

Original article

Longitudinal Predictors of Change in Number of Sexual Partners across Adolescence and Early Adulthood

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Abstract

Purpose: Although sexual risk behavior has negative consequences in adolescence and early adulthood, little is known about pathways of sexual risk across development and their correlates. Study goals were to examine trajectories of number of sexual partners across adolescence and into early adulthood, and to investigate hypothesized individual and family-level predictors.

Methods: A subset of 8,707 white, black, and Mexican American participants in the National Longitudinal Study of Adolescent Health reported on their motivations to have sex, family warmth, and perceptions of maternal attitudes about sex at Wave 1 and on their sexual relationships at each year of age across the three waves of the study.

Results: Multilevel growth curves of number of sexual partners between ages 11 and 27 showed increases in sexual risk across adolescence and deceleration in early adulthood, but differed somewhat as a function of demographic characteristics. As expected, adolescent motivations to have sex and perceptions of permissive maternal attitudes about sex predicted more sexual partners in adolescence, whereas family warmth predicted fewer sexual partners across gender and racial/ethnic groups. Predictors did not differentiate youth as strongly in early adulthood. Interactions between predictors supported a cumulative risk framework, such that perceived permissive maternal attitudes or low family warmth combined with high adolescent motivations to have sex predicted the highest number of sexual partners in adolescence.

Conclusions: This study advances our understanding of change in sexual behavior across development and the individual and contextual correlates of such change. Findings document the cumulative implications of individual cognitions, family experiences, and social contexts for adolescent and young adult sexual experiences. © 2010 Society for Adolescent Medicine. All rights reserved.

Keywords:

Sexual behavior; Sexual partners; Adolescence; Early adulthood; Family; Attitudes; Race/ethnicity

Engaging in sexual behavior with multiple partners increases risk for sexually transmitted infections and is associated with other sexual risk behaviors [1]. Given developmental trends in romantic relationships [2], the number of sexual partners an individual has each year should increase during adolescence but should level off or decrease during early adulthood, as individuals enter longer and more

committed relationships. Such a trend has been documented in one prior study, which involved predominantly African American adolescents from a midwestern city who had low gradepoint averages [3], and has been suggested (but not statistically tested) in prior work [4]. We extended extant research by describing changes from adolescence into early adulthood in number of sexual partners. We also investigated differences in trajectories as a function of gender, family structure, maternal education, age at first sex, and pubertal timing, which have been linked to adolescent sexual behavior in prior research [1,5,6].

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To understand risk and protective factors for changes in number of sexual partners, this study employed a social cognitive framework [7], which proposes interplay between individual cognitions, environmental factors, and personal behavior. We focused on adolescent motivations to have sex, family warmth, and perceived maternal attitudes about sex, which are among the most widely established antecedents of adolescent sexual outcomes [8]. Several recent studies have found that adolescents' perceptions of costs and benefits related to sexual behavior, parent–adolescent relationship quality, and mothers' disapproval of adolescent sex predicted likelihood and timing of sexual initiation, sexual experience, sexual frequency, risky sexual behavior, use of birth control, and likelihood of pregnancy. Less research has focused on number of sexual partners. One cross-sectional study involving a convenience sample of college students found that adolescents' positive motivations for having sex were associated with number of sexual partners through attitudes regarding casual sex [9]. The quality of parent–child relationships, including closeness or warmth, has also been linked to number of sexual partners [10–13]. Finally, maternal attitudes about sex were related to adolescents' number of sexual partners in one cross-sectional study [14].

Although adolescents' motivations to have sex, family warmth, and perceptions of mothers' attitudes about sex have been associated with adolescent sexual risk in past research, examining the implications of these predictors for *trajectories* of number of sexual partners in a *national sample* is important. Also needed is research on *interactions* between individual and contextual risk factors. A cumulative risk perspective suggests that the likelihood of maladjustment increases with the number of risks to which an individual is exposed [15]. Indeed, adolescents who encounter multiple risk factors are most likely to be sexually active or engage in sexual risk behavior [14,16]. Therefore, we expected that high motivations to have sex coupled with low family warmth or perceived permissive maternal attitudes would predict the highest number of sexual partners.

Ecological models suggest macrosystem influences on individual development [17], including the contexts defined by race/ethnicity. Several investigations document differences in adolescent sexual experiences as a function of race/ethnicity. For instance, national data reveal that black, and to some extent, Hispanic, adolescents are more likely to be sexually active, initiate sexual activity earlier, and have more sexual partners than white youth [18]. Racial/ethnic differences may change over time, however, because of sociocultural influences on adolescents' and young adults' dating and family formation patterns. We also know little about whether processes of risk and protection work differently in different racial and ethnic contexts. One study found different links between family relationship predictors and high-risk sexual behavior for white versus African American adolescents [11]. To further understand race/ethnicity as a context for sexual risk, we examined trajectories of number of sexual partners and predictors separately for white, black,

and Mexican American youth. We also examined differences in trajectories as a function of generation among Mexican American youth because acculturation has been associated with sexual behavior in prior work [19].

Method

Participants

Data came from the National Longitudinal Study of Adolescent Health (Add Health). Students enrolled in 7th to 12th grade in a nationally representative sample of 132 schools were selected within each school with a known probability-sampling method. The total Wave 1 (1995) in-home interview sample included 20,745 youth. All adolescents in grades 7 through 11 at Wave 1 were eligible to participate at Wave 2, 1 year later. The Wave 3 interview was conducted with respondents in early adulthood, between 2001 and 2002. Participants completed interviewer-assisted questionnaires about their development and health, and responses were recorded on laptops. Information about sexual behavior was collected through Audio CASI. Institutional review board approval for the Add Health study was granted at the University of North Carolina, Chapel Hill, and approval for the present analysis was granted by the institutional review board at the authors' institutions.

A total of 11,621 youth participated in all three waves of Add Health. To be included in our analytic sample, participants needed to have a valid longitudinal sampling weight. Additionally, we included white, black, and Mexican American youth in analyses because these groups were sufficiently large. Finally, we included adolescents who reported that they had a residential mother figure in the household at Wave 1 (nearly 92% are biological mothers) because we wanted to ensure comparability of the meaning of adolescents' reports on family variables. A total of 8,707 youth were included in analyses, which represented 75% of youth who participated at all three waves of Add Health. The youth in our analytic sample were slightly but significantly younger, less likely to have a mother with less than a high school education, more likely to live in a two biological parent household, and less likely to live in a single-parent household or other arrangement than youth in the full longitudinal sample.

Participants in the final sample ranged in age from 11 to 27 years across the study (average age at Wave 1 was 15.25 years, $SD = 1.60$). They were 50% male, 75% white, 17% black, and 8% Mexican American. The majority of participants lived in households with two biological parents (60%), whereas 16% lived in stepfamily households, 21% lived in single-parent households, and 3% lived in other arrangements. Adolescents' mothers largely had high school degrees (45%), but 26% had college degrees or more, 13% had attended some college, and 16% had less than a high school degree. Of Mexican American youth, 21% were first, 40% were second, and 39% were third generation immigrants.

Table 1
Basic growth model parameters for white, black, and Mexican American youth

	White		Black		Mexican American	
	<i>B</i>	<i>SE</i>	<i>B</i>	<i>SE</i>	<i>B</i>	<i>SE</i>
Intercept	1.05**	0.03	1.07**	0.08	1.04**	0.14
Linear	0.15**	0.01	0.12**	0.01	0.03**	0.01
Quadratic	-0.03**	0.001	-0.02**	0.002	—	—
Cohort	0.06**	0.01	0.07**	0.03	0.10**	0.03
Cohort × linear	—	—	—	—	-0.03**	0.01
Male	-0.17**	0.02	-0.12 [†]	0.06	-0.09*	0.04
Male × linear	-0.01 [†]	0.01	—	—	—	—
Male × quadratic	0.005**	0.001	—	—	—	—
Family structure ^a						
Stepfamily	0.07**	0.03	—	—	—	—
Single parent	0.03	0.03	—	—	—	—
Other family structure	0.19*	0.10	—	—	—	—
Maternal education ^b						
Less than HS	-0.03	0.04	—	—	-0.25 [†]	0.14
High school	-0.03	0.02	—	—	-0.28*	0.13
Some college	-0.04	0.04	—	—	-0.28*	0.14
Less than HS × linear	-0.01	0.01	—	—	—	—
High school × linear	-0.01*	0.01	—	—	—	—
Some college × linear	0.004	0.01	—	—	—	—
Third generation ^c	—	—	—	—	0.19**	0.07
Age at first sex	-0.20**	0.01	-0.15**	0.01	-0.16**	0.01
Age at first sex × linear	0.02**	0.003	0.02**	0.002	0.03**	0.002
Age at first sex × quadratic	0.002**	0.001	—	—	—	—
Pubertal timing ^d						
Early puberty	0.05*	0.02	0.19*	0.10	0.16**	0.05
Late puberty	-0.11**	0.03	-0.20**	0.07	—	—
Late puberty × linear	-0.01	0.01	—	—	—	—
Late puberty × quadratic	0.004*	0.002	—	—	—	—

^a Two biological parent family was the reference group.

^b College degree or more was the reference group.

^c First and second generations combined were the reference group.

^d On time puberty was the reference group.

[†] $p < .10$, * $p < .05$, ** $p < .01$.

Measures

Number of sexual partners per year was our dependent variable. Participants were asked to report on their sexual relationship history in Waves 1 and 2 for the 18 months prior to each wave and in Wave 3 for the period from Wave 2 to Wave 3 (approximately 5 to 6 years). We determined the start and end date of each sexual relationship (defined as a relationship that involved sexual intercourse) in the respondent's history. After matching those dates to the beginning and end dates of each year of age, we constructed a count of the number of sexual relationships each respondent had at each age. To avoid artificial deflation in number of partners during partial years of age completed, only reports from the last full year of age prior to Wave 1 and the last 3 full years of age prior to Wave 3 were included (all reports from Wave 2 were used). This meant that respondents each contributed between 4 and 6 years of observation for the growth curves. The number of sexual partners per year ranged from 0 to 18 across the study; zero partners were reported for 32% (ages 21 to 23) to 100% (age 11) of observations, and average number of partners ranged from 0 (age 11) to 0.98 (age 21).

Adolescent motivations to have sex ($\alpha = .73$) were assessed at Wave 1 with the sum of seven items that asked about the imagined positive and negative personal consequences of sexual behavior (e.g., "If you had sexual intercourse, your friends would respect you more").

Family warmth ($\alpha = .79$) was measured at Wave 1 with the sum of three items about the family environment (e.g., "How much do you feel that people in your family understand you?").

Adolescent perceptions of maternal attitudes about sex ($\alpha = .92$) were assessed at Wave 1 with the sum of three items that asked adolescents about their perceptions of their mother's approval or disapproval of their sexual behavior (e.g., "How would she feel about your having sex at this time in your life?").

Covariates included gender (0 = female, 1 = male), family structure (two biological parent family was the reference category), maternal education (college degree or more was the reference category), age at first sexual intercourse, and pubertal timing (categories were early, on time, or late; on time was the reference category). For models

involving Mexican American youth, generational status (first-, second-, and third-generation immigrant) was a covariate. Because of small sample sizes, first and second generations were combined as the reference group.

Results

To examine trajectories of number of sexual partners per year, a multilevel modeling strategy was used. Respondent age was used as the time metric for growth models and was centered at age 17 to capture behavior at an age most youth reported on during the study. Three-level models were estimated in which age (level 1) was nested within individual (level 2) within school (level 3). Fixed effects that represent average level at age 17 (intercept), average rate of change (linear slopes), and average acceleration or deceleration (quadratic curves) were estimated, as well as interindividual variance, or random effects, around the intercept and linear slope. Random intercept effects at the school level represented between-school variation.

Less than 6% of values on predictor variables were missing. Missing data were handled with the multiple imputation procedure (ICE) in Stata [20]. Descriptive statistics and growth curve models were based on combined outputs from five imputed datasets using Rubin's [20] rules. The complex design of Add Health was dealt with using the Stata GLLAMM program. Appropriate longitudinal sampling weights were applied to the models, and clustering and stratifying variables were taken into account to adjust the standard errors.

Separate models by race/ethnicity were estimated to reduce the number of interactions examined. All models included the covariates listed above when they were significant. Main effects of youth gender and interactions between predictors and gender were also examined. Additionally, it was necessary to distinguish between cohort effects and developmental changes in number of sexual partners per year. Where age at Wave 1 was a significant predictor of level and change in sexual risk, we included it as a covariate.

Describing trajectories of sexual risk

Growth parameters are shown in Table 1 and trajectories are depicted in Figures 1–3. Average number of sexual partners was approximately one for all youth during late adolescence and early adulthood. Among white and black youth, number of sexual partners increased in adolescence but growth decelerated such that number of partners began to decline in early adulthood. Among Mexican American youth, number of partners increased across adolescence and early adulthood. White and black youth who were older at Wave 1 reported more partners at each age than youth who were younger at Wave 1. Mexican American youth who were older at Wave 1 reported more partners at age 17 but smaller increases in number of partners than youth who were younger at Wave 1. White boys re-

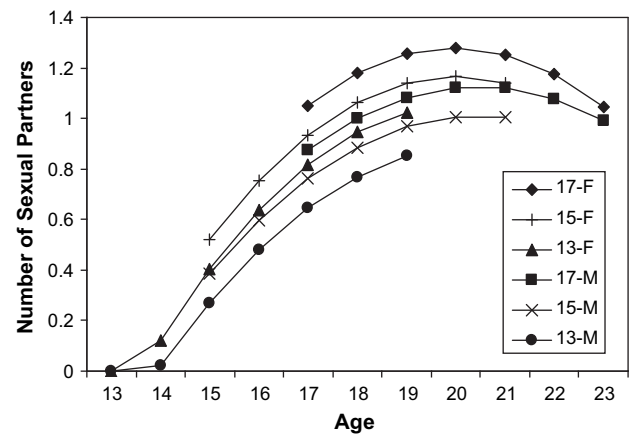


Figure 1. Growth trajectories of number of sexual partners for white youth. Notes for all figures: although youth in the study were ages 11 to 27 years, figures depict youth between ages 13 and 23, which represent over 85% of the analytic sample. The figures depict trajectories for female (F) and male (M) youth who were 13, 15, and 17 years old at Wave 1, controlling for family structure, maternal education, age at first sexual intercourse, and pubertal timing, when these covariates were significant. The model for Mexican American youth also included generation as a covariate. Some values were negative as a result of formula calculations and were truncated at 0.

ported fewer partners than girls at age 17 but less deceleration, and black and Mexican American boys reported fewer partners at each age than girls (the difference for black youth was marginal).

White youth in stepfamilies or other family arrangements reported more sexual partners than youth in two-parent families. White youth whose mothers had high school degrees reported smaller increases in number of partners than youth whose mothers had college degrees or more. Mexican American youth whose mothers had high school degrees or some college reported fewer partners than youth whose mothers had college degrees or more. Mexican American third generation youth reported more partners than first/second generation youth.

White youth who initiated sex later reported fewer partners at age 17 but larger increases in number of partners

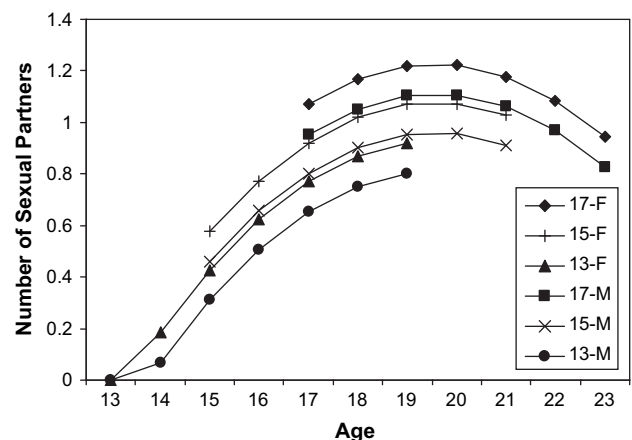


Figure 2. Growth trajectories of number of sexual partners for black youth.

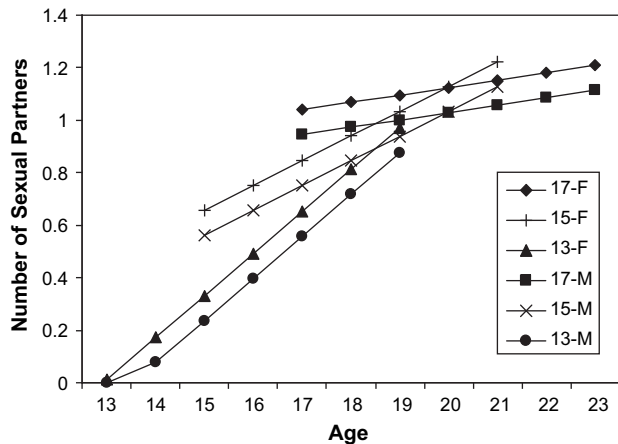


Figure 3. Growth trajectories of number of sexual partners for Mexican American youth.

and less deceleration. Black and Mexican American youth who initiated sex later reported fewer partners at age 17 but larger increases in number of partners. Finally, youth in all groups who reached puberty earlier than their peers reported more partners across the study; white youth who reached puberty later than their peers reported fewer partners at age 17 but less deceleration, and black youth who reached puberty later than their peers reported fewer partners across the study.

Predicting trajectories of sexual risk

Main effects and interactions of predictors for intercept, linear, and quadratic terms were examined. Interactions between adolescents' motivations and family warmth were examined separately from interactions between motivations and perceptions of mothers' attitudes, yielding six interaction models.

As shown in Table 2, adolescents' motivations to have sex at Wave 1 were positively related to the intercept (i.e., number of partners at age 17) among all youth. Additionally, motivations were negatively related to the linear slope for black youth such that youth who had higher motivations at Wave 1 showed smaller increases in number of partners, but a gender interaction indicated that this effect was weaker for black boys. Finally, motivations were negatively related to the quadratic term among white youth, suggesting that youth who reported higher motivations exhibited more deceleration in number of partners.

Family warmth at Wave 1 was negatively related to number of sexual partners at age 17 among all youth and predicted less deceleration in number of partners among white and black youth.

Perceptions of permissive maternal attitudes at Wave 1 were positively related to number of partners at age 17 for white and Mexican American youth; for black youth a gender interaction indicated that this effect was weaker for boys than for girls. More permissive maternal attitudes predicted

smaller increases in number of partners for white and black youth, and gender interactions indicated that these effects were weaker for boys than for girls.

Significant interactions between adolescents' motivations and family warmth at the intercept (for white and Mexican American youth) and for linear change (for white youth) indicated that adolescents who reported low family warmth and high motivations to have sex had the highest number of partners at age 17 and (for white youth) the smallest increase in number of partners across time. Likewise, for white youth, significant interactions between adolescents' motivations and perceived maternal attitudes at the intercept and for linear change revealed that adolescents who reported permissive maternal attitudes and high motivations to have sex had the highest number of partners at age 17 and the smallest increase in number of partners across time. An additional significant gender interaction in the model for black youth suggested that the interaction between perceived maternal attitudes and adolescent motivations impacted change in number of partners marginally among girls, but this effect was weaker for boys.

Discussion

Similar to the results of prior work in which number of sexual partners was examined among both sexually active and inactive respondents [12,14], youth had, on average, one sexual partner at age 17. In accordance with a previous study [3] and controlling for age at first sex and pubertal timing, average number of sexual partners increased during adolescence, but growth decelerated in early adulthood for white and black youth. In contrast, number of partners did not decline for Mexican American youth, but older cohorts reported smaller increases over time. Our results also supported prior work showing that more acculturated Mexican American youth exhibited higher levels of sexual risk behavior [19]. Given the number of interactions tested, we chose to examine separate models by race/ethnicity, and did not directly compare the trajectories for youth in different groups. Still, it is important to understand the meaning of racial/ethnic and cultural contexts of sexual risk, including acculturation among immigrant families. Prevention efforts should also take into account the cultural ecologies of adolescent and young adult sexual development.

Boys reported fewer sexual partners than did girls, a finding that is inconsistent with national data involving students in the same cohort as the Add Health Study [21]. This difference should be tested further, as it may result from differing ages of maturation between boys and girls or the fact that younger girls are involved in sexual relationships with older boys.

Instead of a universal change pattern, youth who were older at Wave 1 reported more partners at each age than youth who were younger. Social desirability biases may have led to inflated reports by older adolescents, but the cohort differences also may reflect social change. Nationwide decreases

Table 2
Main effect and interaction model parameters for white, black, and Mexican American youth

	White		Black		Mexican American	
	<i>B</i>	<i>SE</i>	<i>B</i>	<i>SE</i>	<i>B</i>	<i>SE</i>
Main effects						
AM	0.02**	0.003	0.02**	0.01	0.02*	0.01
AM × linear	−0.001	0.001	−0.005**	0.001	—	—
AM × quadratic	−0.001**	0.000	—	—	—	—
AM × male	—	—	−0.02†	0.01	—	—
AM × male × linear	—	—	0.002**	0.001	—	—
FW	−0.03**	0.01	−0.04**	0.01	−0.02*	0.01
FW × linear	0.001	0.001	−0.001	0.003	—	—
FW × quadratic	0.001*	0.000	0.001*	0.001	—	—
MA	0.04**	0.01	0.06**	0.02	0.04**	0.01
MA × linear	−0.01**	0.002	−0.01**	0.002	—	—
MA × male	−0.01	0.01	−0.04*	0.02	—	—
MA × male × linear	0.005*	0.002	0.004**	0.001	—	—
Interactions						
FW × AM	−0.003**	0.001	—	—	−0.003**	0.001
FW × AM × linear	0.001**	0.000	—	—	—	—
MA × AM	0.005**	0.001	0.001	0.002	—	—
MA × AM × linear	−0.001**	0.000	−0.001†	0.000	—	—
MA × AM × male	—	—	−0.002*	0.001	—	—
MA × AM × male × linear	—	—	0.0003**	0.0001	—	—

Note: AM = adolescent motivations to have sex; FW = family warmth; MA = perceived maternal attitudes about sex. All models included lower order terms for adolescent age and gender. All models included cohort, family structure, maternal education, age at first sexual intercourse, and pubertal timing as covariates when significant; Mexican models additionally included generation.

† $p < .10$, * $p < .05$, ** $p < .01$.

in adolescent sexual involvement in recent years have been reported [22]; younger adolescents' lower rates of sexual involvement may be because of the proliferation of sex education in schools, increased awareness of sexually transmitted infections, or changing social attitudes. These effects illustrate the importance of distinguishing between age differences and age changes in longitudinal studies with youth.

In support of prior work and a social cognitive perspective, individual cognitions and family experiences predicted the trajectories. Whereas previous studies have shown that adolescents' motivations to have sex and permissive maternal attitudes about sex predict higher overall numbers of sexual partners, and that family warmth predicts lower overall numbers of partners, our approach allowed us to demonstrate that these factors predicted both level and change in sexual risk. Risk factors (high motivations, permissive maternal attitudes, low family warmth) predicted higher intercept scores (i.e., number of partners at age 17) but smaller increases across adolescence and more decline in early adulthood, whereas protective factors (low motivations, restrictive maternal attitudes, high family warmth) predicted lower intercept scores but larger increases across adolescence and smaller declines in early adulthood. Thus, the predictors differentiated youth during adolescence (as they initiated sexual involvement), but youth exhibited similar numbers of partners in early adulthood regardless of the risk and protective factors. That is, the predictors made a difference for the pathways taken toward young adult sexual involvement. These findings suggest that it may be important for prevention efforts to target youth and family cognitions

and relationships in preventing youth from having many sexual partners in adolescence, but that other factors unmeasured in this study may be targeted to prevent risk in early adulthood.

Findings supported a model of cumulative risk exposure [15] and reflected the interplay between individual cognitions, environmental influences, and behavior, as proposed by a social cognitive perspective [7]. Low family warmth and perceived permissive maternal attitudes enhanced the negative implications of adolescent motivations for sex. These findings fit with prior research, which has shown that the more risks an adolescent experiences, the more likely he or she is to exhibit risky sexual outcomes [14,16]. It also suggests that relevant foci for preventive intervention reside at multiple levels of adolescents' ecology.

Despite differences in trajectories by race/ethnicity, risk factors and their interactions operated similarly across racial/ethnic groups. It would be premature to draw conclusions about race/ethnicity as a context for the effects of risk and protective factors on sexual risk, however, because we did not directly compare associations as a function of race/ethnicity. Our emphasis was on detecting individual differences within racial/ethnic group given the similarity of the patterns detected between groups. Gender interactions were also few, but suggested that individual cognitions and family characteristics may influence change in number of sexual partners more strongly for girls than for boys. This finding, if replicated in future work, could inform prevention of sexual risk behavior by identifying appropriate program targets for boys versus girls.

Several limitations of this study should be noted. First, although statistically significant, many of the associations in this study were small, suggesting that unmeasured risk and protective factors also contribute to youth sexual behavior and should be targeted by prevention programs. Our conclusions are limited to the predictors we chose. Second, we did not include risk and protective factors related to fathers, given that these were not measured for all youth in our analytic sample. Research has shown important influences of fathers on youth sexual risk [23], and this omission in our study limits the scope of our conclusions. Third, we acknowledge that the analytic sample, although very similar to the full longitudinal sample, was not entirely representative of it. Finally, predictors were measured only at Wave 1. The stability correlations for the predictors across approximately 1 year ranged from .55 to .61, and in some cases differed significantly by cohort and race/ethnicity. Thus, risk and protective factors likely changed over time; investigating time-varying covariations between predictors and outcomes strengthens our ability to identify causal associations [24]. Making use of longitudinal data in this way will advance understanding of youth sexual behavior and how and when to address risks.

In sum, this study adds to our knowledge of change in sexual risk behavior across adolescence and into early adulthood. The use of a large national sample and longitudinal data yields information about trajectories and predictors of number of sexual partners that can inform future work.

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