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Adolescent Connectedness and Adult Health Outcomes

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Abstract

BACKGROUND: Because little is known about long-term effects of adolescent protective factors across multiple health domains, we examined associations between adolescent connectedness and multiple health-related outcomes in adulthood.

METHODS: We used weighted data from Waves I and IV of the National Longitudinal Study of Adolescent to Adult Health ($n = 14\,800$). Linear and logistic models were used to examine associations between family and school connectedness in adolescence and self-reported health risk behaviors and experiences in adulthood, including emotional distress, suicidal thoughts and attempts, physical violence victimization and perpetration, intimate partner physical and sexual violence victimization, multiple sex partners, condom use, sexually transmitted infection (STI) diagnosis, prescription drug misuse, and other illicit drug use.

RESULTS: In multivariable analyses, school connectedness in adolescence had independent protective associations in adulthood, reducing emotional distress and odds of suicidal ideation, physical violence victimization and perpetration, multiple sex partners, STI diagnosis, prescription drug misuse, and other illicit drug use. Similarly, family connectedness had protective effects for emotional distress, all violence indicators, including intimate partner violence, multiple sex partners, STI diagnosis, and both substance use indicators. Compared to individuals with low scores for each type of connectedness, having high levels of both school and family connectedness

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was associated with 48% to 66% lower odds of health risk behaviors and experiences in adulthood, depending on the outcome.

CONCLUSIONS: Family and school connectedness may have long-lasting protective effects across multiple health outcomes related to mental health, violence, sexual behavior, and substance use. Increasing both family and school connectedness during adolescence has the potential to promote overall health in adulthood.

Adolescence is widely recognized as a critical developmental period that shapes individual trajectories into adulthood. During adolescence, many young people engage in risk behaviors or experience adverse events that contribute to poor health outcomes and diminished life opportunities.¹⁻³ For example, a robust body of literature has linked adverse experiences in adolescence to mental health issues, violence victimization and perpetration, risky sexual behaviors, and substance use in adulthood.⁴⁻⁷ Preventing negative trajectories spurred by adolescent health risk behaviors and experiences is particularly important given their prevalence. Data from the 2017 Youth Risk Behavior Survey indicate that in the previous year, 17.2% of US high school students have seriously considered attempting suicide, and 19.0% have been bullied on school property. Lifetime, 9.7% have had 4 sex partners, and 14.0% have misused prescription pain medicine.⁸

However, adolescence is not solely characterized by risk. Researchers have identified protective factors at multiple levels of the social ecology that either directly promote positive outcomes or buffer the negative effects of risk factors.⁹ Family and school connectedness, referring to a sense of caring, support, and belonging to family and school, respectively, are 2 such factors for which evidence is particularly strong.¹⁰ A seminal analysis by Resnick et al¹¹ using Wave I of the National Longitudinal Study of Adolescent to Adult Health (Add Health) demonstrated protective associations between these types of connectedness and adolescent outcomes related to mental health, violence, sexual behavior, and substance use. Over the past 2 decades, protective relationships between family and school connectedness and multiple adolescent health outcomes have been replicated in numerous cross-sectional studies.¹²⁻¹⁶ For example, authors of a recent meta-analysis of primarily cross-sectional research on school connectedness and suicidal ideation and attempt found decreased odds of both outcomes with higher levels of connectedness.¹³ Authors of other recent studies have documented protective associations in relation to sexual risk, violence victimization, and substance use indicators.¹⁴⁻¹⁶

Longitudinal research is particularly valuable for establishing appropriate temporal ordering that is necessary, albeit not sufficient, for causal inference, and in a growing number of longitudinal studies, researchers have documented protective effects of connectedness.¹⁷⁻²³ However, because this literature is still developing, there are some limitations to what is known about the role of connectedness over time. Some studies have relatively short periods of follow-up, documenting longitudinal protective effects in adolescence or early young adulthood.¹⁷⁻²⁰ The few studies with longer-term follow-up have almost all been focused on sexual risk or mental health and single indicators in these domains (ie, sexually transmitted infection [STI] diagnosis and suicidal ideation, respectively), with each study operationalizing connectedness differently and including a varied set of potential

confounders.²¹⁻²³ Not only is there a need to address long-term effects for violence and substance use, including opioid use, but because health risks related to mental health, violence, sexual behavior, and substance use co-occur,^{24,25} there is value in considering outcomes in these domains collectively, with a consistent analytic approach.

Accordingly, we use nationally representative longitudinal data from Waves I and IV of Add Health to examine long-term associations with multiple indicators of mental health, violence, sexual behavior, and substance use. Documenting broad-based, long-lasting impact would further justify practices, programs, and policies that aim to strengthen young people's connections to family and school.

METHODS

Sample

We used nationally representative data from Waves I and IV of Add Health, which employed a stratified, cluster sampling design to sample middle and high schools throughout the United States.²⁶ Wave I data collection (1994–1995) included in-school questionnaires with students in grades 7 to 12 and in-home student ($n = 20\,745$) and parent interviews. Wave IV (2008) data collection involved in-home interviews with 24- to 32-year-old participants ($n = 15\,701$) who had completed in-home interviews as students in Wave I. Student participants lost to follow-up by Wave IV were sufficiently comparable to retained participants, with significant differences in means and proportions not exceeding ~5% for all sociodemographic characteristics, except biological sex (11%). The only differences in baseline risk behaviors and experiences observed between attrited and retained participants were that those lost to follow-up were slightly less likely to report suicidal ideation and more likely to have experienced or perpetrated violence (<5% difference in mean values).

Measures

School and family connectedness measured at Wave I were predictors of interest. A school connectedness scale ($\alpha = .78$) that could range from 6 to 30 was computed as a sum of 6 items (eg, feel close to people at school, feel that your teachers care about you). A family connectedness scale ($\alpha = .82$) was based on 8 items (eg, your parents care about you, people in your family understand you, you feel close to your mom, you feel close to your dad). Responses to separate mother and father items were averaged, and the final 6 items were summed to create a scale with potential scores ranging from 6 to 30.

Outcomes of interest included self-reported health risk behaviors and experiences measured at Wave IV related to mental health, violence, sexual health, and substance use. In Table 1, we detail the operationalization of each outcome. Briefly, we considered indicators of emotional distress, suicidal ideation and attempts, physical violence victimization and perpetration, intimate partner physical and sexual violence victimization, multiple sex partners, condom use, STI diagnosis, prescription drug misuse, and other illicit drug use.

We included the following sociodemographic characteristics as covariates: age in years, biological sex, race and ethnicity, parent's highest level of education, parent's marital status, and receipt of public assistance (eg, supplemental security income, food stamps).

All covariates were from Wave I except for age, which was based on Wave IV because observations were more complete. Parental variables and public assistance were based on Wave I parent report. Wave I measures were also included to control for baseline risk behaviors and experiences related to Wave IV outcomes. These covariates were operationalized in a similar manner as the outcome measures (Table 1), except for sexual violence and early sexual initiation, for which Wave IV lifetime measures were used.

Statistical Analysis

We conducted all analyses using SAS survey procedures (SAS Institute Inc, Cary, NC) and Wave IV sampling weights to account for the complex sampling design.²⁷ The final weighted sample consisted of 14 800 participants who completed interviews at both Wave I and Wave IV. Analytic samples varied for each outcome because of skip patterns and missing data; participants were removed via list-wise deletion. Missing data analysis suggested that missing values were largely attributed to missingness in parental items, with ~15.1% of participants in the final sample missing responses to at least 1 parent item from Wave I. Participants with missing values for parental covariates were more likely to be older and non-Hispanic African American or non-Hispanic other, although mean differences were not more than 10%.

To characterize the overall sample, we examined descriptive statistics for each measure and bivariate associations between connectedness and sociodemographic measures and baseline health risks. We then ran separate bivariate and multivariable regression models for each outcome, including both family and school connectedness, sociodemographic characteristics, and respective baseline outcomes in the adjusted models. Logistic models were used for all outcomes, except for the continuous emotional distress score, for which linear regression was used with β coefficients quantifying the change in emotional distress per unit increase in connectedness.

For dichotomous outcomes with significant multivariable associations for both family and school connectedness, we illustrate comparisons between high and low connectedness scores because the regression models described above only compare per-unit changes. To do so, we defined “high connectedness” as the upper quartile value of each connectedness scale and “low connectedness” as the lower quartile value of each scale. We then input combinations of these values with parameter estimates from the multivariable models to calculate odds ratios for (1) low levels of school connectedness and high levels of family connectedness, (2) high levels of school connectedness and low levels of family connectedness, and (3) high levels of both family and school connectedness. For each estimate, the reference group was low levels of both family and school connectedness. Mean values were input for all continuous covariates, and values of categorical indicators were based on modal responses to meaningfully represent an “average” individual.

We also examined college graduation (yes versus no) as a secondary outcome of interest. As a positive education outcome, it can enhance the relevance of our health-related findings for school health professionals who are particularly well suited to promote school connectedness. The Centers for Disease Control and Prevention has institutional review board approval to conduct secondary data analyses with Add Health data.

RESULTS

The mean age of respondents was 15.4 years at Wave I and 28.3 years at Wave IV; half (50.7%) were male (Table 2). The majority of the sample was non-Hispanic white (65.6%), with 16.1% non-Hispanic African American and 12.0% Hispanic. The vast majority of parent respondents were female (93.7%), and nearly one-fifth of parents had less than a high school education (16.8%) and were receiving public assistance (18.2%). Mean school and family connectedness scores were 22.1 and 25.5, respectively; bivariate associations between these connectedness measures and demographics, risk behaviors, and experiences are reported in Table 3. As for outcomes of interest at Wave IV (Table 2), prevalence ranged from 1.6% (attempting suicide in past 12 months) to 46.6% (condom nonuse in the past 12 months).

In bivariate analyses, higher school connectedness was associated with lower emotional distress and lower odds of all dichotomous risk behaviors and experiences examined, except for past-year suicide attempt (Table 4). In multivariable analyses, protective effects of higher school connectedness remained for emotional distress ($\beta = -.06$, $SE = 0.02$, $P < .001$) (data not shown), suicidal ideation (adjusted odds ratio [aOR] = 0.97, 95% confidence interval [CI] = 0.95–1.00), physical violence victimization (aOR = 0.97, 95% CI = 0.96–0.99) and perpetration (aOR = 0.98, 95% CI = 0.96–0.99), multiple sex partners (aOR = 0.98, 95% CI = 0.96–0.99), STI diagnosis (aOR = 0.98, 95% CI = 0.96–1.00), prescription drug misuse (aOR = 0.97, 95% CI = 0.96–0.99), and other illicit drug use (aOR = 0.98, 95% CI = 0.96–0.99) (Table 4).

Findings were similar for family connectedness. Bivariate analyses revealed significant protective associations for all dichotomous outcomes (Table 5) and emotional distress. In adjusted analyses, higher family connectedness was associated with lower emotional distress ($\beta = -.07$, $SE = 0.02$, $P < .001$) (data not shown) and odds of physical violence victimization (aOR = 0.97, 95% CI = 0.95–0.99) and perpetration (aOR = 0.97, 95% CI = 0.95–0.99), intimate partner physical (aOR = 0.98, 95% CI = 0.96–1.00) and sexual (aOR = 0.94, 95% CI = 0.91–0.97) violence victimization, multiple sex partners (aOR = 0.96, 95% CI = 0.94–0.98), STI diagnosis (aOR = 0.96, 95% CI = 0.94–0.98), prescription drug misuse (aOR = 0.94, 95% CI = 0.92–0.97), and other illicit drug use (aOR = 0.95, 95% CI = 0.93–0.97) (Table 5).

In Table 6, we provide estimates comparing high versus low levels of connectedness for dichotomous outcomes. The magnitude of associations comparing individuals with high family connectedness and low school connectedness to those with low scores for both types of connectedness ranged from a 29% to 51% decrease in odds, depending on the outcome. Similarly, effect estimates comparing individuals with high school connectedness and low family connectedness to low scores for both ranged from a 24% to 31% decrease in odds. Comparing those with high scores for both connectedness scales to those with low scores for both, we found an approximately 50% reduction in odds of past-year violence victimization (aOR = 0.49) and perpetration (aOR = 0.52) as well as STI diagnosis (aOR = 0.46) and multiple sex partners (aOR = 0.46). There was about a 65% decrease in odds of prescription drug misuse (aOR = 0.34) and other illicit drug use (aOR = 0.38).

When examining college graduation as a post hoc outcome (data not shown), higher school connectedness (aOR = 1.07, 95% CI = 1.05–1.09) and family connectedness (aOR = 1.03, 95% CI = 1.00–1.05) were independently associated with increased odds of obtaining at least a 4-year college degree, also controlling for sociodemographic characteristics. Such associations reflected a more than threefold increase in the odds of graduating college (aOR = 3.10) when comparing those with both high scores for school and family connectedness to those with low scores for both scales.

DISCUSSION

Long-term consequences of health risks in adolescence are well documented.¹⁻³ However, the influence of adolescent behaviors and experiences on health trajectories into adulthood is not limited to risk and subsequent adverse impact. Our study suggests that family and school connectedness during adolescence may have long-lasting protective effects across a range of adult health outcomes related to mental health, violence, sexual behavior, and substance use. Specifically, school connectedness in adolescence had independent protective associations for emotional distress, suicidal ideation, physical violence victimization and perpetration, multiple sex partners, STI diagnosis, prescription drug misuse, and other illicit drug use. Similarly, family connectedness had independent protective associations for emotional distress, all violence indicators examined, including intimate partner violence, multiple sex partners, STI diagnosis, and both substance use indicators. Suicide attempt and condom nonuse were the only 2 outcomes not protectively associated with family and/or school connectedness in multivariable analyses. We also found that both connectedness constructs are associated with increased likelihood of graduating from college, a key indicator of life opportunity.

The prevention implications of these findings are noteworthy, despite small effect sizes from the multivariable models. School and family connectedness are measured by multi-item scales so we would expect small effect estimates per unit change on the scale. As we demonstrated by calculating estimates comparing high and low connectedness scores, having both high levels of school and family connectedness is associated with a 48% to 66% lower likelihood of adult risk behaviors or experiences, depending on the specific outcome.

As noted previously, a few of these individual associations have already been documented.^{21,22,28} Specifically, both family and school connectedness have been found to be protective for STI diagnoses.^{21,22} Evaluation data from the Seattle Social Development Project, which aimed to promote both family and school connectedness through a multicomponent intervention, also suggest long-term protective effects for mental and sexual health; long-term associations with substance use were null, which is inconsistent with our study, perhaps because we used discrete indicators rather than a substance use index.²⁸ Likewise, researchers in a previous study using Add Health found protective associations between family connectedness and suicidal ideation, whereas our results for this outcome were null.²³ The 2 studies operationalized connectedness and suicidality differently, which may have contributed to the discrepancy. Despite these few contradictory findings, our study replicates protective associations for STI diagnoses and mental health that have been documented previously and extends the literature by considering additional indicators

related to sexual behavior (ie, condom use) and mental health (ie, emotional distress, suicide attempt) as well as those related to violence and substance use. In contrast to much of the longitudinal research to date, we examined outcomes beyond adolescence and early adulthood; our findings suggest long-term protection into adulthood for multiple health risk behaviors and experiences. Additionally, the findings comparing high and low values of connectedness illustrate the potential magnitude of these protective associations, which has not been clearly demonstrated before.

An implication of our findings is that promoting both family and school connectedness is a promising approach to reducing risk behaviors and experiences long-term. Fortunately, there are a variety of school-, community-, and clinic-based strategies for establishing connectedness across child and adolescent development. Beginning in the early school years, teachers, school staff, and parents play a critical role in setting behavioral expectations and reinforcing that school is a nurturing environment where all students belong. Approaches informed by social-emotional learning, positive behavioral interventions and supports, and/or other positive youth development (PYD) models can offer ways for school staff to clearly articulate expectations, better manage classroom behaviors, cultivate supportive relationships, and foster engagement among all students.²⁹⁻³⁴ For example, schools can implement PYD programs, such as service learning or mentoring programs, and connect students to PYD programs offered by trusted community organizations (eg, 4H, YMCA).^{33,35} School staff may be motivated to implement such approaches given that connectedness is associated with subsequent educational attainment. Moreover, programs based on these principles have been found to be cost effective.³⁶ Engaging parents in schools is another strategy that can promote both school and family connectedness.^{37,38} Family connectedness can also be bolstered by programs that focus on strengthening parental monitoring and supervision and parent-child communication.^{36,39}

Health care providers also have opportunities to promote school and family connectedness. Providers can ask children and adolescents about family relationships and school experiences as part of routine health screenings and engage parents in discussion about how to connect with their children (eg, reading aloud, family meals), monitor their children's activities and friends, and communicate effectively.⁴⁰ Even as confidentiality becomes critical during the adolescent years,⁴¹ providers can still encourage positive parenting practices (eg, parent-adolescent communication, parental monitoring) and advise parents on how to promote adolescents' connectedness to school. PYD programs can also be implemented through clinic settings, such as Prime Time, which documented increases in family connectedness and subsequent long-term reductions in sexual risk.^{42,43}

Limitations of this study should be considered. We examine self-reported health outcomes, and there may be underreporting due to social desirability biases. A specific measurement concern is that condom use in the past 12 months is an imprecise indicator, which may account for the lack of significant multivariable associations with this outcome. Additionally, the prevalence of suicide attempts was low, potentially precluding detection of significant differences. In using Wave IV, we have missing data because of study attrition, but baseline differences between those retained and lost to follow-up were minimal. Additionally, we did not control for all potential confounding factors given some were

unmeasured and others were strongly correlated with baseline outcomes, such that inclusion of these variables would have likely created multicollinearity. The data, particularly Wave I, are older, although given our research question, this is of minimal concern because we would expect connectedness to function similarly today. Finally, although the data are nationally representative, the school-based sampling limits generalizability.

CONCLUSIONS

Our study suggests that school and family connectedness in adolescence are protective factors for health and well-being in adulthood. Despite authors of previous studies reaching similar conclusions with select outcomes, in our study, we look across multiple health outcomes, as well as a key education indicator, and demonstrate long-term protective associations. These findings, in context with literature about how to promote these factors, point to the promise of innovative, multicomponent prevention approaches that span across developmental years and the most proximal actors in the social ecology of children and adolescents, including parents, schools, and health care providers. Although an ambitious and potentially resource-intensive undertaking, growing evidence suggests that such prevention strategies may have widespread and lasting benefits.

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ABBREVIATIONS

aOR	adjusted odds ratio
CI	confidence interval
PYD	positive youth development
STI	sexually transmitted infection
Add Health	National Longitudinal Study of Adolescent to Adult Health

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WHAT’S KNOWN ON THIS SUBJECT:

Family and school connectedness are known protective factors for mental health, violence, sexual behavior, and substance use in adolescence.

WHAT THIS STUDY ADDS:

In this study, we extend the literature by demonstrating long-term protective associations between family and school connectedness in adolescence and multiple health outcomes in adulthood.

TABLE 1

Summary of Health Risk Behaviors and Experiences in Adulthood

Outcome	Measures	Operationalization
Emotional distress, past week	How often was the following true during the past seven days: you were bothered by things that usually don't bother you; you could not shake off the blues, even with help from your family and your friends; you felt you were just as good as other people; you had trouble keeping your mind on what you were doing; you felt depressed; you felt that you were too tired to do things; you felt happy; you enjoyed life; you felt sad; you felt that people disliked you?	Reverse-coded positive items. Items summed. Scale score: 0–30
Suicidal ideation, past 12 months	During the past 12 months, have you ever seriously thought about committing suicide?	Dichotomous indicator, yes versus no
Suicide attempts, past 12 months	During the past 12 months, how many times have you actually attempted suicide?	Dichotomized, yes (1 time) versus no
Physical violence victimization, past 12 months	In past 12 months: someone pulled a knife or gun on you; someone shot or stabbed you; someone slapped, hit, choked, or kicked you; you were beaten up	Summed and dichotomized, yes versus no
Physical violence perpetration, past 12 months	In past 12 months: how often did you use or threaten to use a weapon to get something from someone? How often did you get into a serious physical fight? You pulled a knife or gun on someone; you shot or stabbed someone	Summed and dichotomized, yes versus no
Intimate partner physical violence victimization, current or most recent relationship	How often [has or did] [first name]; [threatened or threaten] you with violence, [pushed or push] or [shoved or shove] you, or [thrown or throw] something at you that could hurt; [slapped or slap], hit, or [kicked or kick] you?	Summed and dichotomized, yes (at least once) versus no
Intimate partner sexual violence victimization, current or most recent relationship	How often [has or did] [first name] [insisted or insist] on or [made or make] you have sexual relations with [him or her] when you didn't want to?	Dichotomized, yes (at least once) versus no
2+ sexual partners, past 12 months	Considering all types of sexual activity: with how many male partners have you had sex in the past 12 months, even if only 1 time; with how many female partners have you had sex in the past 12 months?	Summed and dichotomized, 2+ versus 1
Condom nonuse, past 12 months	In the past 12 months, did you or your partner(s) use any of these methods for birth control or disease prevention (check all that apply): condoms (rubbers)?	Dichotomous indicator, no versus yes
STI diagnosis	Have you ever been told by a doctor, nurse, or other health professional that you have the following sexually transmitted disease: <i>Chlamydia</i> ; gonorrhea; trichomoniasis; syphilis; genital herpes; genital warts; hepatitis B (HBV); human papillomavirus (HPV); any other sexually transmitted disease?	Summed and dichotomized, yes versus no
Prescription drug misuse, ever	Have you ever taken any prescription drugs that were not prescribed for you, taken prescription drugs in larger amounts than prescribed, more often than prescribed, for longer periods than prescribed, or taken prescription drugs that you took only for the feeling or experience they caused?	Dichotomous indicator, yes versus no
Other illicit drug use, ever	Have you ever used any of the following drugs: cocaine; crystal meth; other types of illegal drugs, such as LSD, PCP, ecstasy, heroin, mushrooms, or inhalants?	Summed and dichotomized, yes versus no

TABLE 2

Sample Characteristics

Characteristic	Mean or % ^a	SE ^a	95% CI
Sociodemographic characteristics ^b			
Age, y ^a	28.3	0.12	—
Male	50.7	—	49.5–52.0
Race and ethnicity			
Non-Hispanic African American	16.1	—	12.0–20.2
Hispanic	12.0	—	8.7–15.4
Non-Hispanic other	6.3	—	4.7–7.8
Received public assistance ^c	18.2	—	15.3–21.1
Married parents ^c	72.3	—	70.0–74.6
Parent's highest level of education ^c			
Less than high school	16.8	—	14.0–19.6
High school or GED	32.3	—	30.0–34.6
Some college	29.1	—	27.4–30.8
Adolescent protective factors			
School connectedness ^a	22.1	0.10	—
Family connectedness ^a	25.5	0.08	—
Baseline risk behaviors and experiences			
Emotional distress, past wk ^a	6.6	0.09	—
Suicidal ideation, past 12 mo	13.5	—	12.8–14.3
Suicide attempts, past 12 mo	4.1	—	3.6–4.6
Physical violence victimization, past 12 mo	20.0	—	18.4–21.5
Physical violence perpetration, past 12 mo	34.0	—	32.2–35.9
Forced to have sex, ever ^d	14.2	—	13.4–15.1
Sexual initiation <14 y ^{d,e}	11.3	—	10.1–12.5
STI diagnosis, ever	2.3	—	1.8–2.8

Characteristic	Mean or % ^a	SE ^d	95% CI
Illicit drug use, ever	12.5	—	11.1–13.9
Adult risk behaviors and experiences			
Emotional distress, past wk ^d	6.1	0.08	—
Suicidal ideation, past 12 mo	7.2	—	6.5–7.8
Suicide attempt, past 12 mo	1.6	—	1.2–2.0
Physical violence victimization, past 12 mo	21.7	—	20.6–22.9
Physical violence perpetration, past 12 mo	16.0	—	15.0–16.9
Intimate partner physical violence victimization ^f	22.7	—	21.2–24.2
Intimate partner sexual violence victimization ^f	5.9	—	5.2–6.6
2+ sexual partners, past 12 mo ^g	28.8	—	27.2–30.3
Condom nonuse, past 12 mo ^g	46.6	—	44.7–48.5
STI diagnosis, ever ^h	22.8	—	21.2–24.4
Prescription drug misuse, ever	18.8	—	17.2–20.4
Other illicit drug use, ever	29.9	—	28.0–31.9

—, not applicable.

^aMean and SE reported for continuous measures.

^bAll sociodemographic measures are from Wave I except for age, which is based on Wave IV.

^cMeasure from Wave I parent survey.

^dWave IV recall measure.

^eAmong participants reporting ever had sex.

^fIn current or most recent relationship.

^gAmong participants reporting at least 1 sex partner in the previous 12 months.

^hAmong participants reporting at least 1 sex partner ever.

TABLE 3
School and Family Connectedness by Sociodemographic Characteristics and Baseline Risk

Characteristic	School Connectedness Mean or β^d (SE)	P	Family Connectedness Mean or β^d (SE)	P
Sociodemographic characteristics ^b				
Age, y ^a	-0.20 (0.05)	.0001	-0.27 (0.03)	<.0001
Biological sex		.5060		<.0001
Female	22.0 (0.14)		25.3 (0.09)	
Male	22.1 (0.11)		25.7 (0.09)	
Race and ethnicity		.4042		.0018
White	22.2 (0.12)		25.4 (0.08)	
Non-Hispanic African American	21.8 (0.19)		25.7 (0.15)	
Hispanic	22.0 (0.21)		25.6 (0.20)	
Non-Hispanic other	21.8 (0.27)		24.9 (0.19)	
Receipt of public assistance ^c		.0055		.3940
Yes	21.7 (0.21)		25.4 (0.18)	
No	22.3 (0.11)		25.6 (0.07)	
Parents' marital status ^c		<.0001		.0004
Married	22.4 (0.12)		25.6 (0.08)	
Not married or separated	21.5 (0.15)		25.2 (0.12)	
Parent's highest level of education ^c		<.0001		.2560
Less than high school	21.7 (0.24)		25.5 (0.17)	
High school or GED	22.1 (0.14)		25.6 (0.10)	
Some college	22.1 (0.14)		25.4 (0.10)	
College or postcollege	22.7 (0.13)		25.6 (0.10)	
Baseline risk behaviors and experiences				
Emotional distress, past wk ^d	-0.34 (0.01)	<.0001	-0.28 (0.01)	<.0001
Suicidal ideation, past 12 mo		<.0001		<.0001
Yes	20.1 (0.17)		23.0 (0.14)	
No	22.4 (0.11)		25.8 (0.07)	

Characteristic	School Connectedness		Family Connectedness		P
	Mean or β^c (SE)	P	Mean or β^c (SE)	P	
Suicide attempts, past 12 mo		<.0001		<.0001	<.0001
Yes	19.7 (0.35)		22.5 (0.32)		
No	22.2 (0.10)		25.6 (0.07)		
Physical violence victimization, past 12 mo		<.0001		<.0001	<.0001
Yes	20.5 (0.15)		24.7 (0.12)		
No	22.5 (0.11)		25.7 (0.08)		
Physical violence perpetration, past 12 mo		<.0001		<.0001	<.0001
Yes	21.0 (0.12)		24.9 (0.11)		
No	22.6 (0.12)		25.8 (0.08)		
Forced to have sex, ever ^d		<.0001		<.0001	<.0001
Yes	21.1 (0.17)		24.5 (0.12)		
No	22.2 (0.10)		25.6 (0.08)		
Sexual initiation <14 y ^{d,e}		<.0001		<.0001	<.0001
Yes	20.6 (0.19)		24.6 (0.14)		
No	22.2 (0.11)		25.5 (0.08)		
STI diagnosis, ever		<.0001		<.0001	<.0001
Yes	19.6 (0.35)		23.5 (0.30)		
No	22.1 (0.10)		25.5 (0.07)		
Illicit drug use, ever		<.0001		<.0001	<.0001
Yes	19.8 (0.20)		23.7 (0.12)		
No	22.4 (0.10)		25.7 (0.08)		

^a β^c is reported for continuous measures.

^bAll sociodemographic measures are from Wave I, except for age, which is based on Wave IV.

^cMeasure from Wave I parent survey.

^dWave IV recall measure.

^eAmong participants reporting ever had sex.

Logistic Associations Between School Connectedness in Adolescence and Health Risk Behaviors and Experiences in Adulthood

TABLE 4

Dichotomous Outcomes	<i>n</i> ^a	Bivariate Models		<i>n</i> ^a	Multivariable Models ^b	
		OR	95% CI		aOR	95% CI
Mental health						
Suicidal ideation, past 12 mo	14 327	0.94 ^{***}	0.93 0.96	11 934	0.97 [*]	0.95 1.00
Suicide attempt, past 12 mo	14 335	0.96	0.92 1.01	11 940	1.01	0.96 1.06
Violence						
Physical violence victimization, past 12 mo	14 386	0.96 ^{***}	0.95 0.97	12 038	0.97 ^{***}	0.96 0.99
Physical violence perpetration, past 12 mo	14 388	0.96 ^{***}	0.95 0.98	12 044	0.98 ^{**}	0.96 0.99
Intimate partner physical violence victimization ^c	13 921	0.97 ^{***}	0.96 0.98	11 645	0.99	0.98 1.01
Intimate partner sexual violence victimization ^c	13 910	0.97 ^{**}	0.95 0.99	11 636	1.01	0.98 1.03
Sexual health						
2+ sexual partners, past 12 mo ^d	12 333	0.97 ^{***}	0.96 0.98	10 064	0.98 ^{**}	0.96 0.99
Condom nonuse, past 12 mo ^d	12 312	0.98 ^{**}	0.97 0.99	10 055	0.99	0.97 1.00
STI diagnosis, ever ^e	13 793	0.96 ^{***}	0.94 0.97	11 141	0.98 [*]	0.96 1.00
Substance use						
Prescription drug misuse, ever	14 337	0.95 ^{***}	0.93 0.96	11 956	0.97 ^{***}	0.96 0.99
Other illicit drug use, ever	14 363	0.95 ^{***}	0.94 0.96	11 974	0.98 ^{**}	0.96 0.99

OR, odds ratio.

^aSample sizes vary because of skip patterns and missing data.^bMultivariable models include both school and family connectedness, sociodemographic characteristics, and relevant baseline outcomes.^cIn current or most recent relationship.^dAmong participants reporting at least 1 sex partner in the previous 12 months.^eAmong participants reporting at least 1 sex partner ever.***
P < .001

^{**} $P < .01$
^{*} $P < .05$.

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Logistic Associations Between Family Connectedness in Adolescence and Health Risk Behaviors and Experiences in Adulthood

TABLE 5

Dichotomous Outcomes	<i>n</i> ^a	Bivariate Models		<i>n</i> ^a	Multivariable Models ^b	
		OR	95% CI		aOR	95% CI
Mental health						
Suicidal ideation, past 12 mo	14 322	0.92***	0.90 0.95	11 934	0.99	0.96 1.03
Suicide attempt, past 12 mo	14 329	0.92*	0.87 0.99	11 940	0.97	0.90 1.05
Violence						
Physical violence victimization, past 12 mo	14 381	0.96***	0.94 0.98	12 038	0.97**	0.95 0.99
Physical violence perpetration, past 12 mo	14 383	0.97**	0.95 0.99	12 044	0.97*	0.95 0.99
Intimate partner physical violence victimization ^c	13 919	0.97***	0.95 0.98	11 645	0.98*	0.96 1.00
Intimate partner sexual violence victimization ^c	13 908	0.92***	0.90 0.95	11 636	0.94***	0.91 0.97
Sexual health						
2+ sexual partners, past 12 mo ^d	12 339	0.96***	0.95 0.98	10 064	0.96***	0.94 0.98
Condom nonuse, past 12 mo ^d	12 320	0.97***	0.96 0.98	10 055	0.99	0.97 1.01
STI diagnosis, ever ^e	13 793	0.94***	0.92 0.95	11 141	0.96***	0.94 0.98
Substance use						
Prescription drug misuse, ever	14 335	0.93***	0.91 0.95	11 956	0.94***	0.92 0.97
Other illicit drug use, ever	14 359	0.93***	0.91 0.94	11 974	0.95***	0.93 0.97

OR, odds ratio.

^aSample sizes vary because of skip patterns and missing data.^bMultivariable models include both school and family connectedness, sociodemographic characteristics, and relevant baseline outcomes.^cIn current or most recent relationship.^dAmong participants reporting at least 1 sex partner in the previous 12 months.^eAmong participants reporting at least 1 sex partner ever.****P* < .001

$P < .01$
**
 $P < .05$
*

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TABLE 6

Adjusted Comparisons Between High and Low Connectedness Scores

Dichotomous Outcomes	High Family and Low School Connectedness ^d		High School and Low Family Connectedness ^d		High School and High Family Connectedness ^d	
	High Family and Low School Connectedness ^d	High School and Low Family Connectedness ^d	High School and Low Family Connectedness ^d	High School and High Family Connectedness ^d	High School and High Family Connectedness ^d	High School and High Family Connectedness ^d
Violence						
Physical violence victimization, past 12 mo	0.67	0.73	0.49	0.49	0.49	0.49
Physical violence perpetration, past 12 mo	0.71	0.74	0.52	0.52	0.52	0.52
Sexual health						
2+ sexual partners, past 12 mo ^c	0.60	0.76	0.46	0.46	0.46	0.46
STI diagnosis, ever ^d	0.62	0.75	0.46	0.46	0.46	0.46
Substance use						
Prescription drug misuse, ever	0.49	0.69	0.34	0.34	0.34	0.34
Other illicit drug use, ever	0.51	0.74	0.38	0.38	0.38	0.38

High connectedness, third quartile value of scale distribution; low connectedness, first quartile value of scale distribution.

^aReference is both low school and family connectedness.^bEffect sizes are computed from predicted probabilities based on the multivariable logistic models (Tables 4 and 5). As such, they represent nonlinear combinations of estimators for which CIs are not readily available, although these estimates were only produced for outcomes significantly associated with both family and school connectedness in multivariable analyses. These estimates represent connectedness comparisons for an "average" participant in this sample (unweighted) based on mean values for continuous covariates and modes for categorical covariates: white females age 28.5 years who during adolescence had parents who were married, had some college education, and did not receive government assistance. For each estimate, average individuals did not have any relevant baseline risks.^cAmong participants reporting at least 1 sex partner in the previous 12 months.^dAmong participants reporting at least 1 sex partner ever.