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## Nonacademic Factors Associated with Dropping Out of High School: Adolescent Problem Behaviors

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This study uses a social capital and collective socialization lens to examine nonacademic factors in middle school that predict students' failure to complete high school, and focuses on youth who engage in adolescent problem behaviors of smoking cigarettes, sexual intercourse, delinquency, marijuana use, and alcohol use. Our area of interest was the extent to which these variables were predictive of dropping out of high school measured 6 years later and beyond the traditional variables of school performance and school engagement, which are the target of many dropout prevention programs. Analyses use data from the National Longitudinal Study of Adolescent Health to follow a nationally representative sample of children from middle school through the end of the high-school years. Results indicate that engaging in regular smoking and sexual activity during middle-school years predict high-school dropout independent of school performance during middle school. Acts of delinquency during middle school in the context of poverty (i.e., mothers' receipt of welfare was proxy for poverty) are also predictive of high-school dropout. These findings suggest the importance of factors that reach beyond school performance and school engagement as possible targets for dropout prevention programs.

*Key words: high school dropout, middle school, problem behaviors*

Despite a steady improvement in overall graduation rates since the 1960s, many students in the United States continue to leave school without a diploma (Balfanz, Bridgeland, Moore, & Fox, 2010). According to some estimates, more than one million students dropout each year, with members of minority groups facing the highest likelihood of dropping out (Crowder & South, 2003; Figueira-McDonough, 2010; Vartanian & Gleason, 1999; Wodtke, Harding, & Elwert, 2011). This study uses a social capital and collective socialization lens to examine nonacademic factors in middle school that predict students' failure to complete high school. Our work builds on recent literature that examined multiple factors rooted in environmental and nonschool experiences that lead youth to dropout of high school (Blondal & Adalbjarnardottir, 2009; Cavanaugh, Riegle-Crumb, & Crosnoe, 2007; Crowder & Teachman, 2004; Hernandez, 2010; Pong & Ju, 2000; Van Dorn, Bowen, & Blau, 2006).

Dropping out of high school can affect a youth's future and economic prospects. High-school dropouts are more likely to live in poverty and earn less money than those with a high-school diploma. Moreover, school dropouts tend to be disproportionately members of minority groups (Day & Newburger, 2002); although young people from any socioeconomic group might dropout of high school, those from low-income families face the greatest risk of

dropout (Chapman, Laird, & KewalRamani, 2010; Sirin, 2005). These risks are accentuated by a cyclical and cumulative relationship with adversity: low-income students tend to dropout of high school and often cannot find work or adequate employment; because they cannot find substantial employment and have not achieved a basic educational goal, their children are also more likely to leave school (Englund, Egeland, & Collins, 2008). Taken together, these realities as well as the lack of access to high-quality education, racial/ethnic health disparities, and residence in dangerous neighborhoods, leave poor youth, particularly youth of color, vulnerable (Balfanz et al., 2010; Balfanz & Legters, 2004).

Data collected over a 36-year period (1972 to 2008) by the National Center on Education Statistics show that although rates of high-school completion have improved for all groups, dropout rates have been consistently higher for Latinos (Pearson Education, 2000-2013). In 2008, the Latino dropout rate was 18.3% and the rate for Blacks was 9.9%. These rates contrast sharply with the substantially lower rates for non-Hispanic Whites (4.8%) and Asian/Pacific Islanders (4.4%; Chapman et al., 2010). Of course, dropout prevalence rates vary depending on how dropout is defined. In the present research, a dropout is defined as an individual who fails to graduate from high school or attain a General Education Development (GED) certificate within one year of the

expected graduation date (based on his or her current grade in school).

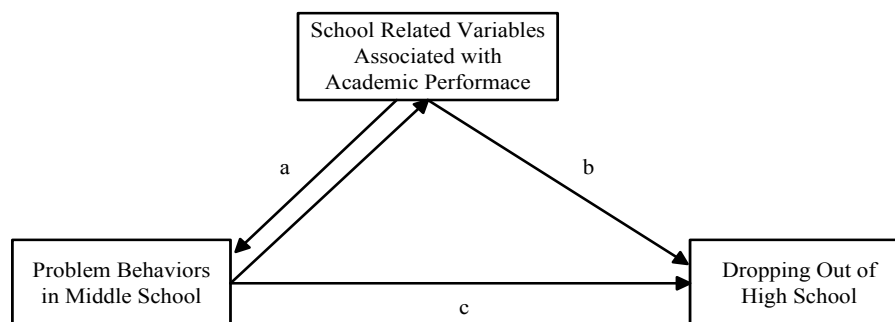
Townsend, Flisher, and King (2007) identified eight theoretical frameworks that helped us understand the conceptual underpinnings of high-school dropout. These frameworks include social control theory, problem-prone behavior and general deviancy, primary socialization, peer clustering, deviant affiliation, differential association, and strain theories. Social science research from each of these traditions has consistently linked dropping out of high school to academic failure and school disengagement that has occurred not only in high school but also in prior scholastic environments. This research demonstrated that school performance during elementary and middle school predicted later academic performance, which was also predictive of high-school graduation (Bowers, 2010; Bridgeland, Dilulio, & Morison, 2006; Englund et al., 2008; Garnier, Stein, & Jacobs, 1997; Hirschfield & Gasper, 2011; Reschly, 2010; Swanson, 2004).

An area of considerable interest has been the identification of factors that affect poor school performance and academic failure. Much of this work has posited that dropping out of school is the culmination of cumulative risk factors over time, including difficulty reading or learning math, grade retention, school disengagement, and a variety of childhood behavior problems (Randolph, Fraser, & Orthner, 2006; Randolph, Rose, Fraser, & Orthner, 2004; Simner & Barnes, 1991; Woolley & Bowen, 2007). One comprehensive study followed a cohort of children from low-income families from birth to age 19 years (Jimerson, Egeland, Sroufe, & Carlson, 2000), and found that global indices of externalizing and internalizing (measured by the Child Behavior Checklist [CBCL]) during the first grade were predictive, to some extent, of high-school dropout (see also Alexander, Entwisle, & Horsey, 1997; Bridgeland et al., 2006; French & Conrad, 2001; Garnier et al., 1997). In general, the underlying logic of these studies holds that behavioral problems lead to academic difficulties and school disengagement, which in turn, increases the risk of dropping out.

Research has also established a link between adolescents engaging in nonacademic risk behaviors (e.g., delinquency; drug, alcohol, or cigarette use; sexual involvement and unintended pregnancies) with poor academic performance (Battin-Pearson et al., 2000; McIntosh, Flannery, Sugai, Braun, & Cochrane, 2008; Sweeten, 2006; Tobin & Sugai, 1999) and subsequently dropping out of high school. Such risk

behaviors are thought to divert students' attention from their studies toward unruly interactions, which can also affect the capacity for memory and concentration (Alexander et al., 1997; Bub, McCartney, & Willet, 2007; Garnier et al., 1997; Simner & Barnes, 1991; Temple, Reynolds, & Miedel, 2000). As a result, the disruption of school performance has been treated as a key mediator through which the effects of engaging in adolescent risk behaviors impact high-school dropout.

A general model of the dynamics that frame the current research is presented in Figure 1. Path *a* represents the classic link between engagement in adolescent risk behaviors and school performance variables—a link that has been established in multiple studies. Figure 1 illustrates this link using reciprocal causal paths, given the substantial research that has implicated engagement in risk behaviors as both a primary factor influencing school performance (Bray, Zarkin, Ringwalt, & Qi, 2000; McCluskey, Krohn, Lizotte, & Rodriguez, 2002; Rumberger & Lims, 2008; Woolley & Bowen, 2007) and a consequence of poor school performance (e.g., drug use impacts school performance and school performance impacts drug use; Crosnoe, 2006; Frisco, 2008; Hirschfield & Gasper, 2011; Lohman & Billings, 2008). Path *b* in Figure 1 captures the well-documented link between poor school performance and dropping out of high school (Cairns, Cairns, & Neckerman, 1989; Garnier et al., 1997; Jimerson et al., 2000; Rumberger & Lim, 2008). When considered together, Paths *a* and *b* suggest a relationship between engaging in risk behaviors and dropping out of high school, with poor school performance constituting the core mediator. Therefore, it follows that prevention programs can reduce rates of high-school dropout by addressing the mediator in this mediational chain; that is, by ensuring youth do not decline in their school performance, even when experimenting with or engaging in risk behaviors. Such programs essentially weaken the link between engagement in risk behaviors and school performance (Path *a*) and capitalize on the strength of Path *b*, which states that better performance in school lessens the probability of dropping out of school. As one example, programs aimed at maintaining or increasing educational involvement and school performance of adolescent mothers (Bohon, Garber, & Horowitz, 2007) are predicated on (a) assuring adolescents that an unintended pregnancy does not undermine school performance (Path *a*), and (b) by providing such assurance, the likelihood of dropping out of high school is diminished (Path *b*).



**Figure 1.** Structural model for high school dropping out

The present research expands on the extant literature by addressing Path *c* in Figure 1. This focus has three notable, unique features. First, Path *c* implies that engaging in risk behavior during middle school affects dropping out of high school *independent* of the effects of risk behaviors on school performance during the middle-school years. This implication is important given that most research analyses that have examined the effects of risk behaviors on high-school dropout have not statistically controlled for school performance because, in part, school performance has been presumed to be the primary mechanism (i.e., mediator) through which risk behaviors affect later dropout. However, if an independent Path *c* is present, then this path suggests a broader focus is required that considers mechanisms other than school performance as mediators of the effect of risk activity on dropping out of high school. The presence of Path *c* suggests that an additional set of mediators beyond school performance per se must be addressed or, alternatively, that the early onset of risk behaviors must be addressed directly and separately from school performance.

Developmental scientists have emphasized the importance of the middle-school years as a period when children are transitioning into adolescence and their choices have nontrivial implications for life trajectories and future success (Bowers, 2010; Cairns et al., 1989; Orthner et al., 2010). During middle school, the school environment changes from one that emphasizes cooperative learning with a single teacher each year (as in elementary school) to one that focuses on grades and tracking with multiple teachers and classrooms. Coupled with this environmental change, children begin to experience hormonal changes that bring physical, emotional, and cognitive alterations. During this key transitional period, younger adolescents' exposure to and awareness of older peers increases, which often brings about qualitative changes in fundamental relationships with parents and siblings (Lerner, 2002; McIntosh et al., 2008; Steinberg & Morris, 2001). Engaging in risk behaviors

during this transitional period is thought to be both a coping mechanism for stress and a strategy used by some youth to establish a unique identity that separates them from their friends and peers in a way that is assumed to be positive (Blanton & Christie, 2003). The act of nontrivial engagement in risk activities during the middle-school years can start adolescents down a trajectory with fundamental implications not just for school performance but also for their relationships with peers and family; how they deal with stress; and their emotional, moral, and social development. These dynamics certainly can affect adolescents' later adjustment during the high-school years, independent of school performance during middle school, which ultimately can impinge on decisions to dropout of school. At the same time, it is important to consider the possibility that these broader developmental implications might be tied to the failure to complete high school, thereby recognizing that the solution to elevated rates of dropout extends beyond merely improving skills related to school performance (Ziomek-Daigle, 2010). The present research is couched in this tradition and broader perspective.

A second unique feature of the current research derives from its consideration of middle-school factors on high-school dropout. Generally, the impact of adolescent risk behaviors on dropping out of high school have been examined within the context of high school per se; conduct during the ninth and 10th grades forecasts dropping out within the next year or two (Jimerson et al., 2000; Rumberger, 1995). In contrast, the present study examined risk behaviors during the middle-school years as predictors of failure to graduate from high school or to obtain a GED within 6 years. If a linkage can be documented between the precocious engagement in risk behaviors during middle school and later dropping out of high school that is independent of school performance during middle school, then this link would suggest programs aimed at decreasing rates of high-school dropout could profitably be broadened to address

adolescent risk behaviors in lower grades (i.e., younger students).

Third, most studies that link adolescent risk behaviors to dropping out of high school have focused on a single behavior, such as delinquency, drug use, or early sexual behavior as isolated behaviors (Crosnoe, 2006; Frisco, 2008; Hirschfield & Gasper, 2011; Lohman & Billings, 2008; McCluskey et al., 2002; Spriggs & Halpern, 2008). Some researchers have attempted to determine which activities are more strongly associated with dropping out of high school, but even these studies have tended to focus on a small subset of risk behaviors. For example, Bohon et al. (2007) found that substance-use disorders in youth before ninth grade and the youth's later sexual behavior during high school were independent predictors of dropping out of high school. Ellickson, Bui, Bell, and McGuigan (1998) found that tobacco use during middle school was predictive of failure to complete high school, whereas marijuana use was not. Both of these studies used convenience samples, with Bray et al. (2000) challenging the result of the tobacco study. Bray and colleagues not only found that both marijuana and tobacco use were associated with dropping out of high school but that marijuana use had the stronger effect. Townsend et al. (2007) provided a systematic review of the relationship between dropping out of high school and substance use. Townsend and colleagues examined 46 peer-reviewed articles that primarily used cross-sectional data but included a few longitudinal articles with a worldwide focus, and found a relationship between substance use (tobacco, alcohol, marijuana/ cannabis, other illicit drugs) and leaving high school early. Of the longitudinal studies reviewed, none examined behavior in middle school as predictors of dropping out of high school. Register, Williams, and Grimes (2001) investigated the relationship of adolescent males' illicit drug use, including hard drugs and marijuana, with educational attainment using the National Longitudinal Survey Youth Cohort. Their results showed all types of drug use by adolescents were associated with at least a one-year reduction in formal schooling. Even though the emphasis of this study was not on middle school and the research focused on educational attainment rather than high-school dropout, Register et al. (2001) offered support for a link between substance use and educational attainment. The present longitudinal research stands out relative to the majority of prior studies in the range of risk behaviors that we investigated as possible predictors of dropping out of high school, and in that these factors were considered as multivariate factors rather than considered in isolation.

In sum, our focus on the precocious initiation of problem behaviors in middle school uses a longitudinal design and examines multiple behaviors to refine the understanding of the complex developmental alterations that occur during these crucial formative years.

## Method

### Respondents

The study used data from the National Longitudinal Study of Adolescent Health (Add Health; Bearman, Jones, & Udry, 1997). Add Health is a large-scale, nationally representative database. The initial Add Health survey (Wave 1) interviewed 20,745 adolescents enrolled in Grades 7 to 12 during the 1994-95 academic year. Our analyses focused on youth who were in middle school (Grades 7 and 8) at Wave 1, who were reinterviewed approximately six years later (Wave 3), and who had longitudinal sample weights to adjust for attrition and nonresponse bias (final *N* varied depending on the analysis in question but generally was in the range of 3,000 respondents for longitudinal analyses and 5,400 for Wave 1 cross-sectional analyses). Although the age range of youth at Wave 1 was 11 to 15 years, 91% of the sample was 12 to 14 years old, yielding a median age of 12.5 years. Details on the sampling frame and interview procedures can be found in Bearman et al. (1997).

### Procedure

Specific interview procedures used for Add Health can be found in Bearman et al. (1997). Topics addressed included health status, peer networks, decision-making processes, family composition and dynamics, and educational aspirations and expectations. Parents were interviewed at Wave 1 only. At the longitudinal follow-up (Wave 3), the reinterview rate for youth was 80%. The Wave 1 data collection occurred during 1995 to 1996, and Wave 3 data were collected from 2001 to 2002.

### Measures

**Dropout status.** At Wave 3, Add Health respondents were between 18 and 26 years old and reported the highest level of education they had achieved. We coded an individual as having dropped out of high school if they indicated they had not graduated from high school nor attained a GED. The primary outcome variables were *graduated from high school or obtained a GED* (scored as 1), and *did not graduate from high school and did not obtain a GED* (scored as 0).

**Adolescent problem behaviors.** The Wave 1 Add Health interview measured problem behaviors in five domains: delinquency, marijuana use, alcohol use, sexual activity, and cigarette smoking. We



created dichotomous indicators of each behavior (*engaged in the activity in a nontrivial way* = 1; *did not engage in the activity in a nontrivial way* = 0). Because there is natural experimentation with these behaviors in early adolescence, we assigned a score of 1 to the category only if the adolescent had engaged in the activity in a way that seemed to define a “commitment” to the problem behavior. For delinquency, an adolescent was assigned a 1 if she or he had engaged in any of the following behaviors in the past 12 months: stolen something worth more than \$50, burglarized a building or home, used or threatened someone with a weapon, or sold drugs. This framework was derived from a broader measure that asked respondents how often during the past 12 months they had performed each of 15 behaviors; responses used a metric of *never*, *1 or 2 times*, *3 or 4 times*, and *5 or more times*. For marijuana use, an adolescent was asked to indicate on how many days he or she had smoked marijuana in the past 30 days. The respondent was assigned a 1 if she or he had smoked marijuana more than 5 times in the past 30 days; all other responses were scored as 0. For alcohol use over the 12 months, adolescents were asked to indicate on how many days they had five or more drinks in a row, with response metrics of *every day*, *almost every day*, *3 to 5 days a week*, *1 or 2 days a week*, *2 or 3 days a month*, or *once a month or less (3 to 12 times in the past 12 months)*. Youth were assigned a 1 if they indicated they engaged in binge drinking at least once a week for the past year. For cigarette smoking, adolescents were assigned a 1 if they reported they had ever been a regular smoker (*daily, for 30 days in row*). Finally, for sexual activity, we assigned an adolescent a score of 1 if they reported they had ever engaged in vaginal sexual intercourse. In addition to analyzing the individual behaviors, we summed the five indices to create an index of the number of different problem behaviors the adolescent had engaged in, which had a potential range from 0 to 5. Few adolescents in the Add Health sample had engaged in more than three problem behaviors, and those with scores of 4 and 5 showed similar patterns of other behaviors to those with scores of 3; therefore, we winsorized this measure at the value of 3.

The cutoff values for the above behaviors were not arbitrary but were based on the substantive criteria identified earlier as well as inspection of frequency distributions (collapsing adjacent categories on the response scale that had small *N*) and preliminary empirical explorations of different cutoff scenarios for the prediction of dropping out. In most cases, the dichotomization made sense because the data suggested a threshold model as plausible; that is, under the chosen cutoff value, adolescents with different values showed similar dropout rates whereas

above the cutoff value, adolescents with different values also showed similar dropout rates (but usually elevated relative to those below the cutoff). These explorations helped to ensure the modeling was not adversely affected by a misspecified functional form between predictors and outcomes.

**Grade point average.** Students’ grade point average (GPA) at Wave 1 was measured by a self-report of letter grades received during the last grading period. An average GPA was assigned, with 1 indicating a grade of D or lower and 4 indicating an A. Meta-analyses of the accuracy of self-reported versus actual GPA tend to indicate that the two are highly correlated (for high school youth, average  $r = 0.82$ ; Kuncel, Credé, & Thomas, 2005).

**Academic aspirations.** The academic aspirations of adolescents were assessed with the following two questions: “On a 1 to 5 scale where 1 is low and 5 is high, how much do you want to go to college?” and “On a 1 to 5 scale, where 1 is low and 5 is high, how likely is it that you will go to college?” Responses to the two items were averaged ( $\alpha = 0.82$ ).

**Perceived parental academic expectations.** At Wave 1, adolescents were asked to use a 5-point scale to provide separate ratings of their mother’s and father’s levels of disappointment if the youth did not graduate from high school. The two items were averaged ( $\alpha = 0.73$ ). If there was no father figure in the family, only the mother’s rating was used as the indicator.

**Connectedness to school.** At Wave 1, adolescents rated how connected they felt to their school using a 5-point *agree/disagree* scale to respond to the following three items: “I feel close to people in my school,” “I feel like I am part of my school,” and “I am happy to be at my school.” The responses were scored from *strongly disagree* (scored 1) to *strongly agree* (scored 5), and scores were averaged ( $\alpha = 0.77$ ).

**Parent education.** Parents reported the highest level of education they had attained by using the following scale: *never attended school* (scored 0) through *professional beyond college* (scored 7).

**Income and welfare status.** Parents reported their total family annual income in thousand dollar units. Based on an inspection of the distribution and to avoid outliers, the reported income was scaled as follows: less than \$10,000 was coded as 1, increments of \$10,000 were coded 2 through 13, and income greater than \$110,000 was coded as 14. Parents were asked, “Are you receiving public assistance, such as welfare?”; responses of *yes* were coded as 1, and *no* coded as 0.

**Additional demographic variables.** Measures also assessed whether the household was a single- or two-parent household, the adolescent's race/ethnicity, and whether the mother was employed full-time.

### Analytic Strategy

We first analyzed whether the problem behaviors were correlated with one another, and determined the correlations were modest. We then conducted simple descriptive analyses relating each problem behavior to dropping out of high school as measured 6 years after the baseline assessment. We did not perform formal tests of Paths *a* and *b* in Figure 1 because these links have been well established in the research literature and our primary focus was on Path *c*.

In general, two approaches are available to estimate path coefficients in models like those shown in Figure 1. The most well-known approach is full information estimation, in which the parameters in the multiple equations implied by the model are simultaneously estimated. Standard computer packages for structural equation modeling can implement full information estimation. A lesser-known approach uses limited information estimation strategies in which the parameters in the multiple equations are estimated equation-by-equation. Both approaches have strengths and weaknesses. For example, if the model is correctly specified, full information estimation often yields more efficient estimators (in a strict statistical sense of the term) than limited information estimation. On the other hand, as compared with full information estimation, limited information estimation is less affected by specification error in other parts of the model, does not make as strong statistical assumptions, and allows the analyst to adapt estimation algorithms to the unique needs of a particular equation, given the metric properties of the measures in the equation.

Three sets of equations are applicable to the model in Figure 1: (a) equations expressing the school performance variables as a function of the problem behaviors (Path *a*), (b) equations expressing high-school dropout as a function of the school performance behaviors (net the problem behaviors; see Path *b*), and (c) equations expressing high-school dropout as a function of the problem behaviors (net the school performance variables; see Path *c*). We adopted a limited information approach that focused on Path *c* because it is only the third set of equations (Figure 1) that are "novel" relative to prior literature. In addition, a full information estimation approach is complicated by the number of variables in the box labeled "School-Related Mediators" (see top of Figure 1) that were measured contemporaneously with the problem behaviors (i.e., the causes and effects for Path *a* are

measured in the same questionnaire at the same time). Based on past research, we knew a reciprocal causal relationship existed between some of the variables (e.g., drug use impacts school performance and school performance impacts drug use). A model that ignored such bidirectional effects would be misspecified and subject to inferential errors. To model Path *a* correctly, the researcher needs to introduce instrumental variables into the system so the model would not be statistically under identified. This process would be challenging, especially given the number of variables in the school performance category.

We addressed Path *c* in Figure 1 by regressing the dichotomous outcome of dropping out of high school onto the five risk behaviors while covarying out school performance variables. Because the outcome variable was dichotomous (*dropped out/did not dropout*), the variable could be modeled using logistic/probit regression, log binomial regression, or a modified linear probability model (Cheung, 2007; Daniloski, Jaccard, & Brinberg, 2011). Studies have documented limitations of logistic regression due to strong assumptions of variance homogeneity and the standardized nature of model coefficients when making group comparisons (Alvarez & Brehm, 1995, 2002; Williams, 2009; Yatchew & Griliches, 1985). Preliminary analyses also indicated that the classic S shaped function implied for outcome probabilities by the logit model was not appropriate, whereas quadratic models in the context of the modified linear probability model would better account for data patterns. Therefore, we used the modified linear probability model with a Huber-White robust estimator as implemented in Mplus (Muthén & Muthén, 1998-2011). For the multivariate models, we also tested if the estimated effect of the problem behaviors varied as a function of ethnicity, gender, and the welfare status of the mother to protect against specification error in the modeling. We used the product term approach for testing interactions as described by Jaccard and Turrisi (2003).

We tested if the problem behaviors predicted dropping out of high school beyond school performance-related variables assessed during middle school and that are typical of those studied in the broader dropout literature (i.e., GPA, academic aspirations, parental educational expectations, school connectedness during middle school). We also included covariates in the estimating equations for a host of theoretically relevant demographic variables, including parental education, household makeup, welfare status of mother, adolescent gender, adolescent ethnicity, and the maternal full-time employment status. All of these additional covariates were included to control for omitted variable bias.

Add Health used school as the primary sampling units, and due to the oversampling, these required the use of sampling weights (Tourangeau & Shin, 1998). In our analyses of the data, strata were defined in accord with the clustered sample design. Analyses were conducted with and without weights given the controversies surrounding the use of weights (e.g., Asparouhov & Muthén, 2007). Weighted analyses in Mplus are reported with discrepancies between the weighted and unweighted analyses noted. Missing data were handled in two sets of runs: one set of runs used full information maximum likelihood methods in which exogenous variables were treated as stochastic (Enders, 2010); and the second set treated exogenous variables as nonstochastic and eliminated cases with missing data on the exogenous variables. Conclusions did not vary across the two strategies for handling missing data. A similar sensitivity approach was taken to analytic approaches that treated dropping out as a strict dichotomy versus as a latent propensity and, again, all conclusions were comparable.

## Results

### Preliminary Analyses

**Descriptive statistics and zero-order associations.** Table 1 presents basic descriptive statistics for the sample and mean/percentage values on the major variables analyzed. Table 2 presents the high-school dropout rates as a function of gender, ethnicity, maternal welfare status, and each of the five problem behaviors. On a simple bivariate level, presence of any of the five problem behaviors during middle school was predictive of dropping out of high school 6 years later. For example, 32% of the youth who engaged in sexual intercourse during middle school subsequently failed to complete high school, whereas only 11% of youth who had not engaged in sexual intercourse during middle school dropped out of high school. Similarly, as compared with 32% of the youth who smoked cigarettes regularly during middle school and who failed to complete high school, only 12% of youth who had not been regular smokers in middle school also failed to complete high school. (See Table 2 for associations characterizing the other problem behaviors).

**Multivariate analyses of problem behaviors.** Although adolescent problem behaviors are commonly thought of as highly correlated, recent meta-analyses have suggested that such correlations are modest in magnitude (Guilamo-Ramos, Litardo, & Jaccard, 2005). This also was the case for the present data. Table 3 presents the estimated correlations (phi coefficients–tetrachoric correlations were similar) between the five problem behaviors. In general, the magnitudes of the correlations were modest, suggesting each might differentially predict dropout

status, which in turn, justified using each as a separate predictor in the context of multivariate modeling.

We calculated the percentage of adolescents who performed single versus multiple problem behaviors during middle school for use in later analyses. The percentage of adolescents who engaged in none, one, two, three, four, or five of the problem behaviors were, respectively, 69.3%, 16.6%, 7.0%, 3.9%, 2.4%, and 0.8%. Although the majority of middle school-aged youth did not engage in any of the behaviors, nearly a third (31%) engaged in at least one problem behavior. Relatively few (about 7%) adolescents engaged in three or more of the problem behaviors.

### Model diagnostics and specification error.

Because we used robust estimation, matters surrounding non-normality and variance heterogeneity are moot (assuming a reasonably correctly specified model). We tested for outliers by examining DFBETAS (standardized difference of the beta) defining an outlier as any case with an absolute value greater than 1.0 for any predictor. No outliers were evident. We examined residuals to identify specification error due to assumed linearity with dropout rates for tri-or-more-valued measures.

Two conceptually meaningful nonlinearities emerged. The first nonlinearity was for GPA, where the estimated impact of increasing middle school GPA on high-school dropout rates lessened at higher GPA values. A similar effect was observed for maternal education. Both of these effects are clarified later, but they led to the inclusion of quadratic terms in the estimating equation for these two variables. Inspection of residuals also suggested a nonhypothesized interaction effect for welfare status with delinquency. We clarify this interaction later, but the suggestion of the effect at this point led us to include a product term for this interaction in the estimating equation.

### Prediction of Dropping Out of High School from Problem Behaviors

**Modeling qualitatively different problem behaviors.** Dropout status was regressed onto the core variables shown in Figure 1, the additional covariates described in the Method section, and the quadratic and interaction terms discussed above. Table 4 presents the coefficients for the model. Our primary interest was in the coefficients for each of the problem behaviors, which, when multiplied by 100, reflected the differences in the percentages between the students who engaged in the behavior and dropped out of high school and the students who did not engage in the behavior and dropped out of high school (holding all other variables constant). Setting aside those behaviors involved with product terms, two of the behaviors yielded statistically significant differences.



**Table 1**  
*Descriptive Statistics for the Sample*

Statistic/Variable	Percent/Mean
% of adolescents high-school dropout	14.4
% serious delinquent behavior	11.4
% heavy drinking	1.6
% had sexual intercourse	16.2
% regularly smoked	11.2
% heavy marijuana use	2.3
% male	48.6
% African American	15.3
% Asian American	2.8
% European American	69.1
% Latino	11.7
% Native American	1.1
% mother full-time employed	77.3
% mothers with less than high school education	16.0
% mothers with high school degree	48.4
% mothers with college degree or higher	6.9
% mothers on welfare	11.9
% mothers married	67.8
Mean GPA	2.83
Mean academic aspirations	4.35
Mean parental academic expectations	4.68
Mean school connectedness	3.84

*Note.* All variables measured at Wave 1 except dropout status, which was measured at Wave 3. Approximate *N* is 5,400 but varies slightly per variable due to missing data.

The rate of high-school dropout was 7.3% higher for students who reported having sexual intercourse during middle school as compared with students who had not had sexual intercourse during middle school, over and above all other variables. Similarly, the rate of high-school dropout was 10.6 % higher for students who had smoked cigarettes regularly during middle school as compared with students who were not regular smokers.

The estimated effect of engaging in delinquent behavior during middle school was dependent on the welfare status of the mother. Using algebraic

manipulation of the coefficients in Table 4 and their variances/covariances, we compared students from families that did not receive welfare and found a trivial difference between dropout rates for students who engaged in delinquent behavior versus those students who did not exhibit these behaviors (estimated percentage difference was less than 1%, *ns*). However, for students whose families received welfare, the estimated percentage difference in high school dropout between students with and without delinquent behavior was 30% ( $z = 4.01$ ,  $p < 0.05$ ), a rather noteworthy disparity.

**Table 2***High School Dropout Rates as a Function of Gender, Ethnicity and Welfare Status*

Group	Percentage high school dropout
Males	16.3
Females	12.5
Mother on welfare	28.8
Mother not on welfare	12.4
African Americans	16.7
Asian Americans	3.8
European Americans	11.8
Latinos	24.2
Native Americans	39.8
Engaged in delinquent behavior at Wave 1	24.1
Did not engage in delinquent behavior at Wave 1	13.1
Engaged in binge drinking at Wave 1	25.7
Did not engage in binge drinking at Wave 1	12.8
Had sexual intercourse at Wave 1	32.5
Did not have sexual intercourse at Wave 1	11.1
Regularly smoked tobacco at Wave 1	31.8
Never smoked tobacco regularly at Wave 1	12.3
Smoked marijuana at Wave 1	28.3
Did not smoke marijuana at Wave 1	13.6

**Table 3***Estimated Correlations Among Problem Behaviors*

Behavior	Delinquency	Sex	Smoker	Marijuana
Delinquency	-			
Sex	0.21*	-		
Smoker	0.22*	0.25*	-	
Marijuana	0.32*	0.24*	0.32*	-
Alcohol	0.31*	0.26*	0.39*	0.33*

\*  $p < 0.05$ 

Note that none of the above estimated effects of the problem behaviors were qualified by the GPA of the student as reflected in moderator analyses we conducted as a function of GPA (i.e., the dynamics were about as likely to operate for students doing poorly in school as for students doing well in school). Nor were the effects qualified by the academic aspirations of the students or their self-reported connectedness to their school, based on our moderator analyses.

Neither marijuana use nor alcohol use yielded statistically significant path coefficients in the model. The lack of significant results does not mean that these variables are not relevant to students' decisions to dropout of high school. Rather, the effects of these variables can plausibly be attributed to either their impact on the school performance mediators that are held constant in the estimating equation or to their confounds with other variables in the equation.

**Table 4***Prediction of High School Dropout From Problem Behaviors*

Predictor	Coefficient	95% Lower CI	95% Upper CI	z ratio
(Intercept)	.838	0.506	1.170	—
Delinquency	-0.003	-0.057	0.050	0.113
Had sex	0.073	0.010	0.135	2.286*
Regular smoker	0.106	0.046	0.166	3.480*
Marijuana use	-0.019	-0.122	0.083	0.366
Alcohol use	-0.005	-0.056	0.046	0.179
Welfare status X Delinquency	0.299	0.155	0.443	4.060*
GPA	-0.210	-0.341	-0.079	3.141*
GPA*GPA	0.025	0.002	0.048	2.098*
Parent academic expectations	-0.014	-0.033	0.005	1.415
Connected to school	-0.002	-0.022	0.019	0.157
College aspirations	-0.037	-0.062	-0.012	2.890*
Maternal education (ME)	-0.132	-0.194	-0.071	4.238*
ME*ME	0.013	0.006	0.019	3.896*
Two-parent home	-0.060	-0.094	-0.026	3.490*
Welfare status	0.004	-0.058	0.065	0.113
Gender	0.008	-0.018	0.035	0.633
D-Black	0.002	-0.054	0.057	0.058
D-Latino	0.004	-0.045	0.053	0.153
D-Other	-0.006	-0.075	0.062	0.186
Age	0.019	-0.002	0.041	1.756
Mother employed full- time	-0.034	-0.064	-0.004	2.220*

\*  $p < 0.05$ 

Although not of primary interest, other estimated effects in Table 4 are worth noting. GPA during middle school was a solid predictor of dropout during high school, although the association of GPA with dropout was best captured by a nonlinear quadratic function. Holding all other variables constant at their mean values, the estimated dropout rates for GPAs of 1.0 = 30.5%, of 1.5 = 23.1%, of 2.0 = 16.9%, of 2.5 = 12.0%, of 3.0 = 8.3%, 3.5 = 5.8%, and 4.0 = 4.6%. At higher levels of GPA, the dropout rate did not vary appreciably with shifts in GPA, whereas shifts at lower GPA levels were quite consequential.

Aspirations for higher education were also predictive of dropping out of high school, with each unit increase on the 5-point aspiration scale associated with a 3.7% decline in dropout. Thus, the difference in dropout rates for students with a score of 1 on the aspiration scale (i.e., low aspirations) versus students with a score of 5 (i.e., high aspirations) was estimated

to be about 18.5%. These trends are consistent with the literature that has implicated the importance of these school-focused mediators and suggested justification for continued focus on increasing GPA levels and encouraging aspirations for higher education.

**Modeling the number of problem behaviors as predictors of dropping out.** We also modeled the estimated effect of engaging in multiple problem behaviors during middle school on dropping out of high school. This model included all of the predictors from the prior model but excluded the qualitatively different problem behaviors. In the place of the excluded behaviors, the model used three dummy variables representing various levels of the performance of problem behaviors irrespective of the specific behaviors. The dummy variables represented the presence of one, two, or three or more problem behaviors; students with no problem behaviors were the reference

group. Holding all other variables constant at their mean values, the dropout rate for students engaging in no problem behaviors was 6.7%; for one behavior, 12%; for two behaviors, 15.4%, and for three or more problem behaviors, the estimated dropout rate was 21.2%. The coefficients for each of the problem behavior dummy variables were statistically significant (coefficient for dummy variable for one behavior = 0.053,  $z = 2.66$ ,  $p < 0.05$ ; coefficient for dummy variable for two behaviors = 0.087,  $z = 2.68$ ,  $p < 0.05$ ; coefficient for dummy variable for three or more behaviors = 0.145,  $z = 3.20$ ,  $p < 0.05$ ). In general, dropout rates increased by about 6% for each additional problem behavior in which the youth engaged.

### Supplemental Analyses

We conducted a number of supplemental analyses to place the above analyses into methodological perspective. First, we repeated all of the analyses but included an additional covariate as an index of social desirability response tendencies; the measure was administered as part of the Add Health survey (see Guilamo-Ramos, Jaccard, & Pena, 2005, for a description of the measure). This covariate statistically adjusts the modeling process to account for study participants' tendencies to respond to questions in a socially desirable way. None of the major conclusions were affected by this added covariate. Second, income levels were represented in the estimating equations using a dichotomous variable representing welfare status. We re-ran the equations omitting the welfare status variable, substituting an index of annual income in units of thousands of dollars as a covariate. None of the major conclusions were affected by this substitution (with the exception, understandably, of the interaction effect between welfare status and delinquency). Third, to place statistically nonsignificant coefficients in Table 4 in perspective, we performed power analyses under scenarios that varied the collinearity between predictors, the sample sizes in the different groups, and the magnitude of effect sizes (ranging from small effects to large effects as defined by Cohen, 1989). With a total sample size of about 3,000, power was satisfactory ( $> 0.80$ ) for virtually all contrasts involving middle to large effect sizes.

When estimating the effects of adolescent problem behaviors on school dropout rates in Table 4, we held constant the school mediators that were measured at the same time as the assessment of problem behaviors. It is possible that engaging in problem behaviors degrades school performance and engagement at future points in time (e.g., a year later) and that the effects of the problem behaviors are mediated by these future school performance and engagement variables rather than the ones that were

measured contemporaneously at the baseline of Add Health. Add Health's Wave 2 survey reassessed the school mediators one year after the baseline measures. We re-ran the analyses of Table 4 substituting the Wave 2 school mediators for the Wave 1 mediators. None of the fundamental trends in the data were altered by this substitution, and the observed pattern of statistically significant coefficients remained the same. This finding reinforces the proposition that the impact of problem behaviors cannot be attributed solely to the effect on concurrent school performance or future school performance (one year later).

### Discussion

The findings in our study were generally consistent with those of other studies that have examined middle-school problem behaviors and future high-school dropout. However, our results extend beyond past research in several substantial ways. Our study used a nationally representative sample in the context of a 6-year prospective design, whereas much (but not all) prior research had used convenience or regional samples with either retrospective designs or designs with short durations between variable assessments. Few studies have examined the predictive ability of problem behaviors during middle school on the failure to complete high school independent of the effects of these behaviors on school performance during middle school. Our analyses yielded results consistent with such effects, independent of school performance in middle school, at least for engaging in sexual intercourse and being a regular cigarette smoker. In addition and as expected, the risk of dropping out of high school increased relative to the number of problem behaviors in which the student engaged. Equally important, we found no evidence that the estimated effects of these problem behaviors on school dropout differed for students doing poorly versus students doing well in on measures of academic performance during middle school (or, for that matter, school performance one year later). As such, the potential impact of problem behaviors that exhibit negative environmental factors on high-school dropout can be considered to cut across many classic indicators of future dropout.

Despite these important linkages, our study also produced some unexpected findings. For example, substance use was not significantly predictive of future failure to complete high school. To be sure, substance use was predictive in simple bivariate analyses (similar to prior studies; see Bohon et al., 2007; Crosnoe, 2006), but this was not the case when variables for other problem behaviors and academic performance were statistically held constant. These findings do not mean that substance use during middle school is irrelevant to the failure to complete high



school. Rather, the effects of substance use during middle school can probably be traced through its impact on more traditional academic performance variables, such as GPA, rather than through other mechanisms. This conclusion also applies to other variables that yielded nonsignificant results, but which prior research had suggested were predictive of dropping out of high school (i.e., keeping in mind the covariates included in our models).

Participating in delinquent behavior was also predictive of the future failure to complete high school independent of school performance and engagement, but its statistically significant interaction with welfare status suggests more nuanced, contextualized effects. Specifically, delinquency during middle school was predictive only of failure to complete high school for poor families (as indexed by welfare usage). If a middle-school student committed an act of delinquency within the last 12 months (defined as having stolen property worth more than \$50, burglarized a building or home, used or threatened someone with a weapon, or sold drugs) *and* the student's mother received welfare, then the student was at considerable risk of dropping out of high school. However, the same delinquent acts committed by students whose mothers were not on welfare, showed no significant association with dropping out of high school. Our findings suggest the possibility of a complex mechanism at play in which early delinquency (during middle school) interacts with poverty to impact future high school completion. This mechanism might be mediated among lower-income communities by the lack of collective socialization with adults who are positive role models. We again stress that our analyses are unique relative to other analyses of delinquency and dropout because we focused on Path *c* in Figure 1, which holds school performance during the middle-school years constant.

### **Sex, Smoking, and Ease of Access to Negative Others**

We found that two middle-school problem behaviors—engaging in sexual intercourse and being a regular cigarette smoker—were not only particularly predictive of the failure to complete high school but also were independent of school performance. Clearly, in the case of smoking cigarettes, it is not the act of smoking itself that leads to a failure to complete high school. Rather, smoking is associated with some other mechanism (independent of school performance) that ultimately leads to adolescents dropping out of school. One possibility is that the social capital of peer interactions when smoking impacts these adolescents. The act of smoking encourages younger adolescents to bond with older peers and/or to build *availability networks* of older individuals who are willing to

purchase cigarettes for younger adolescents. These older individuals and peers may ultimately serve as negative influences and harmful role models. The older individuals who are willing to buy cigarettes might not be willing to buy their younger peers alcohol or harder drugs because those substances have much harsher sanctions. Therefore, the manifestation of the linking relationship with older, influential peers is expressed via cigarette smoking. Studies have found that younger students often pick up smoking as a habit from older peers, especially if those students attend under-resourced and high-risk schools (Leatherdale, Cameron, Brown, Jolin, & Kroeker, 2006; Leatherdale, Cameron, Brown, & McDonald, 2005). In addition, younger adolescents often provide for their smoking habit by “bumming” cigarettes from strangers or by purchasing single cigarettes (i.e., “loosies”) from individuals or, unofficially, in shops from vendors. Again, such social capital interactions might expose the adolescent to individuals and influences that ultimately are counterproductive to obtaining a high-school degree. These same mechanisms might be operative for alcohol and drugs, but the dynamics surrounding cigarettes are clearly distinct in our model. Of course, the above interpretation is speculative; future research should explore these proposed associations in more depth.

For sexual intercourse, students who form romantic attachments to the point where they engage in sex might lose interest in school as their relationships with their romantic partners become their primary focus. This loss of interest does not necessarily result in poorer school performance; rather, the loss of interest just reflects a different set of priorities in which school moves down the hierarchy, as modeled by adults or peers in the community. As choices are made about future courses of action, the newfound concentration on relationships might lead the individual down paths that are inconsistent with completion of his or her formal education. Indeed, this type of a pattern was suggested by Schvaneveldt, Miller, Berry, and Lee (2001), whose analysis of 2,301 children found that early sexual relationships were strongly associated with lowering of educational goals. In addition, adolescent girls who experience a teen pregnancy are more likely to dropout of school in the future, and therefore, youth who embark on an early sexual path during middle school might be more likely to experience a future pregnancy.

Arguably, it is possible that engaging in problem behaviors during middle school might have little effect on dropping out of high school and that the observed associations are merely due to uncontrolled confounds or self-selection mechanisms into the “has/has not performed the behavior” groups.

Assignment to groups is not random and the fundamental problem of endogeneity is always present. However, it is intriguing to consider the implications of a causal impact, especially given that the estimated effects are independent of classic school-based mediators of dropping out.

### **Welfare Use and Delinquency: A Social Interaction**

As noted, we observed an interesting interaction between welfare use and delinquency in predicting failure to complete high school. The dynamics suggested above surrounding social networks and the display of social capital might also be at play in explaining this interaction. Older friends and others in the adolescents' peer group in neighborhoods or schools might influence the choices made by middle school-aged youth. Young people growing up on welfare and who live in highly disadvantaged neighborhoods are often at risk of economic, social, and psychological deprivation (Brody et al., 2001). In high-risk, low-resourced communities, parents might not have outlets for collective socialization, and are more likely to be overly stressed or to work at jobs that do not allow them to be available to their children during after-school hours. In addition, lower-income parents might not have the resources to enroll their children into appropriate after-school activities. Youth that find themselves in these situations are more likely to be particularly vulnerable to the influence of delinquent peers (Brody et al., 2001; Haynie & Osgood, 2005).

On the other hand, young adolescents from middle-class households who engage in delinquent behavior are likely to have other options, which are generally provided by parents or collective socialization. Adolescents whose families are on welfare, but who do not engage in delinquent behavior, might have successfully stayed clear of peers with such behavioral tendencies, either because of their parents or other positive resources gained from collective socialization activities. Because parents in lower-income households might have few resources, their children might look to older or more delinquent peers for support and socialization (Brody et al., 2001; Haynie & Osgood, 2005).

### **Preventing High School Dropout: The Role of Nonacademic Factors**

Our findings suggest that preventing high school dropout requires examination of nonacademic factors during the middle-school years, not just academic factors. As suggested by Ziomek-Daigle (2010), interventions that focus on the broader context of youths' lives (e.g., their peer groups, neighborhood resources and dynamics, family poverty, and the problem behaviors that occur in those contexts) might

be necessary to help prevent high-school dropout. We suspect engaging in early problem behaviors (beyond simple experimentation) during middle school might signal the start down a life trajectory that is not conducive to completing high school, independent of school performance. Interrupting such trajectories is likely to require interventions that are not strictly aimed at improving academic skills. This broader intervention focus might translate as an expansion of current after-school and out-of-school programming, with a greater emphasis on integrating a holistic model of community engagement to enhance collective socialization capability and increase social capital. For example, the Harlem Children's Zone is a model of this expanded programming approach, which embeds not only the schools but also all social services and programming within the community to foster buy-in from deeply disenfranchised families and to encourage youth to complete high school and pursue successful college careers (Harlem Children's Zone, 2009).

Too few of the currently available programs and policies designed to reduce high-school dropout emphasize nonacademic risk factors. The leading school intervention at the federal level, No Child Left Behind, focuses on school performance measured through standardized tests with little, if any, consideration of risk behaviors that stem from personal, family, or neighborhood characteristics (Lagana-Riordan & Aguilar, 2009). Similarly, other interventions that address the problem of school dropout are targeted to high-school youth rather than a middle-school audience. Hence, students might be receiving these interventions too late to interrupt a path leading toward dropout that they started on in middle school. Indeed, one study by Burzichelli, Mackey, and Bausmith (2011), found that among 58 schools in nine school districts, most dropout interventions were focused on Grades 9 through 12. In short, an effective, complementary strategy to current efforts to reduce dropout rates would be to provide middle school-aged youth with comprehensive services. Certainly, we are not arguing that efforts centered on high-school youth and aimed at school performance should receive any less funding. Rather, we believe these efforts need to be augmented with earlier intervention and prevention efforts delivered during the middle-school years and supplemented with programs that recognize the pathways to high-school dropout involve factors beyond school performance. The current study supports the idea of interventions that address risk behavior at the start of the second decade of a youth's life could be of particular importance.

Currently, a wide range of prevention programs are aimed at specific adolescent problem behaviors (e.g., teen pregnancy, substance use), of which most

are implemented independent of school dropout programs. Some schools even adopt specific prevention programs recognizing that the interventions might affect participants' school performance and dropout rates as well as the target behaviors. Nevertheless, if the program content is carefully examined, it is clear that most (but not all) programs that self-identify as school dropout programs strongly emphasize increasing students' reading levels and math skills, which are not in the traditional province of prevention programs for drug use, teen pregnancy, and other problem behaviors. The fundamental concepts, goals, funding streams, and etiology of school dropout programs seem distinct from those of prevention programs designed to address problem behaviors such as teen pregnancy and substance use. Our research leads us to suggest that interventionists should seek a better integration between the different types of programs, and this integration should recognize the importance of a holistic approach to adolescent development.

### Limitations and Future Research Directions

Although the findings from this study are provocative, the results must be interpreted in the context of the study's methodological limitations. The study relied on adolescents' self-reports, which are subject to measurement error that can yield bias in the parameter estimates. This limitation is especially true in modeling that relies on statistical partialling, such as the present study. Because the data are associational in nature, causal inferences require caution. Although our choice of cutpoints for the problem behaviors reflected the observed functional relationships in the data, the risk of overfitting data based on preliminary analyses is always present. The study examined only one set of covariates (related to school performance and a host of demographic variables), and the results might differ with the addition of other covariates. A persistent concern in this type of research is specification error due to omitted variable bias. Our research did not delve into complex peer relationships, neighborhood factors, or family dynamics. We could not comprehensively address the nature of poverty and low-incomes nor could we examine exactly how the receipt of welfare and overall community characteristics affected middle-school students who later dropped out of high school. The database used in our analyses was collected just prior to the introduction of the No Child Left Behind legislation. Although it is highly doubtful that this legislation altered the causal dynamics between adolescent behaviors such as alcohol and drug use, sexual involvement, and delinquency with dropping out of school, care must be taken in

generalizing results across time. Readers are urged to remain mindful of all these limitations.

We believe that future research should closely examine the ways in which providing comprehensive services during middle school might be effective in reducing school dropout. This research should examine multiple factors and services across youths' ecological domains, including schools, neighborhoods, and home. Researchers should also examine the effects of poverty in both quantitative and qualitative ways. In the case of low-income individuals, research should look for additional developmental pathways that are blocked by factors that were not examined in this study, such as the availability of social capital resources and the impact of generational and lifelong structural oppression (Drewry, Burge, & Driscoll, 2010; Haradaway & McLoyd, 2009; Hawkins, 2009).

### Conclusions

Research has consistently found that not graduating from high school has a negative impact on the life chances of thousands of young people every year. Still, most previous studies have focused on academic life as the core predictor of dropping out of high school. The present study uses a longitudinal design with a nationally representative sample to examine nonacademic factors in a middle school population that predict the future failure to complete high school independent of school performance during middle school. Our finding that nonacademic problem behaviors in middle school predict high school dropout is important to understanding at what developmental stage and for what target audience or specific niche interventions should be implemented for students identified as being at-risk of dropping out. We found that both regular cigarette smoking and early initiation of sexual activity in middle school predicted later high-school dropout that was independent of school performance variables. Likewise, we found that engaging in delinquent behaviors during middle school combined with the context of poverty (using maternal receipt of welfare as a proxy for poverty) were strong predictors of high-school dropout. These findings suggest the importance of social capital and the influence of peers, neighborhood factors, and collective socialization on dropping out of high school. It is the role of researchers, policy makers, and practitioners to continue calling for early intervention and preventative measures that will interrupt negative pathways leading to school dropout, and to support the provision of these interventions to adolescents at younger ages, well before youth enter high school.



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