School Connectedness and the Transition Into and Out of Health Risk Behavior among Adolescents: A Comparison of Social Belonging and Teacher Support

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Introduction

In June 2003, an interdisciplinary group of leaders in education released the Wingspread Declaration on Student Connections to School. It stated that students are more likely to succeed at school, have better mental health, and participate in fewer risk behaviors, including unprotected intercourse, when they believe that the adults in the school are invested in their learning and care about them as individuals (Wingspread 2003). In addition, the declaration called on schools and communities to promote students connectedness to school. Several policy agendas and action plans from national education organizations promote intervention programs that increase students' connectedness to school in an effort to either prevent the occurrence of or circumvent the reoccurrence of adolescent risk behaviors. In addition to targeting different youth, intervention programs promote different dimensions of school connectedness. Some focus on increasing students' feelings of safety and belonging at school, others focus on increasing support from teachers and peers, and still others focus directly on increasing academic engagement (Hawkins and Catalano 1992; Olweus 1992, 1999; Schaps et al. 1997).

Although there is substantial evidence on the benefits of school connectedness for academic motivation and achievement (Rutter et al. 1979; Eccles et al. 1997; Barber and Olsen 1997; Goodenow and Grady 1993; Battistich et al. 1995; Roeser et al. 1998; Connell and Wellborn 1991; Battin-Pearson et al. 2000), empirical research has not established a definitive link between school connectedness and adolescent risk behaviors. Most of the research about the benefits of connectedness for preventing health risk behaviors is based on cross-sectional associations. Furthermore, we know of no research that has investigated whether increasing school connectedness among teens who are already engaged in problem behaviors is an effective strategy for steering those young people onto a healthier trajectory. Finally, empirical research

has not adequately assessed the effects of the different dimensions of school connectedness currently promoted within intervention programs, such as engagement, support and belonging, on adolescent risk behaviors. Most researchers combine dimensions of school connectedness into a single global measure (e.g., Hawkins, Guo, Hill, Battin-Pearson and Abbott 2001; Resnick et al. 1997). However, each dimension of school connectedness might have different effects across various adolescent risk behaviors, such as suicidal behaviors and fertility behaviors. Furthermore, the investigation of each dimension of school attachment could reveal independent and/or joint effects on adolescent risk behaviors.

The purpose of this paper is to investigate the association between school connectedness and the transition *into* and *out of* multiple health risk behaviors in a nationally representative sample of middle and high school students. We assess the influence of two separate dimensions of school connectedness, belonging and teacher support, on the prevention of entry into health risk behaviors and the transition out of those behaviors. This research will supply national education organizations with empirical evidence for which young people to target in their intervention efforts and which dimensions of school connectedness to promote for different kinds of adolescent risk behaviors.

Theory Linking School Connectedness to Adolescent Health and Fertility Behaviors

School connectedness has been defined in multiple ways, using a broad range of terminology that includes attachment (Moody and White 2003), social belonging (Bollen and Hoyle 1991), social membership (Wehlage et al. 1989), sense of community (Battistich and Hom 1997) and support (Rosenfeld, Richman and Bowen 2000). Nonetheless, there is a convergence in meaning across streams of research. School connectedness reflects an extension and reciprocation of basic attachment and bonding processes from the family to the school (Karcher

2003). When young people receive empathy, praise, and attention in a clear and consistent fashion, they experience social support and a sense of belonging. They naturally model the behaviors of the adults or peers in school who are providing praise and attention to continue to evoke that response (Karcher 2003). They are also more receptive to regulation by those to whom they feel connected (Hawkins and Weis 1985).

Feeling connected to school, particularly teachers at school, should decrease the likelihood of engaging in antisocial behaviors, because teachers do not approve of and discourage antisocial behaviors, such as substance use and violence. The more connected students feel to their teachers the more likely they are to abide by their teachers' rules and standards, because engaging in antisocial behaviors risks losing praise, attention and support from teachers. The teacher-student bond provides a conventional form of school connectedness, but there is also the possibility of unconventional connectedness to school. (Hawkins and Weis 1985; Karcher 2003).

Unconventional connectedness occurs when students feel connected to peers who set their own behavioral code. This unconventional connectedness may be associated with either increased or decreased risk behaviors, depending on the behavioral code set by friends and peers. It is often assumed that connectedness to peers automatically leads to deviant behavior, but recent evidence suggests that the link between connectedness to peers at school and health risk behavior depends on the nature of the peer group structure (Haynie 2001), the behavior of peers (cites), the nature of the adolescent's relationship to those peers (Bearman and Brückner 1999), and the level of the adolescent's connection to other adults in the school (Baumeister and Leary 1995). Previous research on school connectedness has generally assumed that connectedness to school is a conventional, and therefore positive, form of connectedness. Yet school

connectedness has the potential to discourage or encourage antisocial behavior depending on whether students are connected to school in conventional or unconventional ways.

Evidence Linking School Connectedness to Adolescent Health Behaviors

Previous research has emphasized three dimensions of school connectedness: belonging, social support, and engagement. The first two dimensions are the student's perceptions of what he or she receives from adults or peers at school, whereas engagement reflects the reciprocation of belonging and support through active caring and involvement on the student's part (Karcher 2003). Measures of belonging, support, and engagement have been demonstrated to be associated with multiple health risk behaviors, including substance use (Battistich and Hom 1997; Resnick et al. 1997; Hawkins et al. 2001), sexual intercourse (Resnick et al. 1997; Hawkins et al. 2001), violence or delinquency (Resnick et al. 1997; Battistich and Hom 1997; Hawkins et al. 2001; Jenkins 1997), suicidality (Resnick et al. 1997) and mental health (Resnick et al. 1997; Roseser, Eccles and Stroeber 1998).

One intervention study has demonstrated the protective effect of school connectedness using longitudinal data. Hawkins and colleagues evaluated the effects of an intervention in grades 1-6 aimed, in part, at increasing the school social bond (assessed with the following items tapping belonging and engagement: "I like school," "Most mornings I look forward to going to school," "I do extra school work on my own," "I like my classes this year," and "When I have an assignment to do, I keep working on it until it is finished"). They found that the full intervention group was significantly more bonded to school than the control group at ages 13 and 18 (Hawkins et al. 2001) and that the intervention group was significantly less likely to be involved in deviant or violent behaviors. Ongoing intervention studies being conducted by Battistich and Hom (1997) and Elliott (2003) should provide more definitive evidence.

Although this research suggests that adolescents who feel more connected to school engage, on average, in less risky behavior, it does not allow one to distinguish whether school connectedness is protective for delaying initiation of behaviors, for reducing involvement in problem behaviors once it has started, or both. Karcher (2002) suggests that violence participation lowers connectedness to teachers by causing students to withdraw from school and also by causing teachers to naturally withdraw empathy, praise and acceptance from students they know to have been violent. The same patterns might occur for other types of risk behaviors, such as substance abuse. Reversing the disconnection from school, although important, may be more difficult than promoting school connectedness among adolescents who have not already engaged in risk behaviors. Thus, we expect that current interventions aimed at promoting school connectedness might be better suited for preventing adolescents' initiation of risk behaviors than intervening among youth who already exhibit risk behaviors.

This paper explores the association between two dimensions of school connectedness and the entry into and transition out of six adolescent risk behaviors. One dimension is teacher support, a measure of perceived support from teachers, and the second is a measure of social belonging at school. Each dimension of school connectedness could have independent and/or joint effects across various antisocial behaviors. Only a few studies have explored the independent contribution of the separate dimensions of connectedness (e.g., Jenkins 1997). We expect that conventional connectedness, experienced as support from teachers, will have a strong and consistent influence on reducing the prevalence of risk behaviors of students. Several researchers have tested a mediational model in which support from teachers generates a sense of belonging and engagement which, in turn, leads to positive education outcomes (Connell and

Wellborn 1991; Wehlage et al. 1989). We expect that social belonging will mediate the effect of support from teachers on health risk behaviors as well.

Methods

The Sample

Data are drawn from the National Longitudinal Study of Adolescent Health (Add Health), a nationally representative sample of American adolescents in grades 7-12 in 1995. The primary sampling frame for Add Health was U.S. high schools. A stratified sample of 80 high schools was selected with probability proportional to the school's enrollment. A single feeder school was selected for each high school with probability of selection proportional to the percentage of the high school's entering class that came from the feeder school. School varied in size from less than 100 to more than 3,000 students. Add Health includes private, religious, and public schools from communities located in urban, suburban, and rural areas of the country (Udry 1998).

All students in the eligible grade range at the participating schools were asked to complete in-school questionnaires during the 1994-95 academic year. Based on rosters of students from each school and the in-school questionnaires, students were selected for Wave 1 in-home data collection. The response rate was 78.9%, yielding a sample of 20,745 youth completing in-home questionnaires. Of these, 1,821 cases were not assigned sampling weights. A second interview was conducted during the following academic year for all students except the 12^{th} graders and a few select subsamples. The Wave 2 response rate was 88.2% (n=14,738). The present analysis restricts the sample to those students who responded to both Wave 1 and Wave 2 surveys and who were assigned survey weights at Wave 2 (n=13,570).

Measures of School Connectedness

Add Health contains six questions that tap aspects of connection to school. Three of the questions were developed by Bollen and Hoyle (1991) to measure social belonging. Students were asked how much they agreed or disagreed with the following statements: "You feel close to people at your school," "You feel like you are part of your school," and "You are happy to be at your school." If the survey was administered during the summer, the questions were asked in the past tense, for example, "Last year, you felt part of your school." Responses were a five-item Likert scale ranging from "strongly agree" to "strongly disagree."

Another three items ask the adolescent about his or her perceptions of their teachers. The first question asks students to report how much they agree or disagree with the statement, "The teachers at your school treat students fairly." Response categories range from "strongly agree" to "strongly disagree." A second question asks, "Since school started this year, how often have you had trouble getting along with your teachers?" The five response categories are "never," "just a few times," "about once a week," "almost every day," and "every day." The third question about teachers appears in a different section of the survey that asks about how much different people in the young person's life care about him or her. The question is, "How much do you feel that your teachers care about you?" The five response categories are "not at all," "very little," "somewhat," "quite a bit," and "very much."

Principal components and confirmatory factor analysis were conducted to determine whether the *social belonging* items and the items regarding the *student-teacher relationship* comprised two separate factors or a single construct of schools connectedness. The three social belonging measures (Bollen and Hoyle 1991) loaded on one principal component, whereas the three student-teacher relationship items loaded on a second factor. This two-factor model was

tested using confirmatory factor analysis, and found to have good model fit (McNeely 2003). The social belonging measure has excellent reliability for a three-item scale ($\alpha = .78$). The student-teacher relationship scale has marginal reliability ($\alpha = .63$), probably because it combines two items about students' personal relationship with their teachers with an item that asks about their perception of how teachers treat students in general.

Measures of Health-Related Outcomes

Six health-related outcomes were selected to represent a broad array of adolescent health behaviors. Four of the health outcomes are externalizing behaviors visible by teachers and school staff. These are weapon-related violence, cigarette use, marijuana use, and alcohol use. *Weapon-related violence* is a dichotomous variable indicating whether the adolescent committed at least one of the following acts in the year between the Wave 1 and Wave 2 surveys: threatened to use a weapon to get something from someone, pulled a knife or gun on someone, shot or stabbed someone, used a weapon in a fight, or hurt someone badly enough to need bandages or medical care. Thirteen percent of the sample responded affirmatively to at least one of these items. *Cigarette smoking* is a nominal variable with three categories indicating whether the adolescent is a nonsmoker, an occasional smoker, or a regular smoker, based on the number of days they reported smoking during the last 30 days. A nonsmoker did not smoke in the last 30 days. Occasional smoking is defined as having smoked on 1-19 days, and regular smoking is defined as having smoked on 20–30 days in the past 30 days. *Alcohol use* is also a nominal variable with three categories indicating the frequency with which the student reported getting "drunk or very, very high on alcohol" during the last 12 months. No alcohol use is defined as never having got drunk, occasional use is having gotten drunk up to once a month or less, and regular alcohol use

is defined as having gotten drunk 2-3 days a month or more. *Marijuana use* is a nominal variable with three categories indicating the frequency of WHAT IS DEFN OF MARIJUANA USE.

Two other health-related outcomes were selected because they are less visible, if not invisible, to other students and teachers at school. *Transition to first sexual intercourse* is an indicator of whether adolescents who never had sex at wave 1 report having had sex by the wave 2 interview. Sexual intercourse is determined by the question, "Have you ever had sexual intercourse? When we say sexual intercourse, we mean when a male inserts his penis into a female's vagina." *Suicidality* is a three-category variable indicating whether the student has had no suicidal thoughts, suicidal thoughts, or suicidal attempts in the past year.

Measures of Background Characteristics

The models include several sociodemographic and individual characteristics as potential confounders. These variables are defined in Appendix A, and include race/ethnicity, age, gender, family structure, household size, household income, and the adolescent's score on the Add Health Picture Vocabulary Test, an abbreviated version of the Peabody Picture Vocabulary Test.

Analytic Strategy

Education and community leaders are promoting school connectedness as key both to promoting positive outcomes (usually stated as preventing health-risk behaviors) *and* to reducing risky behaviors among youth who are already involved in problem behaviors. Consequently, we use conditional multinomial logistic and ordinary logistic regression to model the probability that teens *increase* their involvement as well as *decrease* their involvement over time in six health-

related behaviors. The analyses were done in Stata 8.0 (StataCorp 2003) using weights and adjusting for the complex sampling design.

Results

Descriptive Statistics

The description of the sample is presented in Table 1. On average, most students feel a sense of belonging and that their teachers respect and care about them. The value of both scales is 2.7 out of a possible 4 points. Nonetheless, there is good variability in the measures, and the responses span the full possible range of 0 to 4. Taken together, the reported prevalence of behaviors reveals that most American middle and high school students do not engage in health risk behaviors. At Wave 1 a third of the students reported they had had sexual intercourse. Approximately a quarter of students said they had engaged in weapon-related violence (23%) or gotten "drunk or very, very high" on alcohol at least once in the previous year. Nine percent of students reported getting drunk regularly, defined as two or three times a month or more. Thirteen percent reported having used marijuana in the past 30 days, compared to 27 percent who used cigarettes in the last month. Of those who did report smoking cigarettes, half were experimental smokers (less than 20 cigarettes a day) and half were regular smokers. Sadly, nine percent of the respondents reported having seriously considered suicide in the previous year, and four percent reported having attempted suicide.

[Table 1 about here]

Table 2 presents the pattern of transitions into or out of a health risk behavior between Waves 1 and 2. This table shows the row percentages from a cross-tabulation of the health risk behaviors at the two points in time. The rows represent the status at Wave 1 and the columns are

the adolescent's status at Wave 2. Thus, for example, the table shows that 81 percent of the respondents who had never had sexual intercourse at Wave 1 also were virgins at Wave 2. Of the adolescents who, at Wave 1, had never gotten drunk in the past year, 83 percent reported not getting drunk during the subsequent year, 12 percent reported getting drunk occasionally (once a month or less), and 5 percent reported getting drunk regularly.

Overall, Table 2 shows great stability over time among those adolescents who reported no involvement in a risk behavior. Of those who did engage in a risk behavior, over 80 percent reported not engaging in that behavior one year later. The most movement is seen among occasional or experimental participation in a behavior. Only a third of adolescents who smoke, 40 percent of those who got drunk occasionally, and a quarter of occasional marijuana users at Wave 1 report occasional use at Wave 2. The rest either transition into regular use or no use, with a larger percentage transitioning to no use. The pattern reflects the experimental nature of health risk behaviors in adolescence. Most adolescents do not engage in the behaviors, and among those who do, their involvement is often experimental and transitory.

There is somewhat more stability in the regular category of use, especially among smokers. Nearly 80 percent of adolescents who reported smoking regularly at Wave 1 also smoked regularly at Wave 2. This pattern is not surprising, considering the addictiveness of tobacco. Half of adolescents who regularly got drunk or used marijuana also did so a year later. A startling 30 percent of students who attempted suicide in the year prior to Wave 1, made a one or more subsequent attempts by Wave 2.

[Table 2 about here]

Multivariate Results

The results from the multivariate models examining the relationship between school connectedness and the transition into and out of the six health risk behaviors are shown in Tables 3–7. Three models are presented for each risk behavior. Model 1 contains the social belonging measure and the background characteristics. Model 2 contains just the student-teacher relationship and the background characteristics. Model 3 contains both of the school connectedness variables along with the background characteristics. Because results from Model 3 are presented in two separate columns, the columns are labeled Model 3a and Model 3b for ease of discussion.

The results in Table 3 are risk ratios calculated from logistic regression models, and as such their interpretation is fairly straightforward. The results in Tables 4–7 are slightly more complex. Each pair of rows in Tables 4–7 contain the results from a multinomial logit model that models the transition from a given state at wave 1 (e.g., nonsmoking) to various states at wave 2 (e.g., occasional smoking or regular smoking). The coefficients in the tables are presented as relative risk ratios, which can be interpreted as the risk of transitioning to a given state relative to not transitioning for each one-unit change in the school connectedness measure, holding all other variables constant. For example, the first relative risk ratio in Model 1 in Table 6 is the risk of transitioning from no cigarette use at wave 1 to occasional use at wave 2 for each one-unit change in social bonding. The relative risk ratio of .99 suggests that an increase (or decrease) in social bonding is unassociated with the probability of becoming an occasional smoker at wave 2.

Because two coefficients are estimated simultaneously for each independent variable, with the multinomial logistic regression models, a post-hoc Wald test for joint hypotheses was conducted (Hosmer and Lemeshow 1991; StataCorp. 2003). This Wald test was adjusted for the complex sampling design, and the approximate F statistics are presented in the model. We

adopted the most conservative approach of statistical significance by using the Wald test to assess significance rather than the tests of individual coefficients, although we still indicate the statistical significance of the individual coefficients with asterisks.

A comparison of the relative risk (or relative risk ratios for the multinomial logit models) in Model 1 and Model 3a shows how the effect of social bonding changes with inclusion of the student-teacher relationship in the model. Similarly, a comparison of the relative risk (ratios) in Model 2 and Model 3b shows how the effect of teacher support changes with inclusion of social bonding in the model.

Sexual Intercourse. Models 1 and 2 in Table 3 show that each school connectedness variable, taken alone, is protective against the transition to first sexual intercourse among teens who had not yet had intercourse at wave 1. However, when social belonging and teacher support are included in the same model, social belonging is no longer associated with the transition to first sex. The magnitude of the association between teacher support and the outcomes remains essentially unchanged with the addition of social belonging and the control variables.

[Table 3 about here]

Weapon-Related Violence. The last two rows in Table 3 present the risk ratios for transitioning into and out of violence between wave 1 and wave 2. The pattern of findings for both transitions is similar to the findings for sexual intercourse. Among students who reported never having been violent in the 12 months prior to wave 1, only teacher support is related to the transition into weapon-related violence during the subsequent year. Similarly, only teacher support is related to the transition from having been violent at wave 1 to nonviolence at wave 2. In both cases the effect is protective; when students feel supported by their teachers, they are less likely to engage in weapon-related violence for the first time, and are also more likely to desist if

they have been violent. The strength of the association between teacher support and the transition to nonviolence is modest. Each one-unit change in teacher support is associated with a 34 percent greater chance of transitioning from violence to nonviolence.

[Table 4 about here]

Alcohol and Marijuana Use. The results for alcohol and marijuana use are presented in Tables 4 and 5. Teacher support at wave 1 is associated with a lower probability of transitioning to either occasional or regular marijuana use or getting drunk by wave 2. Social belonging, however, is not associated with alcohol or marijuana use once teacher support is taken into account. The strength of the protective effect of teacher support on the transition to occasional or regular use does not change with the inclusion of social belonging in the model, suggesting that social belonging does not mediate the relationship. Neither of the school connectedness measures, either singly or jointly, predict the transition from occasional use to regular use. Likewise, they do not predict a reduction in alcohol or marijuana use, whether the transition be a decrease from regular to occasional use or quitting altogether (regular or occasional use to no use).

[Table 5 about here]

Cigarette Use. A slightly different pattern emerges for cigarette use (Table 6). Social belonging, when entered by itself in the model, is not associated with the transition from being a nonsmoker to smoking occasionally. However, once both school connectedness variables are included, social belonging positively predicts the transition from nonsmoking to occasional smoking. Students who feel that they are part of school, who feel close to people at school, and who like going to school are *more* likely to start smoking occasionally, once support from

teachers is held constant. In other words, social belonging becomes a risk factor for the initiation of smoking, although the magnitude of the effect is model (RR=1.12).

As with the other risk behaviors, teacher support is a protective factor for the initiation of cigarette smoking. It appears to be more protective for the transition to regular smoking than to occasional smoking, although we have not yet tested whether the coefficients are different. In the case of cigarette smoking, teacher support is also protective against the transition from occasional to regular smoking. This suggests that not only might teacher support protect against experimentation with cigarettes, but it also might protect against an addictive habit among those who have experimented with cigarettes. As with the other substance use outcomes, teacher support does not predict quitting behavior.

[Table 6 about here]

Suicidal Ideation and Attempts. Table 7 presents the results of multinomial logit models predicting the effect of school connectedness on the transition to and away from suicidal thoughts or attempts. Rather than combine ideation and attempts into a single measure, we model the effect of school connectedness on the transition from no thoughts or attempts to ideation, and then the transition from ideation to attempt. The results here tell a familiar story. Teacher support protects against suicidal ideation and attempts for those students who report experiencing neither at wave 1. Neither teacher support nor social bonding protect against the reduction in suicidal attempts or thoughts. This is disappointing, given that 30% of students who report a suicide attempt at wave 1 report having attempted suicide again in the subsequent year. The urgency to find potential protective factors for suicide among this group is clear.

[Table 7 about here]

Discussion

A positive student-teacher relationship at Wave 1 is associated with a lower probability of initiating sexual intercourse, weapon-related violence, cigarette smoking, alcohol use and marijuana use. It is also protective against a first suicide ideation or attempt. Surprisingly, however, social belonging is not associated with these outcomes once teachers support is taken into account. This finding suggests that the association between student-teacher relationship and the outcomes in not mediated by a sense of social belonging, as suggested by social support models and the theoretical framework of Wehlage and colleagues (1989). This model does not rule out the possibility that the direct effect of social belonging is mediated by a positive student-teacher relationship, but the theoretical argument that a feeling of social belonging fosters a positive relationship with teachers is less compelling. More likely is that the protective effect of teacher support for health risk behaviors operates independently of social belonging.

In this paper, teacher support was associated more strongly with preventing health risk behaviors than with the reduction or cessation of those behaviors once a young person had initiated them. Teacher support was protective for reduction of just one risk behavior, violence. The lack of a protective effect could be due to the fact that involvement in risk behaviors alienates students from teachers, and students change their willingness or ability to invest in conventional norms, even if they continue to feel supported by teachers and staff (Stanton-Salazar 2001).

By separating school connectedness into two separate albeit related dimensions, this paper contributes to specificity of measurement in the burgeoning field of school connectedness. The broader measures of school connectedness that have received the most attention to date

(Resnick et al. 1997; Hawkins et al. 2001) combine general feelings about school (e.g., "I like school") with academic motivation (e.g., "I do extra school work on my own"), perceptions of safety, and relationships with teachers. This research suggests that not all aspects of school connectedness are equally protective. Social belonging at school does not protect against either initiation or reoccurrence of adolescent risk behaviors, once perceived support from teachers is taken into account. This does not mean that belonging does not matter. Rather, it could mean that this general measure available in Add Health is capturing connectedness to peers, or unconventional connectedness, once the shared variance with teacher support is removed. That could explain the modest positive association between social belonging and the initiation of occasional cigarette use.

Two limitations of this study should be noted. First, as just mentioned, the measures are limited in their ability to measure distinct dimensions of school connectedness. Second, the analysis, although longitudinal, is by no means causal. We could be observing a selection effect rather than a protective effect for teacher support. Students predisposed to feeling connected to their teachers are logically also predisposed to follow conventional norms for adolescents and delay involvement in risk behaviors. We plan to address this latter limitation in further analyses before PAA, as described below.

Additional Analyses to Conduct Before PAA

- We plan to explore alternative specifications of fertility-related behaviors. In particular, we plan to model the transition from no sex to unprotected sex, and the transition from unprotected sex to protected sex.

- Although the present analysis is longitudinal, it is by no means causal. We plan to include additional variables that are antecedents to school connectedness to see if the association is reduced. These include connectedness to parents and family, which is a precursor to school connectedness (Karcher violence paper), and whether the student changed schools between w1 and w2, as well as other variables.

- We plan to explore possible explanations for the lack of association between teacher support and reduction or cessation of behaviors. This includes determining the variability of the school connectedness measures among those who participate in risk behaviors.

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Table 1: Wave 1 Weighted Descriptive Statistics for School Connectedness, Health-Related Outcomes, National Longitudinal Study of Adolescent Health

Measures	Mean / Proportion	S.E.	Minimum	Maximum	Unweighted N
School Connectedness					
Teacher Support	2.76	.02	0	4	13334
Social Belonging	2.70	.02	0	4	13336
Health Risk Behaviors					
Cigarette Use					
None	.73	.01	0	1	13369
Occasional	.14	.01	0	1	13369
Regular	.13	.01	0	1	13369
Getting Drunk					
Never	.73	.01	0	1	13400
Occasional	.17	.01	0	1	13400
Regular	.09	.01	0	1	13400
Marijuana Use					
None	.87	.01	0	1	13337
Occasional	.07	.00	0	1	13337
Regular	.06	.00	0	1	13337
Sexual Behaviors					
Ever Had Sex	.67	.02	0	1	13429
Violent Behaviors					
Violent use of Weapons	.23	.01	0	1	13472
Suicide					
No Suicidal Ideation	.87	.00	0	1	13429
Suicidal Ideation	.09	.00	0	1	13429
Suicide Attempts	.04	.00	0	1	13429
Background Characteristics					
Age	15.00	0.11	11	21	13559
Female	0.50	0.00	0	1	13570
Race/ethnicity					
Hispanic	0.12	0.02	0	1	13559
White	0.67	0.03	0	1	13559
African American	0.15	0.02	0	1	13559
American Indian	0.01	0.00	0	1	13559
Asian	0.04	0.01	0	1	13559
Other race/ethnicity	0.01	0.00	0	1	13559
Family structure					
Two-parent biological	0.54	0.01	0	1	13570
One-parent biological	0.29	0.01	0	1	13570
Step family	0.09	0.00	0	1	13570

Measures	Mean / Proportion	S.E.	Minimum	Maximum	Unweighted N
Other family structure	0.07	0.00	0	1	13570
Household size	4.54	0.04	1	18	13562
Income					
under $10,000	0.10	0.01	0	1	13096
$11,000–$20,000	0.14	0.01	0	1	13096
$21,000–$40,000	0.33	0.01	0	1	13096
$41,000–$60,000	0.26	0.01	0	1	13096
$61,000–$80,000	0.10	0.01	0	1	13096
over $80,000	0.07	0.01	0	1	13096
Missing income	0.20	0.01	0	1	13570
Modified PPVT	100.78	0.64	13	146	12974

Table 2: Weighted Cross Tabulations Indicating the Percent of Respondents Who Transition Into and Out of Health Risk Behaviors: Add Health Waves 1 and 2

	Wave 2	**Never / None**	**Occasional / Yes**	**Regular**	
Wave 1	***Unweighted N***	***Proportion***	***Proportion***	***Proportion***	***Row Total***
Cigarette Use					
Never	9910	.81	.15	.05	1.0
Occasional	1780	.33	.38	.29	1.0
Regular	1539	.11	.11	.79	1.0
Getting Drunk					
Never	9776	.83	.12	.05	1.0
Occasional	2276	.35	.43	.22	1.0
Regular	1221	.23	.26	.52	1.0
Marijuana Use					
Never	11374	.90	.07	.04	1.0
Occasional	894	.50	.24	.26	1.0
Regular	794	.33	.15	.53	1.0
Suicide					
None	11607	.93	.05	.02	1.0
Ideation	1249	.64	.26	.10	1.0
Attempts	510	.51	.19	.30	1.0
Sexual Behaviors					
Never Had Sex	8634	.81	.19	--	1.0
Violent Behaviors					
Never Violent	10337	.94	.06	--	1.0
Yes Violent	3099	.65	.35	--	1.0

Table 3. Weighted Risk Ratios from the Logistic Regression of School Connection on Sex and Violence Transitions: Add Health Wave 2 Respondents

		Social Bonding				Teacher Support			
Transition from		***Model 1***[§]		***Model 3a***[†]		***Model 2***[•]		***Model 3b***[†]	
Wave 1 to Wave 2	*N*	RR	s.e.	RR	s.e.	RR	s.e.	RR	s.e
No Sex to Sex	7895	.78***	.04	.93	.05	.63***	.03	.65***	.04
No Violence to Violence	*9420*	.83**	.05	1.02	.08	.62***	.04	.62***	.05
Violence to No Violence	2809	1.23**	.08	1.09	.07	1.40***	.10	1.34***	.09

*p < .05; **p < .01; ***p < .001

[§]Model includes social bonding measure and control variables.

[†]Model includes social bonding, student-teacher relationship and control variables

[•]Model includes student-teacher relationship and control variables

Table 4. Weighted Relative Risk Ratios from Multinomial Logit Regression of School Connection on Alcohol Use Transitions: Add Health Wave 2 Respondents

		Social Bonding				**Teacher Support**			
Transition from		***Model 1***[§]		***Model 3a***[†]		***Model 2***[•]		***Model 3b***[†]	
Wave 1 to Wave 2	N	RRR	s.e.	RRR	s.e.	RRR	s.e.	RRR	s.e.
None to Occasional	8896	.967	.05	1.137*	.07	.708***	.04	.664***	.04
None to Regular		.850*	.07	1.126	.10	.540***	.05	.509***	.05
F-test[Δ]		*2.37*		*2.8*		*37.8****		*36.1****	
Occasional to None	2085	.975	.08	.978	.09	.977	.09	.988	.10
Occasional to Regular		1.030	.09	1.127	.09	.826	.10	.780*	.09
F-test		*0.3*		*1.8*		*1.5*		*2.8*	
Regular to None	1105	.996	.10	.976	.10	1.038	.12	1.055	.13
Regular to Occasional		.838	.08	.822	.09	.943	.11	1.051	.14
F-test		*1.7*		*1.6*		*0.2*		*0.1*	

*p < .05; **p < .01; ***p < .001

[§]Model includes social bonding measure and control variables.

[†]Model includes social bonding, student-teacher relationship and control variables

[•]Model includes student-teacher relationship and control variables

[Δ] All F-tests in the table have 2 degrees of freedom

Table 5. Weighted Relative Risk Ratios from Multinomial Logit Regression of School Connection on Marijuana Use Transitions: Add Health Wave 2 Respondents

		Social Bonding				Teacher Support			
Transition from		***Model 1***[§]		***Model 3a***[†]		***Model 2***[•]		***Model 3b***[†]	
Wave 1 to Wave 2	N	RRR	s.e.	RRR	s.e.	RRR	s.e.	RRR	s.e.
None to Occasional	10371	.763***	.05	.931	.07	.587***	.04	.608***	.04
None to Regular		.774***	.04	.976	.09	.559***	.05	.566***	.06
F-test[Δ]		*12.0****		*0.45*		*42.3****		*34.1****	
Occasional to None	813	.962	.15	.857	.14	1.279	.20	1.37	.24
Occasional to Regular		1.130	.19	1.176	.22	.966	.16	.889	.16
F-test		*0.7*		*2.2*		*2.8*		*4.7***	
Regular to None	716	.980	.12	1.077	.13	.806	.13	.774	.13
Regular to Occasional		.815	.11	.768	.12	1.009	.23	1.176	.32
F-test		*1.3*		*2.1*		*1.2*		*1.9*	

*p < .05; **p < .01; ***p < .001

[§]Model includes social bonding measure and control variables.

[†]Model includes social bonding, student-teacher relationship and control variables

[•]Model includes student-teacher relationship and control variables

[Δ] All F-tests in the table have 2 degrees of freedom

Table 6. Weighted Relative Risk Ratios from Multinomial Logit Regression of School Connection on Cigarette Use Transitions: Add Health Wave 2 Respondents

		Social Bonding				Teacher Support			
Transition from		***Model 1***[§]		***Model 3a***[†]		***Model 2***[•]		***Model 3b***[†]	
Wave 1 to Wave 2	N	RRR	s.e.	RRR	s.e.	RRR	s.e.	RRR	s.e.
None to Occasional	9044	.987	.04	1.117*	.06	.764***	.04	.725***	.04
None to Regular		.696***	.06	.956	.08	.473***	.05	.493***	.05
F-test[Δ]		*9.8****		*3.3**		*39.1****		*33.8****	
Occasional to None	1629	.951	.09	.931	.10	1.021	.09	1.056	.11
Occasional to Regular		.802*	.08	.898	.10	.971	.05	.743**	.09
F-test		*3.2**		*0.5*		*7.9****		*6.1***	
Regular to None	1374	1.059	.11	1.072	.12	1.011	.12	.972	.13
Regular to Occasional		1.313*	.16	1.240	.17	1.299*	.07	1.154	.17
F-test		*2.4*		*1.2*		*2.0*		*0.6*	

*p < .05; **p < .01; ***p < .001

[§]Model includes social bonding measure and control variables.

[†]Model includes social bonding, student-teacher relationship and control variables

[•]Model includes student-teacher relationship and control variables

[Δ] All F-tests in the table have 2 degrees of freedom

NOTE: I highlighted inconsistencies between the coefficient Wald tests and the adjusted Wald Test (the F-tests).

Table 7. Weighted Relative Risk Ratios from Multinomial Logit Regression of School Connection on Suicidal Ideation and Suicide Attempts Use Transitions: Add Health Wave 2 Respondents

		Social Bonding				**Teacher Support**			
Transition from		***Model 1***[§]		***Model 3a***[†]		***Model 2***[•]		***Model 3b***[†]	
Wave 1 to Wave 2	N	RRR	s.e.	RRR	s.e.	RRR	s.e.	RRR	s.e.
None to Ideation		.902	.07	1.002	.09	.770***	.06	.769***	.06
None to Attempt	10590	.745**	.07	.968	.11	.553***	.05	.562***	.08
F-test[Δ]		*4.4***		*0.0*		*16.6****		*11.0****	
Ideation to None		1.225*	.11	1.160	.11	1.253	.15	1.142	.14
Ideation to Attempt	1132	1.141	.19	1.193	.23	1.011	.16	.904	.16
F-test		*2.7*		*1.3*		*2.2*		*1.0*	
Attempt to None		1.232	.14	1.349	.22	.915	.17	.777	.19
Attempt to Ideation	446	1.125	.18	1.214	.22	.895	.22	.801	.22
F-test		*1.6*		*1.7*		*0.2*		*1.0*	

*p < .05; **p < .01; ***p < .001

[§]Model includes social bonding measure and control variables.

[†]Model includes social bonding, student-teacher relationship and control variables

[•]Model includes student-teacher relationship and control variables

[Δ] All F-tests in the table have 2 degrees of freedom

Appendix. Description of Measures

Description of Measures

Category/variable	Description
	Dependent variables (Measured at Wave 2)
Weapon-related violence	Dichotomous variable indicating adolescent has committed at least one of the following acts in the past year: threatended to use a wapon to get something from someone, pulled a knife or gun on someone, shot or stabbed someone, used a weapon in a fight, or hurt someone badly enough to need bandages or medical care.
Ever suspended	Dichotomous variable that reports whether adolescent was ever suspended during the 1995-96 school year. The interviews were conducted over several months, so the length of time referred to varies across respondents.
Grade-point average	The average grade received in four subjects: English or language arts, mathematics, history or social studies, and science.
Cigarette Use	Three dichotomous indicators are created based on the number of days smoked in the last month: no use, experimental use (1–19 days) and regular use (20–30 days). This allows for examination of transtion to becoming a regular smoker and quitting.
	School connectedness measures (Measured at Wave 1)
Social belonging	The mean of responses to the three questions: "How much do you agree or disagree with the following statements? You feel close to people at your school. You feel like you are part of your school. You are happy to be at your school." Responses were a five-item Likert scale ranging from “strongly agree” to “strongly disagree.”
Student-teacher relationship	The mean of responses to three questions: 1. "How much do you agree or disagree with the following statement? The teachers at your school treat students fairly." Responses were a five-item Likert scale ranging from "strongly agree" to "strongly disagree." 2. "Since school started this year, how often have you had trouble getting along with your teachers?" Response categories are "never," "just a few times," "about once a week," "almost every day," "and everyday." 3. “How much do you feel that your teachers care about you?” The five response categories are “not at all,” “very little,” “somewhat,” “quite a bit,” and “very much.”
	Demographic Characteristics (Measured at Wave 1)
Race/ethnicity	Categories are Hispanic, non-Hispanic white, non-Hispanic black, American Indian, Asian, and other race/ethnicity.

Age	Continuous variable. R's age at time of Wave 1 interview.
Gender	Dichotomous variable. 1= female.
Family structure	Report of parent figure(s) in respondent's primary residence. Categories include: both biological parents, one biological parent, one biological parent and one step-parent, and "other" (e.g., grandparents, adoptive parents, etc.).
Household size	Number of persons residing in the household, including the adolescent. Calculated from the household roster.
Household income	A six-category variable based on parental report of income (under $10,000; $11,000–$20,000; $21,00–$40,000; $41,000–$60,000; $61,000–$80,000; and over $80,000). Since parental report of income was used, and 14.7% of adolescents did not have a parental survey, each adolescent missing parental report of income was assigned the median income of other adolescents of the same race/ethnicity, family structure, region of the country, and urbanicity.
Add Health Picture Vocabulary Test	An abbreviated version of the Peabody Picture Vocabulary Test. All scores are standardized with a mean of 100 and a standard deviation of 15.
Past Behaviors (Measured at Wave 1)	
Weapon-related violence	Same measure as at Wave 2, but referent period is year prior to Wave 1.
Ever suspended	Dichotomous variable that reports whether adolescent was ever suspended.
Grade-point average	Same measure as at Wave 2, but referent period is most recent grading period before Wave 1 interview.