom*</td>
<td>.04</td>
<td>.02</td>
</tr>
<tr>
<td>W1 friends' costs attitudes</td>
<td>$-.08^*$</td>
<td>$.06$</td>
</tr>
<tr>
<td>Selection: W2 friends' costs of sex</td>
<td></td>
<td></td>
</tr>
<tr>
<td>W1 individual intercourse without a condom*</td>
<td>$-.06$</td>
<td>$.02$</td>
</tr>
<tr>
<td>W1 individual costs attitudes</td>
<td>$.13^{**}$</td>
<td>$.15^{**}$</td>
</tr>
<tr>
<td>W1 friends' intercourse without a condom*</td>
<td>$-.02$</td>
<td>$.03$</td>
</tr>
<tr>
<td>W1 friends' costs attitudes</td>
<td>$.58^{**}$</td>
<td>$.16^{**}$</td>
</tr>
</tbody>
</table>

Note. W1 = Wave 1; W2 = Wave 2.
The subsample of retained friends consisted of the 868 respondents who nominated at least one friend in W2 who was also nominated in W1, and the subsample of new friends consisted of the 885 subjects who nominated at least one new friend in W2 who was not nominated in W1. Effect sizes are expressed in units of Pearson’s $r$ to facilitate comparisons, with the signs retained to communicate the directions of the effects. Each model controlled for individual gender, ethnicity, age, the gender composition of the friendship network, and the proportion of W1 friends no longer in school in W2.

*Number of cross-sex partners (maximum of six) with whom the respondent had intercourse without a condom.

$p < .05; ^{**}p < .01$.
The cross-lagged longitudinal analyses found evidence for peer socialization and selection processes affecting change in sexual risk. Because each analysis controlled for preexisting levels of the outcome variable, the obtained effects may be interpreted as influences on change rather than influences on absolute levels of risk. The analyses testing effects consistent with socialization found that friends’ intercourse without a condom predicted change in individual intercourse without a condom, and that friends’ attitudes about the costs of sex predicted change in individual costs attitudes and in individual intercourse without a condom. These modest effects are not direct evidence for socialization, as are studies of deviancy training (Dishion et al., 1996). Nevertheless, they are consistent with the idea that socialization effects operate primarily through friends’ attitudes.

The analyses testing selection effects found that individual attitudes about the costs of sex were associated with change in friends’ attitudes about the costs of sex 1 year later. This effect is consistent with the notion that individuals select friends whose attitudes are similar to their own, a conclusion supported by follow-up analysis using only the Wave 2 attitudes of new friends. In addition, we found significant effects of individual Wave 1 costs attitudes on change in intercourse without a condom among retained friends. The analyses using the attitudes of retained and new friends underscore the pivotal role of attitudes, but not behavior, in both the selection of new friends and retention of, or influence on, existing friends.

The bidirectional pathways of influence found in this study of sexual behavior differ from findings of socialization but not selection effects in studies of substance use (Wills & Cleary, 1999). The effects in this study are consistent with Berndt’s (1992) suggestion that peer relations involve processes of mutual rather than unidirectional influence. Although peers’ attitudes and sexual behavior influence adolescents, adolescents also choose friends whose attitudes are consistent with their own, a process that may reinforce and legitimize their own attitudes about sex. The important role of attitudes in these results is noteworthy in this connection. The reciprocal effects of individual and friends’ attitudes, although modest in size, were the strongest cross-lagged effects in this study.

Peer selection or socialization may contribute to generally increasing sexual risk among adolescents through pluralistic ignorance. When adolescents talk with their friends about sex, they may espouse attitudes or make behavioral claims that exaggerate the risk of their actual behavior (Cohen & Shotland, 1996). In an attempt to gain their peers’ acceptance, adolescents may conform to their perceptions of friends’ attitudes and behaviors (Urberg, Luo, Pilgrim, & Degirmencioğlu, 2003), or replicate the level of risk their friends describe with respect to attitudes or behaviors.

Selection and socialization effects varied by ethnicity, but not in a manner consistent with a previous study, suggesting that peer effects might be stronger among non-Hispanic Whites than among African Americans (Marmer, 1999). In this investigation, African Americans did not differ from non-Hispanic Whites in selection or socialization effects, and both of these groups evidenced stronger selection effects than did Hispanics. The peer effects among Asian subjects did not differ from any other ethnic group, or from the average effect. The ethnic difference in peer influence among Hispanic subjects may be due to ethnic differences in the relation between acculturation, peer influences, and risk. For example, Kirchunova (2004) found that, among Hispanics, acculturation predicted the level of peer influence on academic achievement.

There was also evidence for differential socialization effects by gender. Females, to a greater extent than males, were more likely to engage in intercourse without a condom in Wave 2 if their Wave 1 friends perceived fewer costs concerning sex. The gender differences found in this study are consistent with findings that, compared with males, females are at a higher risk for having multiple sex partners and for engaging in higher risk sexual behaviors (Ford, Sohn, & Lepkowski, 2002), and that peer relations may contribute to heightened female risk (Udry & Billy, 1987). One possible explanation relates to differences in self-construals. Females tend to perceive themselves as interdependent with others, whereas males tend to perceive themselves as independent of others (Cross & Madson, 1997). Greater perceived interdependence may lead to greater responsiveness to the attitudes of friends, which may explain the finding that friends’ attitudes about the costs of sex predicted more frequent intercourse without a condom among females but not among males.

A second possible explanation for the obtained gender differences derives from the scale of attitudes about the costs of sex. The costs of sex noted in the scale are greater for females than males and may have been responsible for the stronger influence of friends’ attitudes about the costs of sex on females. However, our results provide mixed support for this
contention. Consistent with this explanation, when the analysis was conducted without the items relating to pregnancy, the moderating effect of gender was not significant. Contrary to this explanation, the moderated analyses found a differential effect of friends’ attitudes on individual behavior, but no differential effect of individual attitudes on individual behavior. It is difficult to imagine why, among females, higher risk items would result in stronger effects of friends’ attitudes but not stronger effects of their own individual attitudes. We believe, therefore, that the gender differences in socialization effects are not an artifact of the scale items.

The effects of friends’ attitudes found in this study have implications for prevention. These findings may support previous research showing that using adolescents in leadership roles may be an effective way to change attitudes and norms regarding sexual behavior (Mellanby, Newcomb, Rees, & Tripp, 2001). Because the measure of peer influence in this study was limited to the influence of friends’ attitudes and behaviors, we cannot determine whether the effects would translate to adolescent leaders who are not friends. A second implication is that social norms interventions such as those used for substance use prevention (Perkins, 2003) may be more effective among females than among males in preventing high-risk sexual behavior. Such interventions should be implemented with caution, however, because unintended negative consequences have surfaced in similar interventions for substance use (Wechsler et al., 2003) and delinquency (Dishion, McCord, & Poulin, 1999). There is a need for research that can inform intervention and developmental science by enriching our understanding of the influence of peers on adolescents, variations in influence by gender, and the influence of friends within larger peer contexts.

Study Limitations

The limitations of this study should be considered when interpreting these results. First, the sample consisted solely of the saturated schools of the Add Health data set and was not designed to be representative of the U.S. population as a whole. Second, the sample included only those students who remained in school over both years of the study and nominated friends who attended their schools or sister schools. These constraints were necessary because testing the research questions required longitudinal stability of both individuals and at least some of their friends. We do not believe that limiting the sample in this way resulted in artificially lower friendship stability. Berndt and Hoyle (1985) note that the stability of friendships changes little from 4th to 11th grades. Third, this study used nonreciprocated friendship nominations to represent friends’ influence on the individual. This method permitted using a larger and more representative sample than would have been possible with reciprocated friendship nominations. In addition, previous research suggests that using nonreciprocated nominations captures aspects of peer influence not assessed by reciprocated nominations (Kiesner et al., 2003). The limitation of this method is that we cannot differentiate between the effects of actual and desired friendships.

Fourth, excluding romantic partners may have been partially responsible for the greater impact of peer attitudes compared with peer behaviors. Interactions with peers other than romantic partners might have been more likely to focus openly on the potential costs of sex, a less sensitive topic than peers’ actual behaviors. Sexual behavior might not have been as open a topic for peer discussions, making sexual behavior less influential than peer attitudes as a predictor of adolescent behavior. Excluding romantic partners also may have resulted in underestimating the strength of socialization effects.

Fifth, these analyses did not consider the influence of school or community levels. Some of the effects attributed to friends in this investigation may have related to school- or community-level differences.

We took several measures to cope with these limitations and increase the validity of the results. We tested for floor or ceiling effects that would have affected estimates on the attitude measure, but found none. We included appropriate control variables to control for relations between outcome variables and ethnicity, age, the gender composition of networks, and the proportion of friends not in school in Wave 2. Because the measure of intercourse without a condom consisted of counts of partners, we used Poisson regression for analyses of this outcome variable. We also conducted the analyses with imputed data and reciprocated nominations to determine the degree to which our decisions about imputation and reciprocation had on the results. In addition, the analyses in this study controlled for Wave 1 levels of intercourse without a condom and attitudes of the individual adolescents and the sexual behavior and attitudes of their friends. The effect estimates from these analyses are thus the contribution of the predictors to change in the outcome variables, controlling for the Wave 1 levels of other predictors and the demographic and network composition control variables.
Conclusion

Despite these limitations, this study contributes to the literature in three ways. It is the first study to use cross-lagged analysis to consider simultaneously the longitudinal effects of selection and socialization on sexual behavior (cf. Manski, 1995). This is also one of the few studies to consider the role of attitudes in peer influences in sexual behavior. By differentiating attitudes about sex from sexual behavior that might be observed or described by others, it adds to the literature by providing evidence that attitudes are pivotal for understanding peer influences (Henry et al., 2000). Because this study evaluated peer influences on intercourse without a condom, it has implications for efforts to reduce HIV/STD risk among adolescents. More generally, this study enhances a growing body of literature that seeks to understand development within multiple nested contexts (Bronfenbrenner, 1979). Friendship groups are important contexts for adolescent development and may facilitate or impede efforts to prevent high-risk sexual behavior.

References


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**Appendix A**

Table A1

<table>
<thead>
<tr>
<th>Items Included in the Attitudes About the Costs of Sex Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. If you had sexual intercourse, your partner would lose respect for you</td>
</tr>
<tr>
<td>2. If you had sexual intercourse, afterward, you would feel guilty</td>
</tr>
<tr>
<td>3. If you got (someone) pregnant, it would be embarrassing for your family</td>
</tr>
<tr>
<td>4. If you got (someone) pregnant, it would be embarrassing for you</td>
</tr>
<tr>
<td>5. If you got (someone) pregnant, you would have to quit school</td>
</tr>
<tr>
<td>6. If you got (someone) pregnant, you might marry the wrong person</td>
</tr>
<tr>
<td>7. If you got (someone) pregnant, you would be forced to grow up too fast</td>
</tr>
<tr>
<td>8. Getting (someone) pregnant at this time in your life is one of the worst things that could happen to you</td>
</tr>
<tr>
<td>9. It wouldn’t be all that bad if you got (someone) pregnant at this time in your life. (reverse scored)</td>
</tr>
</tbody>
</table>