

# Risky Adolescent Sexual Behaviors and Reproductive Health in Young Adulthood

By Mindy E. Scott, Elizabeth Wildsmith, Kate Welti, Suzanne Ryan, Erin Schelar and Nicole R. Steward-Streng

Mindy E. Scott is senior research scientist, Elizabeth Wildsmith is research scientist, Kate Welti is senior research analyst and Nicole R. Steward-Streng is research analyst—all at Child Trends, Washington, DC. At the time this study was conducted, Suzanne Ryan was senior research scientist and Erin Schelar was senior research assistant at Child Trends.

**CONTEXT:** Little research links adolescent risk behaviors to reproductive health outcomes beyond adolescence, although young adults—men and women in their early 20s—bear a disproportionate burden of STDs and unintended childbearing.

**METHODS:** To assess whether individuals who engaged in risk behaviors during adolescence had increased risk of negative reproductive health outcomes in young adulthood, data from Waves 1–4 of the National Longitudinal Study of Adolescent Health on 5,798 sexually active respondents were analyzed. Logistic and multinomial logistic regressions examined associations between risk behaviors (cumulatively and individually) and each of three outcomes.

**RESULTS:** Four in 10 youth reported at least three risk factors during adolescence. Women who were exposed to an increasing number of risks had an elevated likelihood of having had multiple sex partners in the last year, rather than none (relative risk ratio, 1.3); having had an STD (odds ratio, 1.1); and having had an intended or unintended birth, as opposed to no birth (relative risk ratio, 1.1 for each). Inconsistent contraceptive use and having had multiple partners, a nonmonogamous partner or a nonromantic partner were associated with reporting multiple partners in the last year; inconsistent use, sexual debut after age 16 and not discussing contraception with a partner were associated with having any birth.

**CONCLUSIONS:** Teenagers' sexual behaviors have both short-term and long-term consequences, and interventions that focus on multiple domains of risk may be the most effective in helping to promote broad reproductive health among young adults.

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Levels of unintended childbearing and STD diagnosis in the United States are high: Some 38% of all births are unintended, and approximately 19 million STD cases are diagnosed every year.<sup>1</sup> The costs of unintended births and STDs are also high. Children whose conception was unintended are likely to have lower birth weights, poorer mental and physical health, lower educational outcomes and a greater number of behavioral problems than other children.<sup>2</sup> Furthermore, compared with mothers who have an intended birth, those who have an unintended birth are likely to have poorer mental health and are more likely to have experienced delayed prenatal care, physical violence during pregnancy and unstable relationships; they are also likely to report lower mother-child relationship quality following the birth.<sup>2–4</sup> Finally, a woman with an STD is at increased risk for other STDs, pelvic inflammatory disease, pregnancy complications, infertility and cervical cancer.<sup>1</sup>

A large body of research focuses on the predictors of adolescent sexual behavior, in large part because certain sexual behaviors (e.g., young age at first sex, inconsistent contraceptive use) are associated with increased risk of having an unintended birth and acquiring an STD.<sup>5</sup> Substantially less research examines the link between adolescent sexual risk

behaviors and long-term reproductive health outcomes, even though early sexual behaviors appear to set a pattern for later ones.<sup>6,7</sup> Additionally, women aged 20–24 have the highest unintended childbearing rate,<sup>8</sup> and levels of STD diagnosis are only slightly lower for this group than for youth aged 15–19.<sup>1</sup>

The current study examines the link between adolescent sexual risk behaviors and three reproductive health and behavior outcomes during young adulthood: unintended childbearing, STD diagnosis and the number of sex partners in the past year, which is a critical health measure associated with the acquisition of STDs.<sup>9</sup> We use data from multiple waves of the National Longitudinal Study of Adolescent Health (Add Health) to address two research questions. First, do teenagers who engage in risky sexual behaviors have heightened risk of negative outcomes in young adulthood, net of background characteristics? Second, which dimensions of risky behavior during adolescence are most strongly associated with these outcomes in young adulthood? We measure both the cumulative sexual risk of adolescents, indexing the overall degree of risk-taking, and the role of each sexual risk factor, recognizing that individual factors may influence different outcomes in unique ways.<sup>10</sup>

## DIMENSIONS OF ADOLESCENT RISK

### Sexual Risk Factors

A fundamental life-course principle is that current individual behavior is shaped and guided by one's history—in other words, that personal experiences and characteristics of an individual's social relationships influence long-term well-being.<sup>11</sup> Thus, we expect that young adults' reproductive health outcomes and health behaviors are shaped, in part, by the sexual risk behaviors and relationships they engaged in during adolescence.

Given that some risk factors are more proximate than others to reproductive health outcomes, we expect some dimensions of risk to have stronger associations with the outcomes than others. However, the influence of sexual risk factors may also be cumulative. In general, the cumulative risk hypothesis asserts that having more risk factors increases the prevalence of negative developmental outcomes, net of other factors.<sup>12</sup> In this case, we expect that risk for negative reproductive health and behavior outcomes during young adulthood will be greatest for adolescents exposed to the greatest number of early risk factors. This association may arise because each additional factor increases the number of opportunities for adverse outcomes to occur, or because youth with multiple risk factors are predisposed to increased risk through a lack of self-regulation or an overall attraction to risk.<sup>10</sup> We examine the potential longer term influences of eight adolescent sexual risk behaviors that have been independently associated with reproductive health outcomes and health behaviors during adolescence (and, in some cases, young adulthood).<sup>13–15</sup>

•**Contraceptive inconsistency.** Among sexually active individuals, adolescents, particularly young adolescents, are less likely to use any contraceptive than are older individuals.<sup>16</sup> Additionally, when they use a contraceptive—particularly the pill or condom—they are less likely to use it correctly or consistently.<sup>17</sup> Contraceptive use in early sexual relationships is strongly associated with use in later relationships.<sup>6</sup> Given this connection, and that contraceptive use is very proximate to reproductive health outcomes, we hypothesize that inconsistent contraceptive use during the teenage years will be strongly linked to unintended birth and STD diagnosis during young adulthood. In addition, prior research has found that adolescents with multiple sex partners tend to be inconsistent users of any kind of birth control,<sup>18</sup> and both of these behaviors are characteristic of youth who have a limited ability to regulate their behavior.<sup>10</sup> Thus, we also expect that inconsistent contraceptive use during the teenage years will be linked to an increased number of sex partners during young adulthood.

•**Age at first intercourse.** Age at sexual debut has been of central interest to researchers and policymakers for a variety of reasons. Young age at first intercourse is associated with reduced rates of contraceptive use,<sup>19</sup> resulting in an elevated likelihood of a teenage birth, and many such births are unintended.<sup>20,21</sup> Furthermore, in combination

with other risk factors, being especially young at first sex is associated with increased odds of an STD diagnosis in young adulthood and with an increased lifetime number of sex partners.<sup>9,22</sup> To the extent that early age at first sex is linked to engagement in sexual risk behaviors across the life course, we expect it to be associated with an increased risk of unintended childbearing and STD diagnosis, and an increased number of sex partners, during young adulthood.

•**Older sexual partner.** Adolescent women who are in relationships with older partners tend to have less relative power and lower levels of self-efficacy than those who are in relationships with same-age or younger partners.<sup>23–25</sup> In fact, the combination of an early transition to first sex and having an older sexual partner is associated with especially negative outcomes for adolescents. Females who engage in sex prior to age 16 with an older partner are three times as likely to give birth before turning 20 as are adolescents who have sex with a similar-aged partner before turning 16.<sup>22</sup> This may partly reflect that females with older partners are less likely than others to use condoms or other contraceptives.<sup>19,23</sup> For similar reasons, having an older partner may also increase adolescent females' likelihood of acquiring an STD.<sup>22</sup> Thus, we expect that having had an older sex partner during adolescence will be associated with elevated risks of unintended birth and STD diagnosis, and an increased number of sex partners.

•**Discussion of birth control.** Teenagers who communicate with their partner about sexuality (e.g., when to start having sex, masturbation) and risk or risk prevention (e.g., STDs, condom use) are more likely than teenagers who do not discuss these issues to use condoms.<sup>26</sup> Similarly, female adolescents who talked about contraception with their partners prior to first having sex have twice other young females' odds of having ever used a method and are more likely to use it consistently.<sup>6</sup> We expect that early discussion of birth control will be associated with a lowered risk for STDs and unintended childbearing among young adults.

•**Number of sexual partners.** Research examining the sexual behavior of a nationally representative sample of youth aged 14–22 found that in a three-month period, 15% of sexually active women and 35% of such men had had more than one partner.<sup>9</sup> Having multiple partners is associated with adverse reproductive health outcomes, particularly STDs, because risk of exposure increases with each additional partner.<sup>9</sup> Although some studies have found that youth with multiple partners tend to be inconsistent contraceptive users,<sup>27</sup> others have found that condom use is more common among women who report multiple partners over the past 12 months than among those reporting one,<sup>28</sup> perhaps offsetting some of the risk due to increased exposure. Nonetheless, given the link between early and later sexual behaviors, we expect that adolescents who have multiple sex partners will be at increased risk of having multiple partners, having an STD

and, perhaps to a lesser extent, having an unintended birth in young adulthood.

•**Nonmonogamous relationships.** Even after the number of sexual partners is controlled for, adolescents who have more than one partner at a time are at increased risk of having an STD.<sup>29</sup> Additionally, women who report that they are in nonmonogamous relationships have elevated odds of STD recurrence over time.<sup>30</sup> Results from another study, however, indicated that being in a nonmonogamous relationship may lead to increased condom use among young adults,<sup>31</sup> perhaps reducing the risk of unintended childbearing. Thus, compared with adolescents who were in monogamous relationships, we expect that those who had nonmonogamous relationships will have more sex partners during young adulthood and be at increased risk of STD diagnosis. Yet if these teenagers are more consistent condom users, they may not necessarily be at increased risk of unintended childbearing.

•**Nonromantic partners.** Teenagers whose first sexual experience occurs in a casual or nonromantic relationship (i.e., with someone they have just met or are just friends with) are less likely to use contraceptives than teenagers whose first experience occurs in a steady or romantic relationship.<sup>32</sup> Similarly, adolescents in romantic relationships are more likely than those in nonromantic ones to report having ever used a contraceptive in that relationship; however, they are less likely to have been consistent users.<sup>6</sup> Research using a nonrepresentative sample of adolescent STD clinic clients found that young women with casual partners were the least likely to have ever been pregnant.<sup>33</sup> However, other research found that females who had ever had a nonromantic partner were more likely than others to acquire an STD during young adulthood.<sup>22</sup> The casual sex partners of youth are often friends, or even previous romantic partners.<sup>34</sup> Therefore, casual sexual experiences with unknown partners—and particularly one-night stands—may be the casual relationships that are of particular concern. We expect that youth with a history of such experiences will be at increased risk of negative outcomes, particularly STDs and a greater number of sex partners.

### Other Risk Factors

Social and demographic factors, family background and related risk behaviors during adolescence are associated with early sexual risk behaviors and later reproductive health outcomes. Female gender,<sup>27</sup> age,<sup>28</sup> and racial or ethnic minority status generally are positively associated with risky sexual behaviors.<sup>35</sup> Academic achievement, educational aspirations and the avoidance of substance use generally are negatively associated with risky sexual behavior among youth.<sup>36,37</sup> Finally, higher maternal education,<sup>35</sup> greater parent-child closeness,<sup>38</sup> and stable or intact family structure during adolescence<sup>35</sup> tend to be protective against risky behaviors and negative reproductive health outcomes during adolescence and young adulthood.

## METHODS

### Data and Sample

Add Health is a nationally representative, school-based survey of U.S. students who were in grades 7–12 in 1995.<sup>39</sup> Data collection included four waves of in-home interviews, in 1995, 1996, 2002 and 2008. Our analytic sample was drawn from the nearly 15,200 respondents who participated in the Wave 3 follow-up, which assessed the outcomes of interest. We eliminated 4,369 youth because they did not have valid Wave 3 longitudinal weights and another 3,710 because they were younger than 16 at Wave 2. The latter restriction ensured that the youth in the sample, who were of varying ages at the beginning of the study, had similar (although not equal) time frames in which to be exposed to or to experience each sexual risk factor.

We further limited the sample to the 5,884 youth who were sexually experienced by Wave 3 and reported on at least one sex partner, and excluded the 86 respondents who were married by Wave 2. The overall sample comprised 5,798 respondents, of whom 96% were aged 20–24 at Wave 3 and the rest were 25–27 years old. Because of missing data, the final sample sizes for the analyses of the dependent variables varied slightly.

### Measures

•**Dependent variables.** We used data from Waves 3 and 4 to create three dependent variables: the number of sex partners in the past year, having an STD in the past year and having an unintended birth during young adulthood. The first measure distinguished among young adults who had had no sex partners, only one partner, and two or more partners in the last year. This variable was derived from a Wave 3 question in which respondents reported the number of partners with whom they had had vaginal intercourse in the past year.

For the second variable, Wave 3 data were used to create a dichotomous measure of whether or not respondents had tested positive on the Add Health biomarker assessment or had been told in the past year by a doctor or nurse that they had an STD. The biomarker test covered chlamydia, gonorrhea and trichomoniasis; the clinician-reported STDs also included syphilis, genital herpes, genital warts, human papillomavirus, bacterial vaginosis, pelvic inflammatory disease, cervicitis, urethritis, vaginitis, and HIV or AIDS.

The third measure used Wave 4 data to create a three-level variable that identified whether each female respondent had had an intended birth, an unintended birth or no birth between ages 20 and 24; for male respondents, this measure applied to children they had fathered.\* A birth was categorized as unintended if respondents with a birth history answered no to the question “Thinking back to the

\*We used Wave 4 data so we could focus on births among 20–24-year-olds, who have high rates of unintended childbearing, and because births to married respondents were undercounted at Wave 3.

time just before this pregnancy with [partner name], did you want to have a child then?" If a respondent had experienced more than one birth in this period and at least one had been unintended, he or she was categorized as having had an unintended birth.

•**Sexual risk factors.** At Waves 1 and 2, Add Health asked respondents a series of questions about each of their sexual relationships. From these questions, we constructed eight dichotomous variables that measured whether respondents had had a particular risk factor in one or more of their sexual relationships during adolescence. The risk factors were inconsistent contraceptive use, defined as having ever not used any form of birth control (prescription or nonprescription) with a sexual partner; first sex before age 16; a partner who was three or more years older; no discussion of birth control with a romantic partner (i.e., a partner in "a special romantic relationship") prior to first having sex with that partner; multiple sexual partners; a nonmonogamous relationship;\* a nonromantic sexual partner; and a one-night stand. Adolescents who had not had sex by Wave 2 were classified as having had no sexual risk factors. From these dichotomous variables, we created a risk index that summed all eight factors (range, 0–8).† This index allowed us to examine whether cumulative exposure to risks, as opposed to each individual risk, was associated with the reproductive health and health behaviors of young adults.

•**Individual and family controls.** Background data were taken mainly from Wave 1. We controlled for a number of individual characteristics: gender, age, race or ethnicity, ever-use of substances (tobacco, alcohol, drugs), high educational aspirations (a score of five on a 1–5 scale of desire to attend college), cognitive ability and educational attainment (assessed at Wave 3 and categorized as less than high school, high school degree or GED, or at least some college). Cognitive ability was measured by respondents' scores on Add Health's modified Peabody Picture Vocabulary Test (PVT). Using the Wave 1 sample, this measure was standardized to have a mean of 100 and standard deviation of 10 (range, 13–146).<sup>40</sup> We explored several variable specifications for the PVT, and in all cases a continuous measure provided the best model fit.

We also controlled for three family background characteristics: whether the respondent lived with two parents (biological or adoptive), education level of the more highly educated parent and parent-teenager closeness. The last of these was derived from four items. Respondents were asked to indicate their level of agreement, on a scale of 1–5 ("strongly agree" to "strongly disagree"), with three statements regarding their residential mother and father: "Most of the time your mother/father is warm and loving toward you," "You are satisfied with the way you and your mother/father communicate with each other" and "Overall you are satisfied with your relationship with your mother/father." Teenagers also indicated how close they feel to their parent, using a scale of 1–5 ("not close at all" to "extremely close"). Responses to the first three

questions were reverse-coded, and all four responses were averaged to form a scale (alpha, 0.86). We subtracted one point from the scale to create a range of 0–4; if valid data were available for both residential parents, the two scores were averaged.

## Analysis

We first conducted descriptive analyses of our dependent and independent variables. We then conducted multivariate analyses to examine the association between risky sexual behaviors during adolescence and each outcome in young adulthood, while controlling for individual and family background characteristics. Multinomial logistic regression was used to compare young adults who had had no sex partners in the past year with those who had had either one or at least two partners, as well as respondents who had had one partner with those who reported two or more. For the STD measure, we used logistic regression to compare young adults who had had an STD in the previous year with those who had not. Finally, we used multinomial logistic regression to compare youth who had had no birth with those who reported an intended birth or an unintended birth, and to compare youth who had had an unintended birth with those who had had an intended birth.

Two sets of analyses were conducted for each outcome. First, we included the cumulative risk index to determine whether the risk of negative outcomes increased with the number of risk factors in adolescence, net of controls. For each outcome, we checked various specifications of the risk index (e.g., categorical, with a squared term) in the regression models to assess the possibility of nonlinear associations. None of the alternatives improved the model's fit. Second, we simultaneously included the eight individual sexual risk factors to determine which dimensions were most strongly associated with reproductive health and behavior outcomes in young adulthood, net of controls.‡ In all models, we used Stata survey estimation procedures to weight and adjust for Add Health's clustered sampling design.<sup>41</sup> Missing cases for all independent variables were replaced with imputed values

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\*If one relationship ended and another began in the same month, these were categorized as monogamous.

†Exploratory analyses supported the inclusion of all eight risk factors in one index. Factor analyses produced one factor with an eigenvalue of more than 3, and two with eigenvalues less than 1. For the first factor, all items had loadings of more than 0.5. The eight-item index had a higher alpha (0.82) than indices with any of the items removed.

‡Correlations between sexual risk factors were quite moderate; the highest was 0.58 (nonmonogamous partner and multiple partners), and the rest were at or below 0.50. To ensure that these correlations did not cause analytic problems, we calculated variance inflation factors, which indicate how much the variance of each estimated regression coefficient increased because of collinearity. In no case was the variance inflation factor greater than 3.0, and in all but one case it was below 2.0, assuring us that multicollinearity was not a concern (source: Fox J, *Applied Regression Analysis and Generalized Linear Models*, second ed., Thousand Oaks, CA: Sage Publications, 2008).

using Stata's *ICE* and *mi estimate* procedures.\*<sup>42</sup> Fewer than 5% of cases were missing for any variables except parent-child closeness at Wave 1 (6%) and nonromantic partner history through Wave 2 (8%).

## RESULTS

### Descriptive Analyses

The sample was about evenly split between males and females, and the average age at Wave 1 was 16 (Table 1). The majority of young adults were white (65%); 17% were

black, 12% Hispanic and 6% of other race or ethnicity. Slightly more than half (54%) had lived with two parents at Wave 1. Adolescents reported moderately high levels of parent-teenager closeness (mean, 3.2 out of 4), and the average PVT score was 102 on the scale of 13–146. Seventy percent of respondents had ever used tobacco, alcohol or drugs. Most had high educational aspirations at Wave 1 (66%); by the third survey wave, 53% had completed at least some college, 37% had completed high school and 10% had less than a high school education. Fifty-five percent of respondents' parents had completed at least some college, 31% had completed high school and 14% had less than a high school education.

On average, young adults had reported two sexual risk factors during adolescence. Eighteen percent had reported one or two risk factors, while 22% had reported 3–4 and 17% had reported 5–8. Forty-three percent of young adults had reported no risk factors; 91% of this group had not had sex by Wave 2 (not shown). The most common risk factor was having multiple partners (42%), and the least common were having an older partner and having a nonmonogamous partner (18% each). Thirty-five percent of youth had used contraceptives inconsistently, 26% had been younger than 16 when they first had sex and 29% had ever had a romantic relationship in which they did not discuss contraception before first having sex. Twenty percent had had a nonromantic partner, and 22% had had a one-night stand.

The majority of young adults (60%) had had one sexual partner in the year before the Wave 3 survey, 32% had had two or more, and 8% reported no partners. Almost one in five young adults (17%) had had an STD in the last year. Finally, between ages 20 and 24, 15% of respondents had had an unintended birth, 10% an intended birth and 75% no birth.

### Multivariate Analyses

•**Cumulative risk index.** The more risky sexual behaviors respondents reported in adolescence (as assessed by the cumulative risk index), the higher their relative risk of having had any sexual partner in the year before the Wave 3 interview (relative risk ratio, 1.2—Table 2) and of having had two or more, rather than none (1.3) or one (1.2). Furthermore, each additional sexual risk factor during adolescence was associated with a 10% increase in the odds of having had an STD (odds ratio, 1.1) and the risk of having given birth between ages 20 and 24 (relative risk ratios for both intended and unintended, 1.1).

•**Individual risk factors.** The importance of individual dimensions of risk differed across outcomes. Four

**TABLE 1. Selected characteristics of adolescents aged 16 or older at Wave 2, National Longitudinal Study of Adolescent Health**

Characteristic	% or mean (N=5,798)
<b>Individual/family†</b>	
Male	51.1
Mean age	16.2 (1.1)
Race/ethnicity	
White	65.0
Black	16.7
Hispanic	12.1
Other	6.2
Lived with two biological/adoptive parents	53.6
Mean parent-teenager closeness (range, 0–4)	3.2 (0.8)
Ever used substances	70.4
Mean PVT score (range, 13–146)	101.6 (14.8)
Had high educational aspirations	66.0
Education at Wave 3	
<high school	10.1
High school	37.0
≥some college	52.8
Parent's education	
<high school	13.5
High school	31.3
≥some college	55.3
<b>Sexual risk factors‡</b>	
Mean risk index (range, 0–8)	2.1 (2.4)
No. of risk factors	
0	42.5
1–2	18.2
3–4	22.3
5–8	17.0
Inconsistent contraceptive use	34.5
First sex before age 16	26.2
Ever had older partner	18.1
Ever did not discuss contraception before first sex with a romantic partner§	29.0
Multiple partners by Wave 2	42.0
Ever had nonmonogamous partner	17.6
Ever had nonromantic partner	20.3
Ever had one-night stand	21.5
Had not had sex by Wave 2	38.5
<b>Dependent variables</b>	
No. of partners in last year††	
0	8.4
1	59.6
≥2	32.0
Had STD in last year††	16.9
Had a birth/fathered a child at age 20–24‡‡	
No	75.2
Intended	9.6
Unintended	15.2

†Measured at Wave 1 (1995) unless noted otherwise. ‡Measured at Waves 1 and 2 (1996) unless noted otherwise. §Because this measure applied only to romantic relationships, 5% of respondents did not answer it. ††Measured at Wave 3 (2002). ‡‡Measured at Wave 4 (2008). Notes: Figures are weighted percentages unless noted otherwise. For means, numbers in parentheses are standard deviations. PVT=Peabody Picture Vocabulary Test.

\*Our imputation model included all predictors of interest, controls and dependent variables, as well as auxiliary variables related to delinquency, family turbulence, school and neighborhood safety, grades and family poverty status. Because the inclusion of auxiliary variables is standard in multiple imputation techniques, these variables were not included in subsequent analysis (source: Enders C, *Applied Missing Data Analysis*, New York: Guilford Press, 2010).

**TABLE 2. Relative risk ratios and odds ratios from multivariate logistic regression analyses assessing associations between selected characteristics and reproductive health and behavior outcomes in young adulthood**

Characteristic	No. of partners in last year† (N=5,743)			STD diagnosis in last year‡ (N=4,898)	Birth at age 20–24† (N=5,036)		
	1 (vs. 0)	≥2 (vs. 0)	≥2 (vs. 1)		Intended (vs. none)	Unintended (vs. none)	Intended (vs. unintended)
<b>MODEL 1</b>							
<b>Cumulative risk index</b>	1.2**	1.3***	1.2***	1.1***	1.1**	1.1***	1.0
<b>MODEL 2</b>							
<b>Individual sexual risk factors</b>							
Inconsistent contraceptive use	1.2	1.6*	1.3*	1.2	1.2	1.5**	1.3
First sex before age 16	0.9	0.8	0.9	1.3	0.6*	0.8	1.3
Ever had older partner	1.0	1.1	1.1	1.0	1.1	1.0	0.9
Ever did not discuss contraception before first sex with a romantic partner	1.3	1.5	1.2	0.9	1.2	1.3*	1.1
Multiple partners by Wave 2	1.0	1.3	1.3*	1.0	1.4	1.3	0.9
Ever had nonmonogamous partner	1.6*	2.0**	1.2	1.1	1.2	0.9	0.8
Ever had nonromantic partner	1.4	1.9*	1.4**	1.3	1.2	1.1	0.9
Ever had one-night stand	1.0	0.9	0.9	1.0	1.1	1.0	0.9
<b>Individual/family</b>							
Male	0.6***	1.2	2.0***	0.5***	0.4***	0.5***	1.2
Age at Wave 1	1.0	0.8**	0.8***	1.0	0.8*	0.9	1.1
Race/ethnicity							
White (ref)	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Black	1.4	3.0***	2.2***	3.8***	1.0	1.4*	1.4
Hispanic	1.6*	1.5	1.0	1.1	1.1	0.8	0.8
Other	1.1	1.1	1.0	1.5*	0.9	0.7	0.8
Lived with two parents	0.8	1.0	1.2	0.9	0.7**	0.6***	0.9
Parent-teenager closeness	1.1	1.1	0.9	0.9	1.0	0.9	0.9
Ever used substances	1.3	1.7**	1.3*	1.0	0.9	0.9	1.0
PVT score	1.0	1.0	1.0	1.0	1.0	1.0	1.0
High educational aspirations	1.1	1.0	0.9	0.9	0.8	0.8	1.0
Education at Wave 3							
<high school	1.2	1.1	1.0	1.0	1.2	1.0	0.8
High school (ref)	1.0	1.0	1.0	1.0	1.0	1.0	1.0
≥some college	0.9	1.2	1.4**	1.0	0.4***	0.4***	1.0
Parent's education							
<high school	1.0	1.0	1.1	1.1	0.9	1.0	1.2
High school (ref)	1.0	1.0	1.0	1.0	1.0	1.0	1.0
≥some college	1.1	1.2	1.0	1.1	0.7**	0.9	1.3

\*p<.05. \*\*p<.01. \*\*\*p<.001. †Relative risk ratios. ‡Odds ratios. Notes: Model 1 included all of the same controls as Model 2; results for controls were virtually the same in both models. ref=reference category. PVT=Peabody Picture Vocabulary Test.

dimensions of risk were associated with the number of sex partners in the past year. Young adults who had ever had a nonmonogamous relationship had an increased risk of having had one partner (relative risk ratio, 1.6) or more than one (2.0), rather than none. Youth who had ever used contraceptives inconsistently or had a nonromantic sexual partner also had an increased risk of the latter outcome (1.6 and 1.9, respectively). In addition, young adults who had reported inconsistent contraceptive use, multiple sex partners or a nonromantic relationship during adolescence were at increased risk of having had two or more partners, rather than just one, in the year before Wave 3 (1.3–1.4). By contrast, respondents who had ever used contraceptives inconsistently or had not discussed birth control with a romantic partner before sex had an elevated relative risk of having had an unintended birth (1.5 and 1.3, respectively). Youth who reported early first sex had a reduced relative risk of having had an intended birth—but not an unintended birth—as opposed to no birth (0.6). No individual risk factor was associated with STD diagnosis or having had an unintended, rather than an intended, birth.

•**Control variables.** The estimated associations of the control variables with the outcomes were similar across models; thus, we show them only for the individual risk factor analyses.

Males had a reduced relative risk of having had one sexual partner (relative risk ratio, 0.6), but an elevated risk of having had two partners, as opposed to one (2.0). They also had decreased odds of having had an STD (odds ratio, 0.5) and a reduced risk of having been involved in an intended or unintended birth, instead of no birth (0.4–0.5). Not surprisingly, the younger respondents had been at Wave 1, the lower their relative risk of reporting two sexual partners in the past year instead of one or none (0.8 for each), and of having had an intended birth, rather than no birth (0.8). Compared with white respondents, blacks were more likely to have had two partners (relative risk ratios, 2.2–3.0), an STD diagnosis (odds ratio, 3.8) and an unintended birth (relative risk ratio, 1.4). Hispanics were more likely than whites to have had one sexual partner, rather than none (1.6), and respondents of other races or ethnicities were more likely to have received an STD diagnosis (1.5).

Respondents who had lived with two parents in adolescence had a decreased relative risk of having had an intended or unintended birth, as opposed to no birth (relative risk ratios, 0.7 and 0.6, respectively). Ever-use of tobacco, alcohol or drugs was associated with an elevated relative risk of having had two or more sexual partners (1.3–1.7). Respondents with at least some college education at Wave 3 had a higher relative risk than those with a high school education of having had two or more partners instead of one (1.4), but a lower relative risk of having given birth (0.4 for intended and unintended births). Finally, having a parent who had at least some college education was associated with a decreased risk of having had an intended birth, rather than no birth (0.7).

## DISCUSSION

This study has aimed to extend prior research and help inform policy development by using prospective data to link multiple established adolescent sexual risk behaviors to the reproductive health of young adults. We looked at the role that these risks play individually and cumulatively, as both approaches have substantive and methodological merits. Examining risk factors individually allows one to assess the relative importance of various factors for each outcome, and targeting specific risk factors may allow for more effective use of often limited intervention resources. By contrast, examination of cumulative risk tells us something about the overall level of risk, and can be particularly useful when the power of individual risk factors is weak.

The most common risk factor was having two or more sexual partners during adolescence, and one of the least common was having a nonmonogamous partner. Notably, we found that one in five young adults had engaged in casual sexual relationships or one-night stands while teenagers, consistent with other estimates of casual sex among this age-group.<sup>7,43</sup> This draws attention to the increasing prevalence of “hookups” among teenagers,<sup>44</sup> which may have implications for longer term reproductive health outcomes.<sup>24,31</sup>

Overall, cumulative risk during adolescence was positively associated with number of sex partners in young adulthood, as well as with risk of STD diagnosis and unintended childbearing. These associations appeared to be additive, as the continuous measure provided the best model fit. As noted in other research on cumulative effects,<sup>12</sup> this suggests that the elimination of any risk factor may reduce risk for young adults, even though some behaviors are more important than others in predicting certain outcomes.

Having had a nonmonogamous relationship as a teenager increased the risk of having had any sex partners in the past year. Furthermore, among young adults who had had sex, those who had multiple sex partners or had a casual sexual relationship during their teenage years were more likely to have had two or more partners in the past year than just one. These findings add to the growing body of evidence suggesting that patterns of risk behavior

may be established early and may persist.<sup>6,7</sup> Additionally, respondents who reported inconsistent contraceptive use during adolescence had an elevated relative risk of having two or more partners in young adulthood instead of just one. This finding is consistent with associations observed in prior work,<sup>9</sup> and may reflect a decreased ability among some youth to self-regulate sexual behavior.<sup>10</sup>

None of the individual risk factors was associated with STD diagnosis, but this lack of association may be attributable to the small number of respondents who had had an STD. The positive association between the cumulative risk index and STD diagnosis suggests that the likelihood of having an STD rises with a young person’s number of risk behaviors.

Notably, young adults who had had sex before age 16 had a reduced relative risk of having an intended birth, as opposed to no birth. Although previous research has linked early sexual debut with other sexual behaviors that might be associated with early, and likely unintended, childbearing,<sup>19</sup> little research has examined how early debut is linked to a planned birth. Our findings suggest that youth who have sex at a young age may be less oriented than others toward relationships that involve planned family building.

Youth who reported inconsistent contraceptive use or failure to discuss contraceptive use prior to sex during adolescence had elevated odds of having an unintended birth during young adulthood. Again, this suggests that early patterns of behavior may set the stage for later behaviors.<sup>6,7</sup> In prior research, women who reported not liking alternatives to condoms or who said that cost prevented them from using alternatives were more likely to use condoms—a method with a relatively high user failure rate—than were women who reported relatively few barriers to using other methods.<sup>45</sup> Such barriers point to the need to expand access to long-acting and affordable birth control options for adolescents and young adults. Additionally, for youth who rely on condoms, programs that aim to reduce unintended pregnancy need to focus on increasing consistent use. Our research suggests that enhancing communication between partners may also be an important component of these programs.

## Limitations

This study has a number of limitations. First, given that STD diagnosis is a rare event, few respondents had had an STD, which may have resulted in imprecise estimates.

Second, biomarker tests assessed three STDs at the Wave 3 interview, and self-reports covered diagnoses in the past year. Nonetheless, these measures would have missed STDs that were not tested for at Wave 3 or diagnosed in the previous year. Fortunately, an undercount would result in conservative estimates, and so we are not concerned that the findings are overstated.

Third, the gap between Wave 2, when many of our independent variables were measured, and Wave 3, when our outcomes were measured, is 5–6 years. Obviously, a

lot happened in respondents' lives in that period that we cannot measure. Given the link between early and later sexual risk factors and continuing patterns of behavior, we believe that adolescent behaviors are a reasonable proxy for behaviors in the interim years. Additionally, the further removed (temporally) risk behaviors are from outcomes, the more attenuated associations are likely to be. Thus, the fact that we found any associations is notable.

A fourth limitation is the risk of endogeneity. Unmeasured factors—for example, an underlying propensity to engage in risk behaviors—likely influence both sexual risk factors in adolescence and reproductive health outcomes in young adulthood. By using longitudinal data, however, we were able to control for a number of early characteristics and behaviors that may be associated with a propensity for risk, which would reduce any endogeneity bias.

Finally, because our analyses measured adolescent risk factors at age 16 for some respondents and at slightly older ages for others, we may have underestimated risk for young teenagers.

## Conclusions

A key message that emerged from our findings is that teenagers' sexual behaviors have both short-term and long-term consequences. Although negative reproductive and behavior outcomes were associated with a cumulative number of risk factors, different individual factors were significant across the various outcomes. Only inconsistent contraceptive use was associated with more than one outcome, which supports our hypothesis that behaviors more proximate to reproductive health outcomes would be the strongest predictors of these outcomes in young adulthood, and hence should be a focus of intervention strategies. Contraceptive use and related behavior were among the risk factors associated with unintended childbearing, whereas relationship variables were key predictors of young adults' number of sex partners. Although interventions focusing on specific risk factors may be effective, programs that focus on multiple domains of risk may be more effective in helping promote broader reproductive health among young adults. Program providers should also be aware that an early focus on contraceptive use, relationship context and relationship dynamics will likely influence behaviors beyond the teenage years.

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**Author contact:** [mscott@childtrends.org](mailto:mscott@childtrends.org)