

Supportive Relationships and Sexual Risk Behavior in Adolescence: An Ecological–Transactional Approach

Christopher C. Henrich,¹ PhD, Kathryn A. Brookmeyer,¹ MA, Lydia A. Shrier,² MD, MPH, and Golan Shahar,³ PhD

¹Georgia State University, ²Harvard University, and ³Yale University

Objective To examine the longitudinal associations between supportive relationships with friends and parents and sexual risk behavior in adolescence based on an ecological–transactional perspective. **Methods** Analyses were conducted on 2,652 sexually active adolescents from the first two waves of the National Longitudinal Study of Adolescent Health (Add Health). **Results** African-American adolescents had lower risk for sexual risk behavior. Supportive friendships and parent connectedness interacted in predicting decreased likelihood of sexual risk behavior. Mother–child communication about sex contributed to decreased likelihood of sexual risk only for girls. There were also small reciprocal effects of sexual risk behavior on decreased relationship quality over time. **Conclusion** To better understand the parents' role in adolescent sexual risk behavior, multiple facets of parenting, the social contexts of parenting and adolescents' peers, and the effects of adolescents' behavior on these relationships should be taken into consideration.

Key words adolescence; friends; HIV/AIDS; parents; sexual risk behavior.

In the United States, AIDS is the leading cause of death for adults between the ages of 25 and 44 (Center for Disease Control and Prevention, 2002). Owing to the long incubation period of HIV (Center for Disease Control, 2001), it is likely that many of these adults were infected with HIV during adolescence. In fact, according to the Center for Disease Control and Prevention (2003a), in 1999 at least half of all new HIV infections were among people under the age of 25. These alarmingly high rates of youth HIV infection are linked to adolescents' engagement in sexual risk behaviors. Of all youth AIDS cases in 2000, 59% of males and 45% of females contracted HIV through sexual intercourse (Center for Disease Control and Prevention, 2002). In 2003, of sexually active high-school students nationwide, 37% reported that neither they nor their partner had used a condom during last sexual intercourse (Center for Disease Control and Prevention, 2004) and just over one quarter (25.4%) had used alcohol or drugs during their last sexual encounter (Center for Disease Control and Prevention, 2004).

Since the early 1990s, the Center for Disease Control and Prevention (2003a) has documented both racial and gender shifts in the populations affected by the HIV epidemic, and the shifts are most marked among adolescents. Although females over 25 years of age make up a third of all those infected with HIV, females under 25 make up 51% of HIV infections among youth (Center for Disease Control and Prevention, 2003b). Additionally, African-Americans represent more than half of all new HIV infections (Center for Disease Control, 2000). These statistics point to the importance of investigating sexual behaviors associated with risk of acquiring HIV infection during adolescence as well as how best to protect adolescents from these risk behaviors, especially those groups increasingly affected by the epidemic. Efforts to explicate the processes associated with sexual risk behavior in adolescence have the ability to affect youth social contexts, increase the visibility of adolescence susceptibility to HIV infection, and inform youth intervention and prevention efforts (e.g., Dittus, Miller, Kotchick, & Forehand, 2004).

All correspondence concerning this article should be addressed to Christopher C. Henrich, Department of Psychology, Georgia State University, PO Box 5010, Atlanta, Georgia 30302. E-mail: chenrich@gsu.edu.

Journal of Pediatric Psychology 31(3) pp. 286–297, 2006

doi:10.1093/jpepsy/jsj024

Advance Access publication April 12, 2005

Journal of Pediatric Psychology vol. 31 no. 3 © The Author 2005. Published by Oxford University Press on behalf of the Society of Pediatric Psychology. All rights reserved. For permissions, please e-mail: journals.permissions@oupjournals.org

This study, espousing an ecological–transactional theoretical approach, investigates the role of supportive relationships with parents and friends as potential protective factors against the development of adolescent sexual risk behavior. According to this approach, understanding adolescent behavioral risk and protective factors requires the consideration of ecological effects, that is the social contexts in which the risk and protection occurs (Bronfenbrenner, 1977; Cicchetti & Lynch, 1993), as well as transactional effects, that is the reciprocal nature of the relationship between adolescents' behavior and their social contexts (e.g., Cicchetti, Toth, & Maughan, 2000; Coatsworth et al., 2000; Sameroff, 1995). The ecological/transactional approach emphasizes that the most proximal influences, such as family and friends, may have the greatest effects on developmental outcomes (Cicchetti et al., 2000; Sameroff, 1995). Guided by this approach, researchers examine the ways in which risk and protective factors interact with one another across and within proximal social contexts and their reciprocal patterns of the association with adolescent sexual risk behavior over time.

Findings from previous research demonstrate that quality of the parent–child relationship, parent–child communication, and peer support represent interacting social systems that are related to adolescent sexual risk behavior. The role of support within the family has been widely examined in relation to adolescent sexual risk. Adolescents who report higher levels of connectedness with parents have lower rates of unprotected sexual intercourse (Crosby et al., 2001; Hutchinson, Jemmott, Jemmott, Braverman, & Fong, 2003), engage in sexual intercourse with fewer partners (Crosby et al., 2001; Voisin, 2002) are older at first sexual intercourse (Miller, Norton, Fan, & Christopherson, 1998) and make safer sexual decisions overall (Perrino, Gonzalez-Soldevilla, Pantin, & Szopacznik, 2000; Resnick et al., 1997).

Communication with adolescents about sex appears to be another important aspect of the parent–child relationship pertaining to adolescent sexual risk taking and is a research area that has received much attention. For example, parent–adolescent communication about sex is related to adolescents asking their partners about sexually transmitted diseases as well as number of intimate partners (Hutchinson & Cooney, 1998). Female adolescents' decision-making about sex appears to be particularly influenced by parent communication about sex (Werner-Wilson, 1998), although less communication has been also linked to more conservative female attitudes about sex (Somers & Paulson, 2000).

The pattern of adolescent risk becomes even more complex once the effects of the peer group on risk behaviors are considered. Peers become important behavioral referents in adolescence, and much research has documented the similarities in levels of risk behavior within peer groups (e.g., Boyer, Tschann, & Shafer, 1999; Henrich, Kuperminc, Sack, Blatt, & Leadbeater, 2000; Romer et al., 1994). Further, the impacts of parents and peers are interactively related as demonstrated by research findings that adolescents' sexual behaviors are more closely aligned with peer norms if adolescents have not discussed sex or condoms with their parents (Whitaker & Miller, 2000).

Although supportive friendships have been associated with fewer sexual partners (Rotherbaum-Borus, Reid, & Rosario, 1994), research on another facet of adolescent risk, substance use, suggests that support from friends may operate differentially depending on social context. Supportive friendships have been related to elevated levels of adolescent substance use, especially when peers exhibit high levels of substance use (Wills & Vaughan, 1989; Wills, Mariani & Filer, 1996). Additionally, supportive friendships were more strongly related to higher levels of substance among adolescents who reported low levels of parent support (Wills & Vaughan, 1989).

Such interactions between the parent and peer contexts suggest that examining only one proximal source of supportive relationships may not elucidate the whole story of social influences on adolescent risk behavior. Examining the family–peer mesosystem [i.e., the development of behavior across two or more social contexts (Bronfenbrenner & Crouter, 1983)] may be a more powerful way to measure supportive relationships' influences on adolescent risk behavior. It is also important to investigate the dynamics of social contexts over time to tease apart effects of stability and change within the family–peer mesosystem (Bronfenbrenner & Morris, 1998). This study draws on the ecological literature by examining the interactive effects of supportive relationships with parents and friends on sexual risk behavior in adolescence.

The transactional perspective emphasizes the influence that children exert on their social contexts as part of the cycle leading to the development of problem behaviors (Sameroff, 1995). For example, children with behavior problems can negatively influence their parents' parenting styles to be more punitive and coercive, thus contributing to a vicious cycle of dysfunction (Petit, Laird, Dodge, Bates, & Criss, 2001). To our knowledge, no one has investigated transactional effects of sexual risk behavior in adolescence. However, a key component of understanding cycles of risk and protection

in adolescents' sexual decision-making is to examine how adolescents' sexual risk behavior is associated with change in parent-child relationship quality. Much of the extant research on adolescent sexual risk behavior and social relationships, although offering promising beginnings, is based on cross-sectional data and cannot reveal the ecological and transactional nature of the developmental processes through which risk and protective influences are associated with adolescent risk behaviors (Bronfenbrenner, 1977; Cicchetti & Lynch, 1993; Masten & Coastworth, 1995; Sameroff, 1995). Therefore, there is a need for more sophisticated methodology utilizing longitudinal modeling of complex multivariate designs to allow for the estimation of bidirectional effects between supportive relationships and adolescents' sexual risk as well as the exploration of interactions between stability and change within a mesosystem. Further, understanding how baseline sexual risk interacts with stability and change in the family-peer mesosystem enhances interpretability of the sexual risk outcome as being either onset of risk behavior, termination of risk behavior, or sustained risk behavior (Joiner, 1994).

This study addresses these issues by investigating the potential protective influences of adolescents' supportive relationships with parents and friends on change in sexual risk behavior over time. In addition, the study examines the influence that adolescents engaging in risk behavior may exert on their relationships with parents and friends. Longitudinal analyses were conducted by using data from sexually active adolescents who participated in the first 2 years of the National Longitudinal Study of Adolescent Health (Add Health) to address two sets of main research questions: First, do differing levels of relationship quality (a) within the family-peer mesosystem and (b) among different facets of the parent-child relationship interact in their patterns of association with sexual risk behavior? Second, with the understanding from a transactional perspective that adolescents' behavior may have an impact on their social relationships, to what extent are the study's findings reciprocal in that sexual risk behavior has effects on decreased relationship quality? Moderation by gender and race is included in the analyses investigating these research questions to explore whether protective processes operate differentially for groups experiencing increased risk for contracting HIV.

Method

Participants

Data for this study were taken from the first two waves of the National Longitudinal Study of Adolescent Health

(Add Health), a study of 20,745 adolescents. This sample included a nationally representative core sample of 12,105 students in grades 7 through 12 at the onset of the study. Add Health was designed with the understanding that families, friends, schools, and communities play important roles in the lives of adolescents. To facilitate such analyses, researchers used a clustered sampling design based around 132 schools to recruit the nationally representative sample. This sample from 80 schools and 52 middle schools from the United States was selected with unequal probability of selection. Incorporating systematic sampling methods and implicit stratification in the Add Health study design ensured this sample was representative of US schools with respect to region of country, urbanicity, school type, ethnicity, and school size (Bearman, Jones, & Udry, 1997).

This study used a subsample of 2,655 adolescents (all but three of whom had complete data on all measures) in the core sample who met the criteria of (a) participating in both waves, (b) reporting sexual activity at Wave 1, and (c) being at least 15 years old at Wave 1 because many sexual questions were asked only to participants age 15 and older. The median age of the subsample was 17 years. It was split roughly equally by gender (49% female) and 12% of the sample reported being of Hispanic ethnicity. The sample was 64.1% White (including Hispanic), 28.1% African-American, 2.8% Asian, and 4% American Indian.

Measures and Procedure

In 1995 (Wave 1), adolescents were administered an extensive survey during in-home interviews, and their parents completed a questionnaire. In 1996 (Wave 2), adolescents were administered the in-home survey a second time. In the interview, adolescents were asked about their relationships with family and friends, and they were asked about their participation in an array of sexual risk behaviors. For questions about sensitive and illegal behaviors, adolescents directly entered their responses into interviewers' laptops, with the screen facing away from the interviewer (Blum, Ireland, & Blum, 2003).

Parent-Child Relationship

Add Health includes an 11-item *parent connectedness* scale (Sieving et al., 2001) for which adolescents reported on the quality of their relationships with their parents and the extent to which their parents care about and support them. Sample items include, "how close do you feel to your mother/father?" and "most of the time your mother/father is warm and loving toward you." Adolescents responded to items on a 5-point scales from "not at all" to "very much," and from "strongly disagree"

to “strongly agree.” Items were averaged into a scale with good internal consistency, $\alpha = .87$, in both waves.

Mother–Child Communication About Sex

A subsample of 2,230 adolescents (84%) had parent report data available from the first wave of the Add Health study. [The subsample of adolescents with parent report reported higher levels of supportive relationship variables, multivariate $F(2, 2652) = 3.96, p = .02$.] The parent questionnaire included six items tapping the extent to which parents discussed sex with their adolescent. Items including talking about birth control, sex, the negative things that would happen if the adolescent got/got somebody pregnant, the dangers of getting a sexually transmitted disease, the negative impact on the adolescent’s social life from losing the respect of others, and the moral issues of not having sex. Parents answered each question on a 4-point scale from 1, “not at all,” to 4, “a great deal.” These items were averaged in an internally consistent scale of parent–child communication about sex, $\alpha = .89$. Ninety-six percent of parents completing the questionnaire were mothers (91% = biological, step, or foster mothers) or other female caregivers (4%; e.g., grandmother or aunt). The remaining 4% were fathers or other male relatives. Because of the vast majority of respondents being mothers or other female caregivers, the 4% of male respondents were excluded from the analyses, and the scale was named mother–child communication about sex.

Supportive Friendships

Adolescents reported on five items assessing the frequency with which they had spent time, talked, and discussed their problems with their closest male and female friends. Adolescents indicated whether they had engaged in each of these activities with each friend in the past 7 days. Measures derived from these items have been found to be related to adolescent academic adjustment (Crosnoe & Elder, 2004). When the five items for closest male friend and the five items for closest female friend were averaged (and then multiplied by 5 to be on the same metric as parent connectedness), they formed a 10-item scale assessing frequency of support from closest friends with borderline internal consistency ($\alpha = .68$ in Wave 1; $\alpha = .66$ in Wave 2).

Sexual Risk Behavior

Five behaviors considered sexual risks at each wave of measurement were summed to form a sexual risk behavior index for each wave. The five risks at Wave 1 were never used a condom (10%), drinking during either first or most recent sex (15.5%), using drugs during either

first or most recent sex (7.9%), ever has sex for drugs or money (2.5%), and early onset of sexual activity [<13 years old, 11.6% (age from the Center for Disease Control and Prevention’s Youth Risk Behavior Survey, Brener et al., 2002)]. The five risks at Wave 2 were have not used a condom in past year (4.3%), drinking during most recent sex (10.7%), using drugs during most recent sex (7.4%), sex for drugs or money (3.5%), and ever had anal sex (15.2%). At Wave 1, 63.1% of the sample reported no sexual risk behaviors, 28.2% reported one risk, and 8.7% reported multiple risks. At Wave 2, 68.4% reported no sexual risk behaviors, 24.2% reported one risk, and 7.5% reported multiple risks. Because most adolescents reported no sexual risk behaviors in both waves and a very few reported multiple risks, sexual risk behavior was treated as a binary variable in the analyses (0, “no risks”; 1, “at least one risk”).

Results

Representativeness of Sample

Initial analyses were conducted to compare our sample of 2,755 adolescents who reported sexual activity with all adolescents age 15 years and older in Add Health’s core sample. Our sample was older ($M = 16.71, SD = 1.10$, compared to $M = 16.38$), $t(2754) = 15.80, p < .001$, and had a higher proportion of males, $\chi^2(1) = 1332.84, p < .001$ and African-Americans, $\chi^2(1) = 99.58, p < .001$, and a lower proportion of Whites, $\chi^2(1) = 35.37, p < .001$ and Asians, $\chi^2(1) = 15.36, p < .001$. There were no other racial or ethnic differences between the sexually active sample and the core sample. Because of differences in age, gender, and race, these demographic variables were controlled for in all analyses. Moderation by gender and race was also included in the analyses (Steinberg & Fletcher, 1998).

Descriptive Statistics

Means, standard deviations, and correlations among variables are presented in Table I. Parent connectedness and supportive friendships were not correlated with one another at either wave, nor were they correlated across waves. Parent connectedness was negatively correlated with sexual risk at both waves. Supportive friendships at Wave 2 were slightly negatively correlated with sexual risk at Wave 1. There were also many gender differences. Girls reported slightly more supportive friendships and less parent connectedness than did boys at both waves of measurement. More boys reported engaging in sexual risk behavior at Wave 1, but there were no gender differences in sexual risk at Wave 2. There were

Table I. Correlations Among Measured Variables and Descriptive Statistics ($N = 2,652$)

	1	2	3	4	5	6	7	8	<i>M (SD)</i>
1. Age	1.0								16.71 (1.10)
2. Gender	-.03	1.0							
3. African-American	-.06*	-.03	1.0						
4. Supportive friendships Wave 1	.10*	.08*	-.16*	1.0					3.22 (1.21)
5. Parent connectedness Wave 1	-.01	-.15*	.08*	-.00	1.0				4.07 (.65)
6. Sexual risk behavior Wave 1	-.01	-.10*	-.02	-.01	-.08*	1.0			
7. Supportive friendships Wave 2	.06*	.05*	-.17*	.34*	.01	-.03	1.0		3.45 (1.15)
8. Parent connectedness Wave 2	.01	-.09*	.06*	.02	.60*	-.09*	.00	1.0	4.04 (.67)
9. Sexual risk behavior Wave 2	.06*	-.02	-.07*	.02	-.08*	.24*	.04	-.11	

For gender, male = 0 and female = 1.

* $p < .01$.

also some racial differences. African-American adolescents in the sample were younger, reported less supportive friendships at both waves of measurement, reported higher levels of parent connectedness at both waves of measurement, and were less likely to engage in sexual risk behavior at Wave 2.

Regression Analyses

Hierarchical regression analyses were used to test this study's ecological and transactional hypothesis. In all analyses, missing data were dealt with through list-wise deletion. The ecological analyses employed logistic regression because sexual risk behavior was operationalized as a binary outcome. In the first step of these analyses, Wave 1 sexual risk, age, gender, and a race dummy code (1, "African-American") were entered. In the second step, Wave 1 parent connectedness and supportive friendships were entered. Thus, this step represents the traditional way to test direct effects in longitudinal analyses (Davis, 1985). In the third step, Wave 2 parent connectedness and supportive friendships were entered. Thus, in this step, Wave 2 supportive relationships can be interpreted as change in relationship supportiveness over time, whereas the Wave 1 variables become stable in supportive relationships over time.

In subsequent steps, interactions between supportive relationships and baseline risk and among the relationship variables were examined. This comparative analysis of interaction effects between two social contexts (parent connectedness and supportive friendships) is an established way to operationalize Bronfenbrenner's conceptualization of the mesosystem (Bronfenbrenner, 1977; Bronfenbrenner & Crouter, 1983), and the inclusion of supportive relationship data from both waves of measurement allows for the assessment of stability versus change within the family-peer mesosystem (Bronfenbrenner & Morris, 1998). The fifth step

included the following two-way interactions: Wave 1 supportive friendships \times Wave 1 parent connectedness (i.e., mesosystem stability); Wave 2 supportive friendship \times Wave 2 parent connectedness (i.e., mesosystem change); Wave 1 supportive friendship \times Wave 2 parent connectedness and Wave 1 parent connectedness \times Wave 2 supportive friendships (i.e., interactions among stability and change in the mesosystem); and Wave 1 sexual risk \times Wave 1 parent connectedness, Wave 1 sexual risk \times Wave 2 parent connectedness, Wave 1 sexual risk \times Wave 1 supportive friendships, and Wave 1 sexual risk \times Wave 2 supportive friendships [i.e., interactions with baseline risk to clarify the interpretation of the outcome effects (Joiner, 1994)]. In the sixth step, two-way supportive relationships \times gender and relationships-race interactions were entered to explore for gender and racial differences. The final step in the model consisted of two three-way interactions designed to test whether relationship quality in one context further moderated any interactions between sexual risk at Wave 1 and change over time in relationship quality in the other context. These two interactions were sexual risk at Wave 1 \times supportive friendships at Wave 1 \times parent connectedness at Wave 2 and sexual risk at Wave 1 \times parent connectedness at Wave 1 \times supportive friendships at Wave 2.

Table II summarizes the estimates from the final model, which includes the interaction terms. In the presence of interaction terms, main effects become difficult to interpret (Aiken & West, 1991), so in the text, the main effect estimates are presented from the first three steps when they were first entered into the model, noting whether each was maintained in the presence of the subsequently entered interaction terms.

In the first step, adolescents who reported sexual risk behavior at Wave 1 had higher odds reporting sexual risk behavior at Wave 2, $B = 0.61$, $SE = 0.09$, $p < .001$, odds ratio = 1.78. Older adolescents also had

Table II. Hierarchical Logistic Regression of Interactive Family-peer Effects on Sexual Risk Behavior at Wave 2 ($N = 2,652$)

Independent variables	Final <i>B</i>	<i>SE</i>	<i>p</i>	Odds Ratio	95% Confidence interval	
					Lower	Upper
Sexual risk behavior Wave 1	0.58	0.09	<.001	1.78	1.50	2.11
Age	0.14	0.04	.001	1.15	1.06	1.24
Gender	0.01	0.09	.97	1.01	0.85	1.20
African American	-0.25	0.10	.01	.78	0.64	0.95
Supportive friendships Wave 1	0.01	0.05	.87	1.01	0.91	1.11
Parent connectedness Wave 1	-0.11	0.11	.32	.90	0.73	1.11
Supportive friendships Wave 2	0.06	0.05	.22	1.07	0.96	1.18
Parent connectedness Wave 2	-0.16	0.10	.13	.85	0.70	1.05
Wave 1 friend \times Wave 1 parent	0.03	0.07	.70	1.03	0.89	1.18
Wave 2 friend \times Wave 2 parent	0.11	0.07	.15	1.11	0.96	1.29
Wave 1 friend \times Wave 2 parent	-0.16	0.07	.02	.84	0.74	0.97
Wave 1 parent \times Wave 2 friend	-0.06	0.08	.41	.94	0.81	1.09
Wave 1 sexual risk behavior \times Wave 1 friend	0.03	0.08	.70	1.03	0.89	1.20
Wave 1 sexual risk behavior \times Wave 2 friend	-0.00	0.08	.99	1.00	0.85	1.17
Wave 1 sexual risk behavior \times Wave 1 parent	0.17	0.16	.31	1.03	0.89	1.18
Wave 1 sexual risk behavior \times Wave 2 parent	-0.17	0.16	.29	.85	0.62	1.15

For gender, male = 0 and female = 1.

higher odds of reporting sexual risk behavior at Wave 2, $B = 0.14$, $SE = 0.04$, $p < .001$, odds ratio = 1.15. African-Americans had lower odds of reporting sexual risk behavior at Wave 2, $B = -0.30$, $SE = 0.10$, $p = .002$, odds ratio = 0.74. There was no main effect of gender. As can be seen in Table II, these effects were maintained in the final step of the hierarchical regression, which included interaction terms.

At initial entry in step 2, adolescents reporting higher levels of parent connectedness at Wave 1 were less likely to engage in sexual risk behavior at Wave 2, $B = -0.17$, $SE = 0.07$, $p = .008$, odds ratio = 0.84. There was no effect of supportive friendships. As can be seen in Table II, the main effect of parent connectedness at Wave 1 was not maintained in the presence of the interaction terms, suggesting that it was conditional upon the levels of other independent variables. At initial entry in step 3, adolescents who reported increased levels of parent connectedness over time were less likely to engage in sexual risk behavior at Wave 2, $B = -0.23$, $SE = 0.08$, $p = .004$, odds ratio = 0.80. As can be seen in Table II, the main effect of parent connectedness at Wave 1 was not maintained in the presence of the interaction terms, suggesting that its effects were conditional upon the levels of other independent variables.

Of the block of two-way interactions between supportive relations within and across time and between Wave 1 sexual risk and each supportive relationship, the Wave 1 supportive friendships \times Wave 2 parent connectedness interaction was significant. The results from this step are presented in Table II. None of the gender or

race interactions added in step 5, $\chi^2(10) = 5.88$, $p = .83$, or either of the two three-way interactions added in step 6, $\chi^2(2) = 3.42$, $p = .18$, reached significance, so these two steps were deleted from the analyses presented in Table II.

To probe the two-way Wave 1 supportive friendships \times Wave 2 parent connectedness interaction, two sets of analyses were conducted. The first examined the effects of change in parent connectedness after controlling for Wave 1 risk, age, gender, and race, separately for adolescents who reported low versus highly supportive friendships at Wave 1 (based on a median split). Increases in parent support at Wave 2 were only associated with Wave 2 sexual risk for adolescents who also reported highly supportive friendships at Wave 1, $B = -0.45$, $SE = 0.12$, $p < .001$, odd ratio = 0.64. For adolescents who reported low supportive friendships at Wave 1, there was no effect of increases in parent support on sexual risk, $B = -0.09$, $SE = 0.10$, $p = .38$. To test whether change in parent connectedness in turn moderated the effects of supportive friendships in this interaction, researchers subdivided the sample based on whether adolescents reported increased or decreased parent connectedness over time. There were no effects of Wave 1 supportive friendship under either condition.

Parent Connectedness and Mother-Child Communication

Descriptives

The mother-child communication about sex scale had a mean of 3.12, $SD = 0.78$. Mothers indicated that they

talked more with their daughters about sex ($M = 3.27$, $SD = 0.71$) than with their sons ($M = 2.96$, $SD = 0.83$), $t(2185) = 9.34$, $p < .001$. Mother–child communication about sex had a small positive correlation with parent connectedness at Wave 1, $r = .05$, $p = .02$.

Regressions

A four-step hierarchical logistic regression was conducted to test whether mother–child communication would interact with parent connectedness such that communication had more protective power in the context of high levels of parent connectedness. Wave 2 sexual risk was regressed on Wave 1 sexual risk, age, gender, and race in the first step. The main effects of Wave 1 parent connectedness and Wave 1 mother–child communication about sex were added in the second step. The third step included the two–way interactions of: parent connectedness \times sexual risk, mother–child communication \times sexual risk, and parent connectedness \times mother–child communication, plus parent connectedness \times gender, parent connectedness \times race, mother–child communication \times gender, and mother–child communication \times race. The final step included a three–way interaction between sexual risk behavior, parent connectedness, and mother–child communication. In this set of analyses, only Wave 1 predictors were considered because parent–child communication was not assessed in Wave 2 of Add Health. As with the previous set of regressions, estimates from the final step are presented in Table III, whereas main effect estimates from step of initial entry are presented in the text.

There were no initial main effects of parent connectedness, $B = -0.12$, $SE = 0.08$, $p = .11$, or mother–child

communication, $B = -0.03$, $SE = 0.06$, $p = .68$, and there was no interaction between the two variables (Table III). However, there were interactions of each of the parent variables with gender (Table III). To probe these gender interactions, analyses were run separately for boys and girls. Among girls, both parent connectedness and mother–child communication at Wave 1 were associated with reduced odds of sexual risk behavior at Wave 2 (for parent connectedness, $B = -0.25$, $SE = 0.10$, $p = .01$, odds ratio = 0.78; for mother–child communication, $B = -0.26$, $SE = 0.09$, $p = .005$, odds ratio = 0.77). Among boys, neither parent variable was associated with Wave 2 sexual risk ($B = 0.08$, $SE = 0.12$, $p = .52$ for parent connectedness; $B = 0.15$, $SE = 0.08$, $p = .07$ for mother–child communication). None of the other two–way interaction terms was significant. The three–way interaction was also not significant, $\chi^2(1) = 1.34$, $p = .25$, so its step was not included in Table III.

Examination of Transactional Effects

The final set of analyses tested the extent to which the longitudinal associations between supportive relationships and sexual risk behavior were reciprocal such that sexual risk behavior has effects on decreased relationship quality. Hierarchical linear regressions were conducted in which each social relationship variable at Wave 2 (parent connectedness and supportive friendships) was regressed on its Wave 1 levels, age, gender, race, and Wave 1 sexual risk in the first step. Wave 2 sexual risk was entered in the second step. The third step included two–way interactions: Wave 1 sexual risk \times Wave 1 relationship and Wave 2 sexual risk \times Wave 1 relationship, plus exploratory interactions of gender and

Table III. Hierarchical Logistic Regression of Parent Connectedness and Mother–Child Communication Effects on Sexual Risk Behavior at Wave 2 ($N = 2,207$)

Independent variables	Final <i>B</i>	<i>SE</i>	<i>p</i>	Odds Ratio	95% Confidence interval	
					Lower	Upper
Sexual risk behavior Wave 1	0.58	0.10	<.001	1.78	1.47	2.15
Age	0.13	0.04	.003	1.14	1.04	1.24
Gender	-0.07	0.10	.51	.94	0.77	1.14
African-American	-0.38	0.12	.001	.69	0.55	0.86
Parent connectedness, Wave 1	0.19	0.15	.19	1.22	0.91	1.62
Mother–child communication Wave 1	0.19	0.11	.08	1.21	0.98	1.49
Parent connectedness \times sexual risk behavior	-0.10	0.15	.50	.90	0.67	1.22
Parent connectedness \times gender	-0.36	0.16	.02	.70	0.51	0.95
Parent connectedness \times race	-0.22	0.17	.22	.81	0.57	1.13
Mother–child communication \times sexual risk behavior	-0.01	0.13	.92	.99	0.77	1.27
Mother–child communication \times gender	-0.42	0.13	.001	.66	0.51	0.85
Mother–child communication \times race	-0.14	0.15	.34	.87	0.65	1.16
Parent connectedness \times mother–child communication	0.05	0.10	.66	1.05	0.86	1.28

For gender, female = 1.

Table IV. Effects of Sexual Risk Behavior on Supportive Relationships at Wave 2 ($N = 2,652$)

	Parent connectedness			Supportive friendships		
	Final <i>B</i>	<i>SE</i>	<i>p</i>	Final <i>B</i>	<i>SE</i>	<i>p</i>
Relationship Wave 1	0.60	0.02	<.001	0.30	0.02	<.001
Age	0.01	0.01	.26	0.02	0.02	.31
Gender	-0.01	0.03	.57	0.05	0.04	.27
African-American	0.02	0.02	.31	-0.31	0.05	<.001
Sexual risk behavior Wave 1	-0.06	0.02	.01	-0.12	0.04	.005
Sexual risk behavior Wave 2	-0.07	0.02	.003	0.07	0.05	.13

For gender, female = 1. The Wave 1 relationship independent variable in step 1 is parent connectedness in the first regression and supportive friendships in the second regression.

race with sexual risk behavior. The results are presented in Table IV.

The regressions explained 36% of the variance in Wave 2 parent connectedness and 14% of the variance in Wave 2 supportive friendships. When initially entered, sexual risk behavior at Wave 1 had small negative effects on both parent connectedness and supportive friendships at Wave 2, $B = -0.06$, $SE = 0.02$, $p = .006$, and $B = -0.12$, $SE = 0.04$, $p = .007$, respectively, indicating that adolescents reporting sexual risk behavior at Wave 1 experienced slight relative decreases in supportive relationships over time. Additionally, African-American adolescents reported a statistically significant decrease in supportive friendships, $B = -0.31$, $SE = 0.05$, $p < .001$. In step 2, sexual risk at Wave 2 had a negative effect on Wave 2 parent connectedness, above and beyond the effects of sexual risk at Wave 1 (Table IV). There was no effect of sexual risk at Wave 2 on supportive friendships. There were no interactive effects of sexual risk on parent connectedness, $\Delta R^2 = .001$, $p = .49$, or supportive friendships, $\Delta R^2 = .001$, $p = .49$. Thus, the interactions were not included in Table IV.

Discussion

This study examined protective processes associated with sexual risk behavior within the family-peer mesosystem and over time transactionally. Our findings underscore one of the ecological perspective's main tenets, which is that in psychological research, interactions are often more telling than are main effects (Bronfenbrenner, 1977). Findings revealed interactions within the family-peer mesosystem as well as transactional effects of sexual risk on levels of supportive relationships, suggesting that supportive relationships and sexual risk behavior in adolescence are dynamically interwoven.

Parent connectedness and supportive friendships interacted to predict reduced likelihood of sexual risk

behavior. Increased parent connectedness over the course of the study was only associated with low sexual risk for adolescents who also reported stable, highly supportive friendships over the two waves. For these adolescents, increases in parent connectedness were associated with a sizable decrease in the odds of adolescents engaging in sexual risk behavior over time. Thus, although supportive friendships had no main effects on sexual risk, they assisted in decreasing risk by enhancing the protective effects of increased parent connectedness. This finding adds to other recent research documenting the importance of supportive relationships within the family-peer mesosystem as protective factors for adolescent adjustment (Crosnoe & Elder, 2004; Scholte, van Lieshout, & van Aken, 2001). Additionally, in the subsample with mother-report data, girls with high initial levels of both parent connectedness and mother-child communication were less likely to engage in sexual risk behavior over time. These effects did not hold for boys. However, these gender differences may be because the subsample was limited to parent-report data, suggesting that, in those households, mothers may have been the primary caregivers. Previous literature has found that mother-daughter communication around sexual practices is linked to females' safer sexual decision-making (Werner-Wilson, 1998), including greater lifetime condom use (Miller, Levin, Whitaker, & Xu, 1998).

Implications of these findings are that parents play an important role in whether their adolescents engage in sexual risk behavior (Dittus et al., 2004), but that to fully understand this role, multiple facets of parenting and the social contexts of parenting in conjunction with gender and adolescents' peers must be taken into consideration. Further, the association between sexual risk behavior and supportive relationships in adolescence has transactional elements. Adolescents who reported engaging in sexual risk behavior at the onset of the study reported small decreases in the quality of their relationships with parents and friends over the course of the

study. This finding is consistent with Action Theory formulations (Brandtstadter & Lerner, 1999), as well as empirical research (e.g., Lopez & Little, 1996; Shahar, Henrich, Blatt, Ryan, & Little, 2003) indicating that children and adolescents can play a role in generating the very social conditions that play a role in their adverse developmental outcomes.

Another implication of this study is that the interactive effects of parent connectedness and supportive friendships appeared to be equally useful for both the prevention and reduction of risk. Additionally, no moderation by race was found for the effects of parents and friends. Further, the African-American adolescents in the sample reported higher feelings of parental connectedness (although lower levels of supportive friendships) and were at lower risk of engagement in sexual risk behavior. So, even though African-American adolescents were more likely to report being sexually active, they were also more likely to engage in safe sexual practices.

The transactional model (Sameroff, 1995) further elucidates numerous points of intervention within the parent-child relationship to reduce sexual risk. For optimal effectiveness, interventions should take into account children's effects on parents, as well as parents' effects on their children. For example, an intervention can directly target remediation efforts at adolescent behavior (e.g., sexual risk taking) and parental interpretations of this behavior (e.g., that the adolescent is a "bad kid" because his/her behavior defies parental values) in addition to parents' behavior itself. Such multifocused interventions may have more power to reduce adolescent sexual risk behavior.

Although our findings underscore the importance of taking an ecological-transactional approach in studying supportive relationships and sexual risk behavior in adolescence, they only begin to illuminate the full power of such an approach. From an ecological standpoint, a host of other contexts, including socioeconomic status, neighborhood collective efficacy, school outreach, and community health policies, could potentially interact with the effects of parents and peers in relation to adolescent sexual risk and are the focus of continuing research. Further, because AIDS is a worldwide pandemic, cultural and policy level influences [i.e., Bronfenbrenner's (1977) macrosystem] may also be critical in understanding how families can help prevent sexual risk behavior among adolescents.

The study's ability to make conclusions about the transactional nature of causality is limited by its correlational design and two time points of measurement. Multiple waves of measurement are necessary to more

completely and reliably characterize transactional developmental effects (McArdle, 2001; Sameroff, 1995). Still, given the cross-sectional nature of much of the extant literature in the field, this study's longitudinal design represents an important step toward more fully transactional models. Another avenue for future research is an increased understanding of the mechanisms through which supportive relationships are associated with reduced sexual risk. Possible mediators include adolescent attitudes, self-esteem, and education pertaining to sex as well as their general psychosocial adjustment (Dittus et al., 2004).

Finally, our conclusions are tempered by limitations in the Add Health measures. All constructs in this study, except gender and parent-child communication, are adolescent self-report, which can be biased on items pertaining to sensitive and illegal behavior, in spite of the privacy precautions taken by interviewers. Also, the parent and friendship questions in Add Health are not based on established measures, to our knowledge. However, they have been validated in prior research with the data set (Crosnoe & Elder, 2004; Resnick et al., 1997). Further, most parent respondents were mothers, so it was not possible to compare the gender differences found pertaining to mother-child communication with those of father-child communication about sex, which may be more important for boys and is another potential avenue for further research.

Despite these limitations, this study demonstrates how supportive parenting and supportive friendships can interact to prevent and mitigate adolescent sexual risk behavior. HIV infection is a widespread, persistent, and deadly threat to the health of youths and adults worldwide. Continuing basic and applied research drawing from theoretical approaches that appreciate the complexities of human development is imperative to stem youth contraction of HIV/AIDS.

Acknowledgements

The authors thank the thoughtful feedback of Lisa Armistead and three anonymous reviewers on previous drafts of this article. This work was supported by Yale University's Center for Interdisciplinary Research on AIDS (CIRA) through a grant from the National Institute of Mental Health to Michael Merson, MD (No. P30 MH 62294). This research was based on data from the National Longitudinal Study of Adolescent Health (Add Health), a program project designed by J. Richard Udry (PI) and Peter Bearman, and funded by grant P01-HD31921 from the National Institute of Child Health and Human Development to the Carolina Population

Center, University of North Carolina at Chapel Hill, with cooperative funding participation by: the National Cancer Institute; the National Institute of Alcohol Abuse and Alcoholism; the National Institute on Deafness and Other Communication Disorders; the National Institute of Drug Abuse; The National Institute of General Medical Sciences; the National Institute of Mental Health; the National Institute of Nursing Research; the Office of AIDS Research, NIH; the Office of Research on Women's Health, NIH; the Office of Population Affairs, DHHS; the National Center for Health Statistics, Center For Disease Control and Prevention, DHHS; the Office of the Assistant Secretary for Planning and Evaluation, DHHS, and the National Science Foundation.

Received August 9, 2004; revision received December 15, 2004 and February 28, 2005; accepted March 7, 2005

References

- Aiken, L. S., & West, S. G. (1991). *Multiple regression: Testing and interpreting interactions*. Newbury Park, CA: Sage.
- Bearman, P. S., Jones, J., & Udry, J. R. (1997). The national longitudinal study of adolescent health: Research design [WWW document]. Retrieved 7/9/2002, from <http://www.cpc.unc.edu/addhealth>.
- Blum, J., Ireland, M., & Blum, R. W. (2003). Gender differences in juvenile violence: A report from add health. *Journal of Adolescent Health, 32*, 234–240.
- Boyer, C. B., Tschann, J. M., & Shafer, M. (1999). Predictors of risk for sexually transmitted diseases in ninth-grade urban high-school students. *Journal of Adolescent Research, 14*, 448–465.
- Brandstadter, J., & Lerner, R. M. (Eds.). (1999). *Action and self-development*. London: Thousand Oaks.
- Brener, N. D., Kann, L., McManus, T., Kinchen, S. A., Sundberg, E. C., Ross, J. G. (2002). Reliability of the 1999 youth risk behavior survey questionnaire. *Journal of Adolescent Health, 31*, 336–342.
- Bronfenbrenner, U. (1977). Toward an experimental ecology of human development. *American Psychologist, 32*, 513–531.
- Bronfenbrenner, U., & Crouter, A. C. (1983). The evolution of environmental models in developmental research. In W. Kessen (Ed.), *Handbook of child psychology: Vol. 1. History, theory, and methods* (pp. 357–414). New York: Wiley.
- Bronfenbrenner, U., & Morris, P. A. (1998). The ecology of developmental processes. In R. M. Lerner (Ed.), *Handbook of child psychology: Vol. 1. Theoretical models and human development* (5th ed., pp. 993–1028). New York: Wiley.
- Center for Disease Control and Prevention. (2000). *A glance at the HIV epidemic*. Retrieved June 25, 2004, from <http://www.cdc.gov/nchstp/od/news/At-a-Glance.pdf>.
- Center for Disease Control and Prevention. (2001). *HIV/AIDS surveillance report, 13*(1).
- Center for Disease Control and Prevention. (2002). *Young people at risk: HIV/AIDS among America's youth*. Washington, DC: U.S. Department of Health and Human Services.
- Center for Disease Control and Prevention. (2003a, November). *Healthy people 2010: Responsible sexual behavior*. Retrieved June 25, 2004, from www.healthypeople.gov/Document/html/uih/uih_bw/uih_4.htm.
- Center for Disease Control and Prevention. (2003b). *HIV/AIDS surveillance in adolescents*. Retrieved November 20, 2004, from <http://www.cdc.gov/hiv/graphics/adolesnt.htm>.
- Center for Disease Control and Prevention. (2004). Youth risk behavior surveillance – United States, 2003 (pp. 17–20). *Morbidity and Mortality Weekly Report Surveillance Summaries, 53*(SS02). US Government Printing Office: Washington, D.C.
- Cicchetti, D., & Lynch, M. (1993). Toward an ecological-transactional model of community violence and child maltreatment: Consequences for children's development. *Psychiatry, 56*, 96–118.
- Cicchetti, D., Toth, S. L., & Maughan, A. (2000). An ecological-transactional model of child maltreatment. In A. J. Hameroff, M. Lewis, & S. M. Miller (Eds.), *Handbook of developmental psychopathology* (pp. 689–722). New York: Plenum Publishers.
- Coatsworth, J. D., Pantin, H., McBride, C., Briones, E., Kurtines, W., & Szapocznik, J. (2000). Eco-developmental correlates of behavior problems in young Hispanic families. *Applied Developmental Science, 6*, 126–143.
- Crosby, R. A., DiClemente, R. J., Wingood, G. M., Cobb, B. K., Harrington, K., Davies, S. L., et al. (2001). HIV/STD-protective benefits of living with mothers in perceived supportive families: A study of high-risk African American female teens. *Preventative Medicine, 33*, 175–178.
- Crosnoe, R., & Elder, G. H. (2004). Family dynamics, supportive friendships, and educational resilience during adolescence. *Journal of Family Issues, 25*, 571–602.
- Davis, J. A. (1985). *The logic of causal order*. Beverly Hills, CA: Sage.

- Dittus, P., Miller, K. S., Kotchick, B. A., & Forehand, R. (2004). Why parents matter!: The conceptual basis for a community-based HIV prevention program for the parents of African American youth. *Journal of Child and Family Studies, 13*, 5–20.
- Henrich, C. C., Kuperminc, G. P., Sack, A., Blatt, S. J., & Leadbeater, B. J. (2000). Characteristics and homogeneity of early friendship groups: A comparison of male and female clique and nonclique members. *Applied Developmental Science, 4*, 15–26.
- Hutchinson, K. M., & Cooney, T. M. (1998). Patterns of parent-teen risk communication: Implications for intervention. *Family Studies: Interdisciplinary Journal of Applied Family Studies, 47*, 185–194.
- Hutchinson, M. K., Jemmott, J. B., Jemmott, L. S., Braverman, P., & Fong, G. F. (2003). The role of mother-daughter sexual risk behaviors among urban adolescent females: A prospective study. *Journal of Adolescent Health, 33*, 98–107.
- Joiner, T. E. (1994). Covariance of baseline symptom scores in prediction of future symptom scores. A methodological note. *Cognitive Therapy and Research, 18*, 497–504.
- Lopez, D. F., & Little, T. D. (1996). Children's action-control beliefs and emotional regulation in the social domain. *Developmental Psychology, 32*, 299–312.
- Masten, C. A., & Coastworth, J. D. (1995). Competence, resilience and psychopathology. In D. Cicchetti & D. J. Cohen (Eds.), *Developmental psychopathology-Vol. 2. Risk disorder and adaptation* (pp. 715–752). New York: Wiley.
- McArdle, J. J. (2001). A latent difference score approach to longitudinal dynamic analysis. In R. Cudeck, S. Du Toit, & D. Sorbom (Eds.), *Structural equation modeling: Present and future*. Lincolnwood, IL: Scientific Software International.
- Miller, K. S., Levin, M. L., Whitaker, D. J., & Xu, X. (1998). Patterns of condom use among adolescents: The impact of mother-adolescent communication. *American Journal of Public Health, 88*, 1542–1544.
- Miller, B. C., Norton, M. C., Fan, X., & Christopherson, C. R. (1998). Pubertal development, parental communication, and sexual values in relation to adolescent sexual behaviors. *Journal of Early Adolescence, 18*, 27–52.
- Perrino, T., Gonzalez-Soldevilla, A., Pantin, H., & Szapocznik, J. (2000). The role of families in adolescent HIV prevention: A review. *Clinical Child and Family Psychiatry, 3*, 81–96.
- Petit, G. S., Laird, R. D., Dodge, K. A., Bates, J. E., & Criss, M. M. (2001). Antecedents and behavior-problem outcomes of parental monitoring and psychological control in early adolescence. *Child Development, 72*, 583–598.
- Resnick, M. D., Bearman, P. S., Blum, R. W., Bauman, K. E., Harris, K. M., Jones, J., et al. (1997). Protecting adolescents from harm: Findings from the national longitudinal study on adolescent health. *Journal of the American Medical Association, 287*, 823–832.
- Romer, D., Black, M., Ricardo, I., Feigelman, S., Kaljee, L., Galbraith, J., et al. (1994). Social influences on the sexual behavior of youth at risk for HIV exposure. *American Journal of Public Health, 84*, 977–985.
- Rotherbaum-Borus, M., Reid, H., & Rosario, M. (1994). Factors mediating changes in sexual HIV risk behaviors among gay and bisexual male adolescents. *American Journal of Public Health, 84*, 1938–1946.
- Sameroff, A. J. (1995). General systems theories and developmental psychopathology. In D. Cicchetti & D. Cohen (Eds.), *Manual of developmental psychopathology: Theory and methods* (Vol. 1, pp. 659–695). New York: Wiley.
- Scholte, R. H. J., van Lieshout, C. F. M., & van Aken, M. A. G. (2001). Perceived relational support in adolescence: Dimensions, configurations, and adolescent adjustment. *Journal of Research in Adolescence, 11*, 71–94.
- Shahar, G., Henrich, C. C., Ryan, R., Blatt, S. J., & Little, T. D. (2003). Interpersonal relatedness, self-definition, and their motivational orientation during adolescence: A theoretical and empirical integration. *Developmental Psychology, 39*, 470–483.
- Sieving, R. E., Beurhing, T., Resnick, M. D., Bearinger, L. H., Shew, M., Ireland, M., et al. (2001). Development of adolescent self-report measures from the national longitudinal study of adolescent health. *Journal of Adolescent Health, 28*, 73–81.
- Somers, C. L., & Paulson, S. E. (2000). Students' perceptions of parent-adolescent closeness and communication about sexuality: Relations with sexual knowledge, attitudes and behaviors. *Journal of Adolescence, 23*, 629–644.
- Steinberg, L., & Fletcher, A. C. (1998). Data analytic strategies in research with ethnic minority youth. In V. C. McLoyd & L. Steinberg (Eds.), *Studying minority adolescents: Conceptual, methodological, and theoretical issues* (pp. 279–294). Mahwah, NJ: Erlbaum.
- Voisin, D. R. (2002). Family ecology and HIV sexual risk behaviors among African American and Puerto

- Rican adolescent males. *American Journal of Orthopsychiatry*, 72, 294–302.
- Werner-Wilson, R. J. (1998). Gender differences in adolescent sexual attitudes: The influence of individual and family factors. *Adolescence*, 33, 519–531.
- Whitaker, D. J., & Miller, K. S. (2000). Parent-adolescent discussions about sex and condoms: Impact on peer influences of sexual risk behavior. *Journal of Adolescent Research*, 15, 251–273.
- Wills, T. A., Mariani, J., & Filer, M. (1996). The role of family and peer relationships in adolescent substance use. In G. P. Pierce, B. R. Sarason, & I. G. Sarason (Eds.), *Handbook of social support and the family* (pp. 251–549). New York and London: Plenum Press.
- Wills, T. A., & Vaughan, R. (1989). Supportive relationships and substance use in early adolescence. *Journal of Behavioral Medicine*, 12, 321–339.