Multilevel Examination of the Relationships Between Risk/Protective Factors and Academic Test Scores

Report prepared by:

Michael W. Arthur, Ph.D.
Eric C. Brown, Ph.D.
John S. Briney, M.S.

Social Development Research Group
School of Social Work
University of Washington

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Executive Summary

Many programs that have been tested and shown to be effective at preventing youth substance use and related problems are designed to be implemented in school settings. However, following passage of the No Child Left Behind Act of 2001, schools are required to document progress from year to year in increasing the proportions of students who demonstrate satisfactory levels of academic achievement or else face increasing sanctions from the federal government (U.S. Department of Education, 2003). As a result, school administrators face tough decisions about how best to use school resources, and may be hesitant to spend class time on prevention programs that are not seen as having a direct impact on academic achievement. Moreover, there is limited information about factors outside the classroom and school that affect students' academic achievement as measured by test scores. This report presents findings from a study that explored the relevance of effective prevention programming to efforts to promote students' academic success. It describes relationships between school building levels of student substance use and risk and protective factors that predict adolescent problem behaviors, and the academic achievement test scores of individual students within those schools. To the extent that the levels of student substance use and risk and protective factors in a school are related to students' academic test scores, the value of prevention programming to schools may become more apparent and new targets for efforts to increase academic success can be identified.

Multilevel statistical analyses were conducted to examine relationships between the prevalence of substance use and risk and protective factors predictive of adolescent problem behaviors in middle and high schools in Washington State, assessed via the Healthy Youth Survey, and the likelihood of students within those schools meeting the state standards for achievement in mathematics, reading, and writing on the Washington Assessment of Student Learning (WASL). Since it was not possible to link individual students' data from the anonymous Healthy Youth Survey to their scores on the WASL, two approaches to the analysis were taken. First, analyses were conducted examining the within-cohort relationships between past-month prevalence of alcohol, marijuana, and cigarette use, and the average numbers and levels of risk and protective factors reported by 10th grade students on the Healthy Youth Survey conducted in the Fall of 2002 and aggregated at the school-building level, and the likelihood of 10th grade students in those buildings meeting the mathematics, reading, and writing standards on the WASL conducted in the Spring of 2003. Similar analyses were conducted examining the cross-cohort relationships between these same substance use and risk and protective factors variables reported by 8th grade students on the Fall, 2002 Healthy Youth Survey, and the WASL outcomes for 7th grade students in the same schools in the Spring of 2003. Results revealed the following:

- Both 7th and 10th grade students in schools where students reported *greater* prevalence of alcohol, tobacco, and marijuana use were *less* likely to meet the standards on the mathematics, reading, and writing sections of the WASL.

- Both 7th and 10th grade students in schools where students reported experiencing *more* risk factors were *less* likely to meet standards on each of the three sections of the WASL.
- Both 7th and 10th grade students in schools where students reported experiencing *more* protective factors were *more* likely to meet standards on each of the three sections of the WASL.

Specific Results for 10th Grade Students

Next, analyses examined each of the 16 risk factors and 7 protective factors measured by the Healthy Youth Survey individually to determine which specific factors predicted WASL outcomes. A higher prevalence of each of the following 12 risk factors among 10th grade students in a school predicted reduced likelihood of 10th grade students in that school meeting the standard on all three sections of the WASL:

- Laws and norms favorable to drug use
- Perceived availability of alcohol, tobacco, and drugs
- Low neighborhood attachment
- Antisocial behavior among familiar adults
- Academic failure
- Early initiation of drug use
- Early initiation of antisocial behavior
- Favorable attitudes toward antisocial behavior
- Favorable attitudes toward drugs
- Intentions to use drugs
- Low perceived risks of drug use
- Friends who use drugs

Additionally, the risk factor Low Commitment to School predicted reduced likelihood of meeting the standard for the mathematics section of the WASL, and the risk factor Poor Family Management predicted reduced likelihood of meeting the standards for both the writing and mathematics sections of the WASL. Only the risk factors Perceived Availability of Handguns and Peer Rewards for Antisocial Involvement failed to predict the likelihood of meeting the standard for any of the three sections of the WASL.

Among the seven protective factors measured by the Healthy Youth Survey, a higher prevalence of the following five protective factors among 10th graders in a school predicted increased likelihood of 10th graders in that school meeting the standard on all three sections of the WASL:

- Community recognition for prosocial involvement

- Family opportunities for prosocial involvement
- Family recognition for prosocial involvement
- School opportunities for prosocial involvement
- Social skills

The protective factors School Recognition for Prosocial Involvement and Belief in the Moral Order did not predict the likelihood of meeting the standard for any of the three sections of the WASL.

Specific Results for 7th Grade Students

For 7th grade students, a higher prevalence of each of the following 13 risk factors reported by 8th grade students attending the same school predicted reduced likelihood of meeting the standards on all three sections of the WASL:

- Laws and norms favorable to drug use
- Perceived availability of alcohol, tobacco, and drugs
- Perceived availability of handguns
- Low neighborhood attachment
- Antisocial behavior among familiar adults
- Academic failure
- Early initiation of drug use
- Early initiation of antisocial behavior
- Favorable attitudes toward antisocial behavior
- Favorable attitudes toward drugs
- Low perceived risks of drug use
- Friends who use drugs
- Peer rewards for antisocial behavior

In addition, the risk factor Poor Family Management predicted reduced likelihood of meeting the standard for the writing section of the WASL, and the risk factor Intentions to Use Drugs predicted reduced likelihood of meeting the standards for both the mathematics and writing sections of the WASL. Only the risk factor Low Commitment to School did not predict the likelihood of meeting the standard for any of the three sections of the WASL.

Among the seven protective factors measured by the Healthy Youth Survey, a higher prevalence of each of the following four protective factors among 8th graders in a school building predicted increased likelihood of 7th graders attending the same school meeting the standards on all three sections of the WASL:

- Community recognition for prosocial involvement
- Family recognition for prosocial involvement
- Social skills
- Belief in the Moral Order

In addition, higher prevalence of the protective factor School Opportunities for Prosocial Involvement predicted a greater likelihood of 7th graders' meeting the standard for the mathematics section of the WASL. The protective factors Family Opportunities for Prosocial Involvement and School Recognition for Prosocial Involvement did not predict the likelihood of meeting the standard for any of the three sections of the WASL.

Results Controlling for Demographic and Economic Characteristics of Students and Schools

These analyses were then repeated, statistically controlling at the individual level for students' gender, race (White versus Nonwhite), ethnicity (Hispanic versus Nonhispanic), and special education status. Covariates also were added at the school-building level for the percent of students in each building enrolled in the free and reduced lunch program, and at the school-district level for total student enrollment and per pupil expenditures. These analyses examined whether or not levels of substance use, risk, and protection in a school were related to students' achievement outcomes above and beyond the influence of demographic and economic variables often associated with academic achievement.

As expected, after adding these covariates to the models, the relationships between the prevalence of substance use, risk, and protective factors in a school and students' WASL scores in that school were, in most cases, slightly attenuated. However, almost all of the relationships remained statistically significant even after controlling for these other factors, indicating that relationships between school levels of substance use, risk and protection and academic achievement cannot be explained as being due to differences between schools in the demographic and economic characteristics of their students. Among 10th grade students, the only additional risk factor that failed to predict the likelihood of meeting the standard for any of the three sections of the WASL after controlling for the demographic and economic characteristics of students and schools was Favorable Attitudes Toward Antisocial Behavior. In contrast, the risk factor Low Commitment to School became a significant predictor of reduced likelihood of meeting the standard for the writing portion of the WASL after controlling for these variables, despite a nonsignificant bivariate relationship in the unadjusted model. Among the protective factors, only the protective factor School Opportunities for Prosocial Involvement failed to predict the likelihood of meeting the standard for any of the three sections of the WASL after adjusting for the demographic and economic variables.

For the 7th grade students, the only additional risk factors reported by 8th grade students in the same school that failed to predict WASL outcomes after controlling for demographic and economic characteristics were Low Neighborhood Attachment and Academic Failure. The only additional protective factors that failed to predict an increased likelihood of meeting the standard for any of the three sections of the WASL after controlling for the demographic and economic

variables were Community Recognition for Prosocial Behavior and Family Recognition for Prosocial Behavior. In contrast, after adding in the covariates, a higher prevalence of the protective factor School Recognition for Prosocial Behavior reported by 8th grade students in a school predicted a greater likelihood that 7th grade students in that school would meet the standard for the writing section of the WASL, even though this relationship was not significant in the unadjusted model.

Summary and Implications for Policy and Practice

These findings indicate that the levels of substance use and risk and protective factors reported by students in a school building predict the academic achievement of students in that school. Specifically:

- Higher prevalence of alcohol, marijuana, and cigarette use in middle and high schools in Washington State predicts lower likelihood of 7th and 10th grade students in those schools meeting the standards for the mathematics, reading, and writing sections of the WASL.
- Higher prevalence of overall risk as well as specific risk factors in a school predicts lower likelihood of students in that school meeting the standards for all three sections of the WASL.
- Higher prevalence of overall protection as well as specific protective factors in a school predicts greater likelihood of students in that school meeting the standards for all three sections of the WASL.

These analyses do not establish causal relationships between levels of substance use, risk, and protection in a school building and students' performance on the WASL. However, the finding that the average levels of these factors in a school's student population are related to student achievement outcomes, even across grade cohorts and after controlling for demographic and economic variables, suggests that:

- Reducing the prevalence of risk factors and drug use and increasing protection in school populations should increase students' academic outcomes within those schools.
- Implementing tested, effective curricula in schools that reduce risk factors and enhance protection among their students is relevant to the schools' academic mission.
- Schools should monitor levels of risk and protective factors experienced by their students, and work with community partners to reduce risk and enhance protection across all domains of students' lives.

Schools play a very important role in our society for promoting the healthy academic and social development of our children. In an effort to increase the effectiveness of public schools in the United States, the No Child Left Behind Act requires the use of effective, research-based educational practices and the monitoring of the academic and social development of students, and holds schools accountable for students' progress in meeting developmental goals. The findings reported here suggest that efforts to promote the social and behavioral health of students through prevention curricula and programs that have been shown to reduce risk factors and

increase protective factors are likely to improve their academic achievement as well. Educators, policy makers, parents, service providers, and community leaders should use this information to address the social and emotional development of students. Schools should monitor the risk and protective factors experienced by their students and collaborate with community stakeholders to implement tested, effective prevention programs that reduce the risk factors and increase the protective factors their students experience.

Multilevel Examination of the Relationships between Risk/Protective Factors and Academic Test Scores

Introduction

Background

In recent decades there has been substantial progress in the development and testing of interventions that effectively prevent youth violence, substance use, delinquency, and other problems (Greenberg, Domitrovitch, & Bumbarger, 1999; Mrazek & Haggerty, 1994; Weissberg & Greenberg, 1998). Through longitudinal studies of youth development, researchers have identified risk and protective factors that predict either increased (risk) or decreased (protective) likelihood of problems (Coie et al., 1993; Hawkins, Catalano, & Miller, 1992; Mrazek & Haggerty, 1994). High quality experimental and quasi-experimental evaluations of prevention interventions have demonstrated the efficacy of a growing number of programs at impacting important risk and protective factors or directly reducing youth problems (Durlak & Wells, 1997; Elliott, 1998; Tobler et al., 2000). This growth in the research base for effective prevention has been accompanied by increasing recognition of the importance of prevention in efforts to improve child and youth mental health and behavioral outcomes (U.S. Department of Health and Human Services, 1999, 2001).

Schools are a logical setting for preventive interventions and the main venue for prevention education targeted at adolescents (Ellickson, 1995; Hallfors & Godette, 2002; Ringwalt et al., 2002). School is the only public institution that provides almost universal access to children, including those most likely to develop problems. Schools share with families a societal expectation to promote healthy development through childhood and adolescence. Schools are also an appropriate locus for preventive interventions because many of the factors that predict problem behavior outcomes may similarly predict academic success or failure (Battin-Pearson et al., 2000; Wang, Haertel, & Walberg, 1997). Classroom management, parental support, student-teacher interactions, student attitudes towards school, peer group associations and influences, school culture and classroom climate, and individual temperaments, attitudes and skills have all been identified as important influences on learning and behavior (Wang et al., 1997), and can all be impacted by school-based preventive interventions (Gottfredson, 2001; Greenberg et al., 2003; Hawkins, Catalano, Kosterman, Abbott, & Hill, 1999; Hawkins, Guo, Hill, Battin-Pearson, & Abbott, 2001).

However, with the passage of the No Child Left Behind Act of 2001, school administrators are facing increased pressure to document progress in raising academic achievement for all students, measured primarily through achievement test scores (Greenberg et al., 2003; U.S. Department of Education, 2003). This pressure is forcing school administrators to prioritize where and how to devote resources in order to meet these demands. Despite the demonstrated success of numerous school-based preventive interventions at reducing risk factors, enhancing protective factors, and reducing problem behaviors such as violence, delinquency, and substance use, the effectiveness of these interventions at increasing academic

performance and achievement test scores has not typically been evaluated. Within this context, school administrators can be reluctant to invest time and resources in curricula and programs that focus on broader issues of social and emotional development that are not viewed as directly linked with developing academic skills (Kafterian, Robertson, Compton, Davis, & Volkow, 2004; Zins, Bloodworth, Weissberg, & Walberg, 2004). Research on how school-based prevention programs relate to students' academic success and achievement test scores is needed to demonstrate the relevance of these programs for efforts to improve students' academic achievement.

Demographic Factors Associated with Academic Achievement

Gender. While there have been many reports of a gender gap in achievement, with boys generally performing at lower levels than girls (Epstein, Elwood, Hey, & Maw, 1998; Francis, 2000; Gorard, Rees, & Salisbury, 2001; Van Houtte, 2004), the relationship between gender and achievement is complex. Several researchers have found that girls perform better on achievement tests of mathematics, reading, and writing prior to high school, with boys overtaking girls in mathematics and science at higher grade levels (Han & Hoover, 1994; Mau & Lynn, 2000). However, some studies suggest the gender gap is apparent only among students who score higher on the exams (Gorard et al., 2001). In a study focusing specifically on low achieving students, Gorard et al. (2001) found no gender gap for students who scored lower in any subject, except for a few significant differences in mathematics and science. Similarly, after controlling for other factors such as involvement in delinquent behavior, antisocial peers, and socio-economic status (SES), Battin-Pearson and her colleagues found that gender did not predict school dropout. Moreover, where differences between boys and girls in achievement test scores have been found, they have been relatively small (Gorard et al., 2001; Han & Hoover, 1994).

Race and Ethnicity. As with gender, relationships between race and ethnicity and academic achievement are complex and not well understood. While empirical studies have shown, generally, that White and Asian students outperform African American, Hispanic, and Native American students on achievement tests (e.g., Farkas, 2003; Patterson, Kupersmidt, & Vaden, 1990; Steinberg, Dornbusch, & Brown, 1992), differential exposure to poverty and other risk and protective influences appear to account for much of the disproportionality in achievement (Becker & Luthar, 2002; Gutman, Sameroff, & Eccles, 2002; Washington Kids Count, 2001). Thus, while it is important to consider race and ethnicity in studies of achievement, it appears that poverty and other risk and protective factors play an important role in the link between race/ethnicity and achievement.

Poverty. Research studies consistently show that students who live in poverty score lower on standardized tests than students with a higher socioeconomic status (SES) (Eamon, 2002; Guo, 1998; Korenman, Miller, & Sjaastad, 1995; Orthner, Cook, Rose, & Randolph, 2002; Smith, Brooks-Gunn, & Klebanov, 1997). Conger and his colleagues (1997) found that 10th grade students from families with lower family income had lower grade point averages (GPAs), and being poor at any time during the four years preceding 10th grade predicted lower GPAs. Low SES students are also more likely to drop out of school (Battin-Pearson et al., 2000). However, the mechanisms through which poverty influences achievement are complex and not

fully understood. Some studies have found that social factors such as type of school, absences from school, gender, ethnicity, geographic location, housing type, and home environment are more significant than economic factors in explaining the relationship between SES and academic achievement (Considine & Zappala, 2002; Eamon, 2002). Poverty is also a risk factor for substance use and other problem behaviors (Hawkins et al., 1992), which may have a negative impact on students' academic achievement.

Poverty is also a strong predictor of test scores at the school-building and school-district levels. Nationally, for example, the Department of Education (1998) reported that average mathematics achievement levels of 9-year-olds in high poverty schools are more than 2 grade levels below that of 9-year-olds in low poverty schools. For reading achievement levels, the gap for 9-year-olds between high and low poverty schools is nearly 4 grade levels. In Washington State, The Washington Center for School Research reported that the percentage of students enrolled in the free and reduced price lunch program accounted for between 12% and 29% of the variation in achievement test scores between schools (Abbot & Joireman, 2001). These differences may reflect differences between students in different schools in school readiness and cognitive ability, as well as differences between schools in academic resources and the quality of the learning environments. For example, Washington Kids Count (2001) reported that school district expenditures predicted differences between districts in students' academic performance.

Substance Use. Use of alcohol, cigarettes, marijuana, and other substances is prevalent among American middle and high school students, with nearly one in five 8th graders and more than one third of 10th graders reporting use of alcohol during the past month in the 2004 national Monitoring the Future study (Johnston, O'Malley, Bachman, & Schulenberg, 2005). A number of studies have indicated that students who use substances are more likely to fail academically (e.g., Ellickson, Tucker, & Klein, 2001; Hawkins et al., 1992; Jeynes, 2002) and to drop out of school (Garnier, Stein, & Jacobs, 1997; Janosz & Le Blanc, 1996; Krohn, Thornberry, Collins-Hall, & Lizotte, 1995). In particular, students who initiate use of alcohol and cigarettes prior to seventh grade are at higher risk of school failure, poor academic achievement, and school dropout (Ellickson et al., 2001; Fleming et al., 2005). Moreover, in a study of students in Washington State, Mandel and her colleagues (2002) found that groups of students who reported even moderate involvement with substance use had poorer achievement test scores on the Washington Assessment of Student Learning (WASL) and Iowa Test of Basic Skills (ITBS).

Other Risk and Protective Factors. Some studies have linked other social and psychological characteristics to academic performance and school dropout, but the evidence linking these factors to achievement test scores is sparse. Factors such as bonding or connectedness to school, social and emotional skills, parental and peer support for academics, and commitment to education have been linked to better academic outcomes, but not necessarily test scores (Halle, Kurtz-Costes, & Mahoney, 1997; Hawkins et al., 2001; Hymel, Comfort, Schonert-Reichl, & McDougall, 1996; Keith & Keith, 1993; Malecki & Elliott, 2002; Ryan, 2001; Wentzel, 1991). In a longitudinal study of suburban students from one district in Washington State, Fleming and his colleagues found that higher levels of school bonding and better social, emotional and decision-making skills, assessed when students were in the 7th grade, predicted higher test scores on the WASL when the students were in the 10th grade. Conversely, alcohol and cigarette use, aggressive behavior, attention problems, and negative behavior of

peers measured in 7th grade predicted lower scores on the 10th grade WASL. These findings were maintained after controlling for students' gender, race and ethnicity, SES, and 4th grade test scores (Fleming et al., 2005).

Thus, some evidence suggests that students' exposure to risk and protective factors, as well as their early involvement in substance use and aggressive behaviors, may influence their subsequent performance on standardized achievement tests. Moreover, several studies have shown that students exposed to multiple risk factors have much lower grades and lower achievement test scores than students experiencing few risk factors and multiple protective factors (Pollard, Hawkins, & Arthur, 1999; Sameroff, Seifer, Barocas, Zax, & Greenspan, 1987). This evidence suggests that prevention programs and curricula that lower students' risk and increase protection may be likely to impact students' academic achievement test scores. However, it is not clear if programs that lower levels of risk and increase levels of protection in the general population will impact students' test scores, or if it is necessary to target individual students. Further, relationships between risk and protective factors and achievement test scores might be spurious; due to the influence of demographic and economic factors on both risk/protection and achievement. Conversely, it is also possible that the long-established relationships between students' demographic and economic characteristics and academic achievement are mediated by differential exposure to risk and protective factors.

Prevention Planning Using Epidemiological Assessments of Risk, Protection, and Substance Use

The emphasis on proven research-based practices and programs mandated in the No Child Left Behind (NCLB) legislation is not limited to educational initiatives. Title IV, Part A of the NCLB Act, known as the Safe and Drug-Free Schools and Communities Act, requires schools receiving funding under the program to use research based programs to reduce violence and the use of illegal drug use and promote a safe and drug-free learning environment (Safe and Drug-Free Schools Program, 2001). First introduced in 1998 by the Department of Education, the Principles of Effectiveness require funding for prevention programs that are based on data-driven decisions, a requirement not so well known or implemented by many schools or districts (Simons-Rudolph et al., 2003). These Principles of Effectiveness were readopted in the NCLB legislation and apply to Safe and Drug-Free Schools and Communities activities and formula grants awarded under this program. The Principles of Effectiveness stipulate that local prevention programs and activities must (1) be based on a needs assessment of objective data regarding the incidence of drug use and violence, (2) target specific performance objectives, (3) be based on scientific research that demonstrates the programs have been shown to reduce violence or drug use, (4) be based on the analysis of predictor variables such as risk and protective factors, (5) include meaningful and on-going parental input in program selection and (6) have periodic evaluations of established performance measures (No Child Left Behind, 2002).

To obtain some of the data required by the Principles of Effectiveness in Washington State, the Office of Superintendent of Public Instruction has partnered with the Departments of Health, Social and Health Services, and Community, Trade, and Economic Development to conduct the Healthy Youth Survey in all interested schools with 6th, 8th, 10th, and 12th grade classes every other year. The survey provides an assessment based on objective data about drug

and violence problems in the school and community to be served, and it provides an analysis of the prevalence of risk factors and protective factors that exist in the school, community, family and individual domains. These data can be used by schools to select tested, effective prevention programs and establish performance objectives and measures for these programs (Arthur & Blitz, 2000; Hawkins, 1999). In addition to providing data on the prevalence of substance use and violence within schools, the survey includes measures of 16 risk factors and 7 protective factors and provides profiles of the prevalence of these factors in a school's student population (See Figures 1 & 2). Schools can use these profiles to identify specific elevated risk factors and depressed protective factors to address with prevention programs and curricula; to establish performance objectives related to measurable reductions in targeted risk factors and increases in targeted protective factors; to mobilize and involve parents, students and other community members in planning prevention activities linked to these objectives in the school and community; and to monitor progress over the years in reducing targeted risk factors, substance use, and violence and in enhancing protective factors in student populations.

Rationale and Purpose of this Report

While the relevance of these risk and protective factors for efforts to reduce substance abuse and violence has been well-established (e.g., Arthur, Hawkins, Pollard, Catalano, & Baglioni, 2002; Durlak, 1998; Farrington, 1998; Hawkins et al., 1992; Pollard et al., 1999), relationships between the prevalence of these factors in school populations and the academic success of students in those schools have not been examined. Thus, the relevance of school-based prevention activities and the data provided by the Healthy Youth Survey (HYS) for efforts to improve students' achievement test scores is not known. The purpose of this report is to describe relationships between the prevalence rates of substance use, risk and protection in schools and the likelihood of students' meeting State standards for achievement on the mathematics, reading, and writing tests of the Washington Assessment of Student Learning (WASL). We do this by reporting findings from two sets of analyses:

- Within grade-cohort analyses of 10th grade students to assess the effects of school-level substance use, risk and protection, measured by the HYS, on the same students' likelihood of meeting the academic standards established for the WASL.

- Between grade-cohort analyses of 7th- and 8th grade students to assess contextual effects of school-level substance use, risk, and protection reported by 8th grade students on the HYS on the likelihood of 7th grade students attending the same schools meeting the academic standards established for the WASL.

In each of these two sets of analyses we examined: 1) unconditional models (i.e., bivariate relationships between measures of academic achievement and measures of the prevalence of substance use, risk factors, and protective factors not statistically controlling for covariates); and 2) conditional models (i.e., multivariable relationships between measures of academic achievement and measures of the prevalence of substance use, risk factors, and protective factors controlling for the effects of demographic and economic variables that might influence these relationships).

Given the correlational design of this study, we did not determine whether the levels of substance use and risk and protection in a school building exert a causal influence on students' achievement test scores. However, results of these analyses do provide evidence regarding the association between levels of substance use, risk, and protection in student populations and the academic achievement of students in schools. To the extent that such associations are established, initial evidence regarding the relevance of efforts to reduce the prevalence of substance use and risk factors and to increase the prevalence of protective factors among students will be demonstrated.

Methods

Data Sources and Measures

Data used in these analyses were supplied by several sources outside of the University of Washington and were merged together by project staff to create the final working data sets. Measures of academic achievement and demographic characteristics of students came from the Spring 2003 administration of the Washington Assessment of Student Learning (WASL), supplied by the Washington State Office of Superintendent of Public Instruction (OSPI). Although data were provided at the individual level, no student-specific identifiers were included. Individual-level data included students' grade level, school building number, and school district number. The outcome variables used in the analyses consisted of three dichotomous measures of mathematics, writing, and reading achievement indicating whether or not a student met the grade-specific performance standards in accordance with the State of Washington Essential Academic Learning Requirements (EALRs). Student characteristics included in the analysis as covariates were their gender, race (coded White versus Nonwhite), ethnicity (coded Hispanic versus Nonhispanic), and whether or not they were attending special education classes. Although it would have been informative to include more specific racial breakdowns in the analysis given prior studies showing differences in achievement among African American, Asian American, and Native American students, not enough schools in Washington State had sufficient proportions of students from these groups to include their use as covariates in the analysis.

Aggregated school-building rates of substance use, risk and protection were obtained from the Fall, 2002, administration of the Washington Healthy Youth Survey (HYS), which is a collaborative effort of the Washington State Office of the Superintendent of Public Instruction, the Department of Health, the Department of Social and Health Service's Division of Alcohol and Substance Abuse, and Community Trade and Economic Development (http://www3.doh.wa.gov/HYS). Substance use measures included the proportions of students in each school who reported using cigarettes, alcohol, and marijuana during the past month. Risk and protective factor measures in the HYS were derived from the Communities That Care (CTC) Youth Survey (Arthur et al., 2002), and represented the proportion of students in each school who were above the CTC Youth Survey cut point for each of 16 risk factors and 7 protective factors (see Appendix A for definitions of these factors). The cut-points were derived by identifying scores on each factor that optimally discriminated between youths engaged in

problem behaviors and those who reported only positive behaviors (Arthur, Briney, Hawkins, Abbott, & Brooke-Weiss, under review). To facilitate interpretation of the findings, school prevalence rates of substance use, risk and protective factors were scaled in increments of 5 percentage points, a modest goal for prevention efforts to reduce substance use and risk factors while increasing protective factors. Thus, findings are reported in terms of the projected gains in the percent of students meeting the WASL standards for each 5 percent change in the school-level prevalence of use of each substance, and of each individual risk or protective factor. Measures of overall risk exposure and overall protection were also included, using the average numbers of risk and protective factors above the cut point reported by students within a school.

Additional data related to the characteristics of schools and school districts were obtained from the OSPI website (http://reportcard.ospi.k12.wa.us/DataDownload.aspx). Although a variety of school and school-district data were available, we limited the list of potential covariates to those found to be related to academic achievement. From this list of potential covariates, preliminary analyses indicated that the percentage of students in a school that received free or reduced-price lunch dominated all other school-level characteristic in terms of predicting the academic achievement outcomes and, therefore, was the sole school-building covariate included in the analyses. District-level data were available from the 2002-2003 General Fund Expenditures, Revenue, and Ending Total Fund Balance Report (http://www.k12.wa.us/safs/PUB/FIN/0203/GFExpReve.pdf). District-level covariates included in the analyses were (a) total student enrollment and (b) per pupil expenditures. Per pupil expenditures were calculated as the total expenditures in a district divided by the number of full-time equivalent enrollment in that district[1].

Analysis Samples

Samples Used in the Analysis of 10th Grade Outcomes

Data on academic achievement and student characteristics for the 10th grade cohort of the spring 2003 administration of the WASL consisted of a total of 78,778 students from 510 schools. Of these, 2,025 students (2.6%) were excluded from the study because of missing race/ethnicity, gender, or special education status. Missing data for mathematics, reading, and writing outcomes excluded an additional 2,448 (3.2%), 2,703 (3.5%), and 2,660 (3.5%) students, respectively. Thus, after excluding all missing student-level data, samples of $N = 74{,}050$, $N = 74{,}093$, and $N = 74{,}305$ 10th grade students were eligible for analysis of the three respective achievement outcomes.

The fall 2002 administration of the Healthy Youth Survey (HYS) included 10th grade students from 285 different schools. Schools with missing data on all substance use measures, risk factors, and protective factors, and schools with less than 5 students per school were excluded from the sample. These criteria resulted in a final school-level sample of 242 schools across 174 districts with HYS data. Data on the characteristics of schools (e.g., percentage of students receiving free or reduced price lunch) existed for a subset of 226 of the 242 schools.

[1] Total district expenditures include basic education, special education, vocational education, skills center, compensatory education, other instructional, community services, support services, food services and pupil transportation.

Linking student-level WASL data with school-level HYS data and district-level data resulted in analysis samples of $N = 46{,}887$, $N = 46{,}713$, and $N = 46{,}743$ 10th grade students for mathematics, reading, and writing outcomes, respectively. All three of these samples were nested within 237 schools and 171 school districts (five schools did not have corresponding school and district identification numbers across all three sources of data). These formed the analysis samples for the unconditional models (i.e., models not statistically controlling for covariates). Inclusion of school characteristics reduced the analysis samples to $N = 41{,}556$, $N = 41{,}393$, and $N = 41{,}424$, 10th grade students nested within 201 schools and 156 districts, respectively. These comprised the analysis samples for the conditional models (i.e., models with covariates)[2].

Analysis of the Comparability of the 10th Grade Samples to Schools Statewide

To assess the external validity of findings from analyses of the resulting 10th grade samples, we compared the student and school characteristics of the analysis samples for the unconditional models to the statewide data on students and schools reported on the Office of Superintendent of Public Instruction (OSPI) website (See Tables 1 and 2). Results indicated that students in the analysis samples were essentially identical to the statewide student population in terms of the proportions of students passing each section of the WASL, males and females, Whites and Nonwhites, Hispanics and Nonhispanics, and of students receiving special education (See Table 1). Additionally, schools in the analysis samples had similar proportions of students meeting the academic standards on all three sections of the WASL and of students receiving free and reduced lunch as the statewide proportions (See Table 2). The school districts included in the analysis samples had slightly higher levels of per-pupil expenditures and enrollments than school districts statewide, suggesting that very small school districts were somewhat under-represented in the analysis samples. Overall, however, the schools included in the analysis appear to mirror the characteristics of Washington State schools quite closely.

Samples used in the Analysis of 7th Grade Outcomes

The 7th grade cohort of the spring 2003 administration of the WASL consisted of a total of 82,171 students from 590 schools. Of these, 739 students (0.9%) were excluded from the study because of missing race/ethnicity, gender, or special education status (i.e., student-level covariates). Missing data for mathematics, reading, and writing outcomes excluded an additional 1,476 (1.8%), 1,495 (1.8%), and 1,512 (1.9%) students, respectively. Thus, after excluding all missing student-level WASL data, samples of $N = 79{,}937$, $N = 79{,}920$, and $N = 79{,}956$ 7th grade students were eligible for analysis.

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[2] Visual inspection of frequency distributions for 10th grade school-level prevalence rates indicated that two risk factors (Poor Family Management and Low School Commitment) and three protective factors (Family Opportunities for Prosocial Involvement, Family Recognition for Prosocial Involvement, and School Recognition for Prosocial Involvement) were characterized by skewed distributions with a disproportionate number schools indicating 0% or 100% prevalence. As such skewed distributions can lead to erroneous conclusions in statistical analyses, these schools were dropped from the analysis. Thus, analysis samples for these five risk/protective factors represented a sub-sample of the larger analysis sample for both the unconditional models (ranging between 36,220 to 46,194 students in 182 to 218 schools and 141 to 163 school districts) and the conditional models (ranging between 34,858 to 35,887 students in 171 to 173 schools and 136 school districts).

The fall 2002 administration of the Healthy Youth Survey (HYS) included 8th grade students from 352 schools. From this pool of schools, 55 schools were excluded for missing substance use, risk factor, and protective factor data, or for having less than 5 students per school. These exclusion criteria resulted in a sample of 297 schools within 188 districts. Data on school characteristics existed for a subset of 280 of the 297 schools. In contrast to analysis of the 10th grade outcomes, analysis of 7th grade outcomes was limited to schools that had both grades 7 and 8 in the same school building. Of the 280 schools with both HYS and school characteristic data, 269 schools had 7th and 8th grades in the same school building.

Linking student-level WASL data with school-level HYS data and district-level data resulted in available analysis samples of $N = 50{,}112$, $N = 50{,}116$, and $N = 50{,}108$ 7th grade students for mathematics, reading, and writing outcomes, respectively, nested within 266 schools and 170 districts (three schools did not have corresponding school and district identification numbers across all three sources of data). These comprised the analysis samples for unconditional models. Inclusion of school characteristics to the student-level WASL data, school-level HYS risk/protective factor data, and district-level financial data reduced the analysis samples to $N = 40{,}632$, $N = 40{,}638$, and $N = 40{,}637$ 7th grade students in 222 schools and 150 districts, for the three respective outcomes. These comprised the analysis samples for the conditional models[3].

Analysis of the Comparability of the 7th Grade Samples to Schools Statewide

To assess the external validity of findings from analyses of the resulting 7th grade samples, we conducted similar comparisons of the student and school characteristics of the analysis samples for the unconditional models and the statewide data on 7th grade students and schools reported on the Office of Superintendent of Public Instruction (OSPI) website (See Tables 1 and 2). Results indicated that students in the analysis samples were essentially identical to the statewide student population in terms of the proportions of students passing each section of the WASL, males and females, Whites and Nonwhites, Hispanics and Nonhispanics, and of students receiving special education (See Table 1). Additionally, schools in the analysis samples had similar proportions of students meeting the academic standards on all three sections of the WASL and of students receiving free and reduced lunch as the statewide proportions (See Table 2). As with the 10th grade samples, the school districts included in the 7th grade analysis samples had slightly higher levels of per-pupil expenditures and enrollments than school districts statewide, suggesting that very small school districts were somewhat under-represented in the analysis samples. Overall, however, once again the schools included in the analysis appear to mirror the characteristics of Washington State schools quite closely.

[3] Visual inspection of frequency distributions for 8th grade school-level prevalence rates of risk and protective factors indicated that three risk factors (Poor Family Management, Academic Failure, and Low School Commitment) and three protective factors (Family Opportunities for Prosocial Involvement, Family Recognition for Prosocial Involvement, and School Recognition for Prosocial Involvement) also were characterized by skewed distributions with a disproportionate number schools indicating 0% or 100% prevalence. Again, these schools were dropped from analysis of these six risk/protective factors, thus resulting in analysis samples for these six factors of between 32,328 to 33,246 students in 189 to 192 schools and 134 to 136 school districts for unconditional models, and between 32,205 to 33,123 students in 184 to 187 schools and 130 to132 school districts for conditional models.

Statistical Analyses

The Hierarchical Generalized Linear Model

As described earlier, examination of the relationships between academic achievement outcomes and substance use, risk factors, and protective factors could only be conducted by linking students' individual WASL outcomes to their schools' prevalence of risk and protection. This implies a hierarchical structure to the data, with students (at level 1) nested within schools (at level 2), and schools, in turn, nested within school districts (at level 3). Typically, students within a particular school will tend to be slightly more alike than students from different schools, and schools within a particular district will be more likely to share characteristics in common relative to schools across different districts. To address the hierarchical nature of these data and the dependencies that may occur, we used the hierarchical generalized linear model (Raudenbush & Bryk, 2002). This model explicitly decomposes the variability in the outcome variables across the three levels and allows for examination of predictor variables at each level.

Specifically, we used the logit link function in HGLM to model the binary outcomes of either meeting (or failing to meet) the academic standard for each respective section of the WASL for student *i*, attending school *j*, nested, in turn, within district *k*. Thus, the level-1 model represents the regression of students' log-odds (or logit) of meeting the academic standard, conditional on student characteristics, as shown in the equation:

$$\text{Log}[\varphi_{ijk}/(1 - \varphi_{ijk})] = \pi_{0jk} + \pi_{1jk}(\text{White vs. Nonwhite}) + \pi_{2jk}(\text{Hispanic vs. Nonhispanic}) + \pi_{3jk}(\text{Gender}) + \pi_{4jk}(\text{Special Education class vs. Regular class})$$

where φ_{ijk} represents the probability of meeting the academic standard conditional on model covariates, π_{0jk} represents the level-1 intercept (i.e., average log-odds of meeting the academic standard), and π_{1jk} through π_{4jk} represent regression coefficients for the level-1 covariates indicating the predicted difference in log-odds between each group (statistically controlling for other covariates in the model). This model assumes that the random effect of the level-1 intercept follows a standard logistic distribution with mean zero and variance equal to $\pi^3/3 = 3.29$ (see Snijders & Bosker, 1999, p. 224).

The level-2 model includes a random effect for the level-1 intercept (π_{0jk}), which permits schools' mean log-odds of students meeting the academic standard to vary across schools within their respective school district. Variables included in the conditional model assess the effects of school-level predictors (i.e., percent of students receiving free or reduced lunch and prevalence of substance use, risk factor, or protective factor) on a student's likelihood of meeting the academic standard. The equation for the level-2 conditional model is:

$$\pi_{0jk} = \beta_{00k} + \beta_{01k}(\%\text{Free or Reduced Lunch}) + \beta_{02k}(\text{Substance Use/Risk Factor/Protective Factor}) + r_{0jk}$$
$$\pi_{1jk} = \beta_{10k}$$
$$\pi_{2jk} = \beta_{20k}$$
$$\pi_{3jk} = \beta_{30k}$$
$$\pi_{4jk} = \beta_{40k}$$

where β_{00k} represents the mean log-odds of meeting the WASL standards across schools within district *k* and β_{01k} and β_{02k} represent regression coefficients for school-level predictor variables (the effects of which are assumed to be constant across districts), which, in this study, represent the change in the log-odds of meeting a WASL standard for a unit change in the predictor variable. These regression coefficients are *population-averaged* results and, consequently, relate to the effects of the predictor variables averaged over the entire distribution of schools and districts. As the school-level predictor variables were scaled in increments of 5% prevalence rates, regression coefficients relate the increase in the log-odds of meeting a WASL standard to a 5% reduction in the percentage of students receiving free or reduced-price lunch, a 5% reduction in the prevalence of a substance use variable or risk factor, and a 5% increase in the prevalence of a protective factor. Standard errors associated with the regression coefficients represent robust standard errors, which are less sensitive to violations of distributional assumptions among random effects. Robust standard errors tend to be somewhat larger than model-based (i.e., non-robust) standard errors, thus representing a more conservative test of predictor variables. The random effect r_{0jk} represents the deviation of school *j* from the mean log-odds of the outcome across all schools in district *k* and is assumed to follow a normal distribution characterized by zero mean and variance τ_π. The value for τ_π represents variance in the outcomes among schools within districts.

Similarly, the level-3 model addresses the nesting of schools within districts by allowing for variation in school-average outcomes within their respective districts. The effects of district-level covariates (i.e., total district expenditures per pupil and total district student enrollment) on the log-odds of meeting the academic standard are assessed in the level-3 conditional model, as shown below:

$$\beta_{00k} = \gamma_{000} + \gamma_{001}(\text{Per Pupil District Expenditures}) + \gamma_{002}(\text{Total District Enrollment}) + u_{00k}$$
$$\beta_{01k} = \gamma_{010}$$
$$\beta_{02k} = \gamma_{020}$$
$$\beta_{10k} = \gamma_{100}$$
$$\beta_{20k} = \gamma_{200}$$
$$\beta_{30k} = \gamma_{300}$$
$$\beta_{40k} = \gamma_{400}$$

Here, γ_{000} represents the grand mean in the log-odds of meeting the WASL standard among all districts, and γ_{001} and γ_{002} represent regression coefficients for district-level covariates. For interpretability of level-3 covariate effects, both level-3 variables were grand-mean centered (i.e., centered about their mean value across all districts). Additionally, Per-Pupil Expenditures was log-transformed to improve the normality of its distribution. The random effect u_{00k} denotes the deviation in log-odds of students' meeting the WASL standard for each district *k* from its grand mean and also is assumed to follow a normal distribution characterized by zero mean and variance τ_β. The value for τ_β represents variance in the outcomes among districts. All statistical models were conducted using version 6.0 of the *Hierarchical Linear and Nonlinear Modeling* software program (Raudenbush, Bryk, Cheong, & Congdon, 2004).

Odds Ratios

A more easily interpreted estimate of the effects of the predictor variables can be obtained by computing the odds ratios derived as the natural logarithm of model regression coefficients. Odds ratios represent the increase in the odds (or likelihood) of a typical student meeting the WASL standard given a unit change in the predictor variable. For individual-level covariates, odds ratios indicate the increased likelihood of meeting the WASL standards given the student characteristic in question (e.g., being female). For school-level predictor variables, odds ratios indicate the increased likelihood of meeting the WASL standard given a 5% reduction in the percentage of students receiving free or reduced-price lunch, a 5% reduction in the prevalence of a substance use variable or risk factor, or a 5% increase in the prevalence of a protective factor. For the average numbers of risk/protective factors reported by students in a school, odds ratios indicate the decrease in the odds of meeting the WASL standard given each additional risk factor or the increase in the odds of meeting the WASL standard given each additional protective factor reported on average. In the unconditional models, odds ratios represent the relationships between the academic outcomes and predictor variables independent of the effects of the covariates. In the conditional models, adjusted odds ratios statistically control for the effects of the covariates (i.e., student characteristics, percentage of students in a school receiving free or reduced-price lunch, and district characteristics).

Population Attributable Risk Percentage

In order to understand more completely the relationships between the academic outcomes and the prevalence of risk and protection in schools, we calculated the population attributable risk percentage (PAR%; see Hennekens & Buring, 1987) for each individual risk and protective factor. PAR% is defined as

$$PAR\% = \frac{Pe(RR - 1)}{Pe(RR - 1) + 1} \times 100$$

where Pe is the prevalence of the risk or protective factor in question and RR is the relative risk of experiencing the outcome (i.e., meeting the standard on each section of the WASL) given a decrease or increase in risk or protection, respectively. In this study, we used the proportion of students in a school above each risk or protective factor cut point averaged across all schools in the sample as the estimate of the overall prevalence of the risk or protective factor. As an estimate of relative risk, we relied on odds ratios generated from the multilevel hierarchical generalized linear models. As school-level prevalence rates for substance use, and risk/protective factors were scaled in increments of 5% points, PAR% is the average absolute percentage increase in students that would be expected to meet a WASL standard given a 5% reduction in the prevalence of substance use or a risk factor, or a 5% increase in the prevalence of a protective factor. PAR% was not calculated for covariate effects or for the average numbers of risk or protective factors in schools.

Results

Analysis of School- and District-Level Variation

10th Grade Outcomes

In order to understand the relative contribution of schools and school districts to the overall variation in mathematics, reading, and writing achievement outcomes (i.e., meeting the academic standard for each respective section of the WASL), we present unconditional variance estimates for each outcome by level of nesting (i.e., students, schools, and school districts). As noted earlier, variation in the dichotomous outcomes at level-1 was modeled assuming a standard logistic distribution, which implies a constant level-1 variance of 3.29. Estimates of level-2 variances (τ_π) represent variation in the achievement outcomes among schools within districts and estimates of level-3 variances (τ_β) represent variation in the achievement outcomes among districts. For 10th grade achievement outcomes, values of τ_π were .499, .401, and .496 for mathematics, reading, and writing, respectively. All level-2 variances were statistically significant (ps < .05). Estimates of τ_β were .050, .059, and .053 for the three achievement outcomes, respectively; however, the level-3 variances were not statistically different from zero (all ps > .05).

The relative contributions of school- and district-level variation as a proportion of total variation can be calculated by dividing τ_π and τ_β, respectively, by the sum of the variances across all three levels. These proportions are referred to as intraclass correlations (ICCs; Snijders & Bosker, 1999). ICCs for between-school (level-2) variation in 10th grade achievement outcomes were .130, .107, and .129, respectively, indicating that approximately 11% to 13% of the total variation in these outcomes was among schools. ICCs for between-district (level-3) variation in the same achievement outcomes were .013, .017, and .014, respectively, suggesting substantially smaller portions of total variation in mathematics, reading, and writing outcomes attributable to school districts.

7th Grade Outcomes

Similar analyses of school- and district-level variance components were conducted for 7th grade mathematics, reading, and writing achievement outcomes. Estimates of level-2 variances (τ_π) were .152, .150, and .180, and estimates of level-3 variances (τ_β) were .217, .168, and .156, respectively. All level-2 and level-3 variances for 7th grade achievement outcomes were statistically significant (ps < .05). ICCs for between-school (level-2) variation in 7th grade mathematics, reading, and writing outcomes were .042, .042, and .050, respectively, suggesting smaller between-school contributions to total variability in these outcomes compared to the 10th grade outcomes. ICCs for between-district (level-3) variation in these were .059, .047, and .043, respectively, suggesting that districts accounted for more of the total variation in 7th grade achievement outcomes than for 10th grade achievement outcomes.

Prediction of Academic Achievement

Results of the hierarchical generalized linear models for 10th grade mathematics, reading, and writing achievement outcomes are presented in Tables 3, 4, and 5, respectively. Results of 7th grade mathematics, reading, and writing achievement outcomes are presented in Tables 6, 7, and 8, respectively. Each table presents unstandardized regression coefficients (B), standard errors (SE), probability values for associated *t*-tests (*p*), odds ratios, and population attributable risk percentages (PAR%). Results of the unconditional models (in the left-most set of columns) demonstrate the bivariate relationships between each predictor variable (i.e., school-level substance use, risk factor, and protective factor) and achievement outcomes without statistical control for covariates (i.e., students' gender, race/ethnicity, special education status, school percentage of students receiving free or reduced-price lunch, district-level number of students and per pupil district expenditures) or other predictor variables. Results of the conditional models (in the right-most set of columns) demonstrate the relationship between each school-level predictor variable and achievement outcome statistically controlling for potential covariate effects. All covariates were entered simultaneously in the conditional models.

Predictors of 10th Grade WASL Outcomes

Covariate analyses. With the exception of students' gender not being related to meeting the standard on the mathematics section of the WASL, student characteristics were strong predictors of academic achievement. Generally, White students were approximately 1½ times more likely to meet the WASL standards than Nonwhite students, Hispanic students were approximately 50% less likely to meet the WASL standards than Nonhispanic students, and special education students were between 15 to 20 times less likely to meet the WASL standards than students attending regular classes. Female students were 1½ times more likely than male students to meet the standard on the reading section of the WASL and twice as likely to meet the standard on the writing section of the WASL. Additionally, students in schools where greater proportions of students were receiving free or reduced-price lunch were less likely to meet the WASL standards, with the likelihood decreasing by 6% to 8% for every 5% increase in the percentage of students receiving free or reduced-price lunches. With the inclusion of student- and school-level covariates in the models, district-level characteristics (i.e., number of students and per pupil total expenditures) were not significantly related to the achievement outcomes.

Prevalence of 10th grade substance use predicting 10th grade WASL outcomes. Across all 10th grade achievement outcomes, school-level rates of 30-day alcohol, marijuana, and cigarette use were negatively associated with the likelihood of students' meeting the academic standards on the WASL. Unadjusted odds ratios associated with these effects ranged from 1.11 (for prevalence of 30-day marijuana use predicting reading achievement) to 1.17 (for prevalence of 30-day cigarette use predicting mathematics achievement). Thus, for each 5% difference (increase) between schools in the prevalence of drug use, students were, on average, 11% to 17% less likely to meet the standards on the WASL. Values for the population attributable risk percentage based on substance use prevalence rates ranged from 2.42 (for prevalence of 30-day marijuana use predicting reading achievement) to 5.34 (for prevalence of 30-day alcohol use predicting mathematics achievement). Thus, for each 5% reduction in the prevalence of alcohol, marijuana, or cigarette use among 10th graders across schools, there was a corresponding 2% to

5% increase in the percentage of 10th grade students in that school meeting the academic standards. Graphical representations of the relationships between school-level substance use prevalence and the probability of an average 10th grade student meeting the WASL standards are presented in Figures 3 through 5. Adjusted odds ratios from the conditional models (controlling for the demographic and economic variables) were slightly smaller, ranging from 1.09 to 1.14 (for the same achievement outcomes and substances). This indicates an average 9% to 14% decrease in the likelihood of a student's meeting a WASL standard for every 5% increase in the prevalence of substance use among 10th grade students across schools after controlling for the variation associated with students' demographic and economic characteristics.

Prevalence of 10th grade risk and protective factors predicting 10th grade WASL outcomes. First, the average numbers of risk and protective factors experienced by 10th grade students in a school were each examined for their prediction of mathematics, reading, and writing achievement. Across all achievement outcomes, the average number of risk factors reported by students was a strong predictor of meeting WASL standards with odds ratios ranging from 1.20 to 1.30 in the unconditional models and from 1.15 to 1.22 in the conditional models. The average number of protective factors reported by students in a school also was a strong predictor of meeting the WASL standards in the unconditional models, with odds ratios ranging from 1.38 to 1.52. For the conditional models, the average number of protective factors reported by students was significant for mathematics and writing achievement. However, for reading achievement the effect was marginal ($p = .055$). Adjusted odds ratios for mathematics and writing outcomes were 1.31 and 1.38, respectively. These results indicate a 20% to 30% decrease in the likelihood of a 10th grade student meeting the WASL standard for each additional risk factor reported by 10th graders in a school, and a 38% to 52% increase in the likelihood of a 10th grade student meeting the WASL standard for each additional protective factor reported by 10th graders in a school. Graphical representations of the relationships between the average numbers of risk and protective factors reported by 10th graders in a school and the probability of an average 10th grade student meeting the WASL standards are presented in Figures 6 and 7.

Second, unconditional models examined the relationships between each risk factor and achievement outcome individually. These analyses revealed that almost all of the 16 risk factors examined were significantly (negatively) associated with 10th grade mathematics, reading, and writing achievement outcomes. Unadjusted odds ratios corresponding to significant risk factors ranged from 1.06 to 1.15 for mathematics, 1.04 to 1.09 for reading, and 1.05 to 1.10 for writing outcomes. These values indicate an average 4% to 15% decrease in a 10th grade student's likelihood of meeting a WASL standard given a 5% increase in the prevalence of a single risk factor reported by 10th graders in that school. Based on population attributable risk percentages, this translates to approximately 2% to 6% more students meeting the WASL standards given a 5% reduction across schools in the prevalence of a risk factor in the student population. In the conditional models, the majority of risk factors were still significantly associated with the achievement outcomes. However, owing to the presence of student- and school-level covariates in the models, adjusted odds ratios from the conditional models were slightly smaller than those from the unadjusted models; that is, adjusted odds ratios from the conditional models ranged from 1.05 to 1.10 for mathematics, 1.04 to 1.09 for reading, and 1.04 to 1.09 for writing outcomes.

Examination of the seven protective factors in the unconditional models indicated that five were significantly (positively) associated with the achievement outcomes. Unadjusted odds ratios from the unconditional models ranged from 1.04 to 1.12, indicating a 4% to 12% increase in an average student's likelihood of meeting a WASL standard given a 5% increase in the prevalence of a protective factor across schools. In terms of population attributable risk, the results indicate that a 5% increase in the prevalence of each of these protective factors across schools was associated with approximately 3% to 6% more students meeting the WASL standards. Two of the seven protective factors examined remained significant in the conditional models predicting mathematics achievement and four of the seven protective factors examined remained significant in the conditional models predicting reading and writing achievement. Adjusted odds ratios from the conditional models ranged from 1.04 to 1.09.

Predictors of 7th Grade WASL Outcomes

Covariate analyses. Similar to the results from the analyses of 10th grade achievement outcomes, student characteristics generally were strong predictors of meeting the academic standards on each respective section of the WASL. White students were 34% to 60% more likely to meet the WASL standards than Nonwhite students, Hispanic students were 78% to 96% less likely to meet the WASL standards than Nonhispanic students, and special education students were approximately 11 to 13 times less likely to meet the WASL standards than students in regular classes. Females were no more likely than male students to meet the standard on the mathematics section of the WASL; however, they were 16% more likely to meet the standard on the reading section of the WASL and more than twice as likely (adjusted odds ratio = 2.12) to meet the standard on the writing section of the WASL. Greater proportions of students within a school receiving free or reduced-price lunches again were negatively associated with the proportions of students meeting the WASL standards, with the likelihood of meeting the WASL standards decreasing by 9% for mathematics and reading achievement, and by 2% for writing achievement, for every 5% increase in the percentage of students in a school receiving free or reduced-price lunches. District-level characteristics were not significantly related to the 7th grade WASL outcomes after accounting for student and school characteristics.

Prevalence of 8th grade substance use predicting 7th grade WASL outcomes. Examination of the effects of the prevalence of substance use among 8th graders in a school on the WASL outcomes of 7th grade students in that school using unconditional models revealed significant negative effects for 30-day alcohol, marijuana, and cigarette use. Unadjusted odds ratios ranged from 1.02 to 1.03 for mathematics achievement, from 1.09 to 1.11 for reading achievement, and 1.13 to 1.14 for writing achievement. Thus, a 5% difference (reduction) between schools in the prevalence of alcohol use among 8th graders was associated with a 3% increase in the likelihood of 7th graders in the same building meeting the standard on the mathematics section of the WASL, an 11% increase in the likelihood of meeting the reading standard, and a 14% increase in the likelihood of meeting the writing standard. Similar odds ratios were observed for marijuana and cigarette use among 8th graders. In terms of population attributable risk, these effects indicate increases in the percentages of 7th grade students meeting the WASL standards of between 0.6% and 2.5% for a 5% difference (reduction) across schools in the prevalence of substance use among 8th graders. Graphical representations of the relationships between school-level substance use prevalence among 8th graders and the

probability of an average 7th grade student meeting the WASL standards are presented in Figures 8 through 10. These effects were attenuated by the inclusion of covariates in the conditional models. For example, in the conditional models, the school-level prevalence of substance use was not significantly related to reading achievement and the prevalence rates of alcohol and marijuana use were weakly related to mathematics achievement, with adjusted odds ratios of 1.01 for each substance. For writing, the effects of 30-day alcohol and cigarette use were stronger than for the other achievement outcomes with adjusted odds ratios of 1.06 and 1.07, respectively.

Prevalence of 8th grade risk and protective factors predicting 7th grade WASL outcomes. Results from the unconditional models examining the effects of the average numbers of risk and protective factors reported by 8th grade students in schools on the WASL outcomes of 7th grade students in the same schools were consistent with the results from the analysis of 10th grade risk and protective factors on 10th grade WASL outcomes. That is, the school-average numbers of risk and protective factors reported by 8th grade students were generally strong predictors of 7th grade WASL outcomes. In the unconditional models, odds ratios for the effects of the average number of risk factors in a school ranged from 1.18 to 1.23, suggesting an 18% to 23% decrease in the likelihood of a 7th grade student meeting a WASL standard for each unit increase in the average number of risk factors reported by 8th grade students across schools. The adjusted odds ratios in the conditional models were somewhat smaller, ranging from 1.06 to 1.11 after controlling for student, school and district characteristics.

The school-average number of protective factors reported by 8th graders also was a strong predictor of 7th graders meeting the WASL standards. Odds ratios in the unconditional models ranged from 1.31 to 1.38, indicating a 31% to 38% increase in the likelihood of a 7th grade student meeting the WASL standard for each additional protective factor reported, on average, by 8th grade students across schools. For the conditional models, the average number of protective factors reported by 8th graders in schools was significantly related to 7th graders reading and writing WASL outcomes in those schools. This time, however, the effect was marginal for mathematics achievement ($p = .052$). Adjusted odds ratios for reading and writing outcomes were 1.11 and 1.15, respectively. Graphical representations of the relationships between the average numbers of risk and protective factors reported by 8th graders in a school and the probability of an average 7th grade student meeting the WASL standards are presented in Figures 11 and 12.

In the analyses examining each risk factor individually, almost all of the 16 risk factors reported by 8th graders were significantly (negatively) associated with 7th graders in the same schools meeting the standards on the mathematics, reading, and writing sections of the WASL. Unadjusted odds ratios corresponding to significant risk factors ranged from 1.04 to 1.11 for mathematics, 1.04 to 1.10 for reading, and 1.05 to 1.11 for writing outcomes. These values correspond to a 4% to 11% decrease in the likelihood of an average 7th grade student meeting the WASL standard given a 5% difference (increase) across schools in the prevalence of the risk factor reported by 8th graders. These effects translate to population attributable risk percentages of approximately 1.5% to 5% fewer 7th grade students meeting a WASL standard in a school with a 5% higher prevalence of a single risk factor reported by 8th grade students. Controlling for student-, school-, and district-level covariates in the conditional models, 9 of the 16 risk

factors examined were still significant predictors of mathematics achievement, 5 of the 16 risk factors were still significant predictors of reading achievement, and 11 of the 16 risk factors were still significant predictors of writing achievement. Again, the adjusted odds ratios from the conditional models were generally smaller than those from unadjusted models. For example, adjusted odds ratios from the conditional models ranged from 1.03 to 1.05 for mathematics, 1.02 to 1.04 for reading, and 1.03 to 1.06 for writing outcomes.

Of the seven protective factors examined in the unconditional models, five were significant predictors of mathematics achievement with four of the five also being significant predictors of reading and writing achievement. The unadjusted odds ratios associated with these protective factors ranged from 1.04 to 1.09, indicating a 4% to 9% increase in the likelihood of an average 7th grade student meeting a WASL standard given a 5% difference (increase) across schools in the prevalence of a single protective factor reported by 8th grade students. Values of population attributable risk for the significant protective factors ranged from 2.00 to 5.06, indicating that approximately 2% to 5% more 7th grade students met the WASL standards given a 5% difference (increase) across schools in the prevalence of a protective factor within the 8th graders in a school. After controlling for covariate effects in the conditional models, only one protective factor, Social Skills, remained a significant predictor of mathematics achievement; two protective factors, Social Skills and Belief in the Moral Order, remained significant predictors of reading achievement; and Belief in the Moral Order and School Recognition for Prosocial Involvement remained significant predictors of writing achievement. Adjusted odds ratios associated with these protective factors were approximately 1.03.

Conclusions and Implications for Policy and Practice

The results of these analyses indicate that average levels of substance use and risk and protective factors reported by students in a school are related to the academic test score performance of students within that school. These effects remain after controlling for demographic and economic factors that are related to achievement, and are even apparent for students in different grades within the same school building. These findings are consistent with the findings from other studies that have linked substance use and various risk and protective factors to academic performance at both an individual (e.g., Fleming et al., 2005; Jeynes, 2002; Pollard et al., 1999; Sameroff et al., 1987), and aggregate group level (Mandell et al., 2002). The findings add to the existing literature by demonstrating that school-building levels of substance use, risk, and protection are related to the achievement test scores of individual students within those schools, including students in grades other than those reporting on levels of substance use, risk and protection.

Importantly, this study examined the influence of student substance use and risk and protective factors as contextual variables rather than individual characteristics. That is, the prevalence of these factors in student populations was found to be related to the academic success of students embedded within those populations. This suggests that curricula and programs that promote the development of social and emotional skills among all students in a school are likely to influence the academic performance of students in that school. These

findings support the idea that social and emotional development is an important element of school reform efforts designed to promote the academic achievement of all students (e.g., Elias et al., 1997; Greenberg et al., 2003). In sum, the findings provide initial evidence that schools should be able to increase the academic test scores of their students by implementing prevention programs that reduce risk, enhance protection, and reduce the prevalence of substance use within their student populations.

Limitations and Directions for Further Research. It is important to note that these analyses used dichotomous measures of both predictors (substance use and risk and protective factors) and outcomes (achievement test scores). This was done to provide estimates of the potential improvements in the proportions of students in a school who meet the standards for achievement on the WASL (an important concern of school officials) given modest reductions in the prevalence of substance use and related risk factors, or modest increases in protective factors, that could be expected from implementation of tested, effective prevention curricula and programs in that school. These are the data that school administrators use to gauge their progress in meeting the needs of their students. However, it is likely that restricting the variance in both predictor and outcome measures by dichotomizing the variables resulted in conservative estimates of the strength of the relationships between these variables. Analyses of school mean scores on frequency measures of substance use and mean scores on the risk and protective factor scales in relation to mean test scores should be conducted to provide additional information about these relationships. Moreover, analyses of the possible interactive effects of changes in multiple risk and protective factors that might be impacted by prevention efforts on students' test scores might provide a better estimate of the effects of prevention programs on achievement. With these caveats in mind, the results reported here are likely to be conservative estimates of the impact of school prevention programs on student achievement.

It is also important to recognize that these analyses examined the effects of substance use and risk and protective factors on academic achievement of students averaged across the schools in the sample. It is possible that the strength of these relationships may vary across schools. That is, the effects of the prevalence of substance use and risk and protection among students may be stronger or weaker in schools where fewer students are meeting the standards for achievement on the WASL. The samples of schools analyzed appear to be representative of all the schools in Washington State, with the average achievement levels of schools in the sample similar to all schools statewide. This suggests that the findings reported here would apply to all schools, on average, in the State. Moreover, in this study the effects of substance use, risk, and protection did not differ between students identified as needing special education services and students without this designation, suggesting that these relationships may be similar for higher and lower achieving students. However, further studies are needed to examine whether the relationships observed in these samples are stronger or weaker in schools where fewer students are meeting the standard.

Implications for policy and practice.

These findings support the idea that schools are an appropriate venue for curricula and other programs and policies that address the social and emotional development and learning of students (e.g., Elias, Zins, Graczyk, & Weissberg, 2003; Greenberg et al., 2003). Unfortunately,

despite the demonstrated success of numerous school-based interventions and efforts by funding agencies to increase the use of effective prevention curricula and programs, schools still spend the bulk of their prevention time and money on interventions that have not been shown to work or are known to be ineffective or even harmful (Hallfors, Godette, Sporer, & Pankratz, 2000; Hantman & Crosse, 2000; Silvia & Thorne, 1997). Simons-Rudolph and her colleagues (Simons-Rudolph et al., 2003) found, in a survey of school administrators, that many were not familiar with the Principles of Effectiveness as defined in the Safe and Drug Free Schools section of the No Child Left Behind legislation. An important implication of the findings of this study is that educators need better access to information about prevention science, including information about risk and protective factors and tested, effective prevention curricula and programs that have been shown to reduce risk and enhance protection among student populations.

Schools should monitor levels of risk and protective factors experienced by their students. In accordance with the Principles of Effectiveness laid out in the No Child Left Behind legislation (No Child Left Behind, 2002), the results of this study demonstrate the importance of schools monitoring the prevalence of risk and protective factors experienced by their students. Efforts to improve the social and behavioral health and development of students by reducing risk and enhancing protection are likely to benefit their academic performance, and thus should be an integral part of the monitoring and strategic planning process in schools. The measures of risk and protective factors included in the Healthy Youth Survey have been validated as predictors of substance use and related problem behaviors (e.g., Arthur et al., 2002; Pollard et al., 1999), and have been shown to provide consistent measurement across grades, males and females, and racial/ethnic groups (Glaser, Van Horn, Arthur, Hawkins, & Catalano, 2005). The profiles of risk and protection provided by the HYS can be used to identify the most prevalent risk factors and most depressed protective factors in a student population, which serve as obvious targets for prevention efforts. These measures can also be used to set performance objectives, and to monitor progress over time in achieving these objectives. The results reported here suggest that successful efforts to reduce substance use and risk, while increasing protection, are likely to produce gains in students' achievement as well.

Schools should implement tested, effective curricula for reducing risk and enhancing protection among their students. The findings that risk and protective factors are related to student achievement provide evidence that schools' investments in implementing tested, effective prevention curricula are worthwhile and related to their mission of educating all students. This is consistent with emerging evidence from other studies that suggest that school-based prevention and social-emotional learning programs have a significant positive impact on students' academic performance (Kawashima, Durlak, & Weissberg, 2005). In particular, programs that increase the social and emotional skills of students, those that focus on changing the social climate of the school or classroom, and those that promote students' bonding to school through effective classroom management and instructional strategies have been shown to be effective at reducing drug use and violence and promoting academic success (Gottfredson, 2001; Greenberg et al., 1999; Greenberg et al., 2003; Hawkins, Catalano, & Arthur, 2002; U.S. Department of Health and Human Services, 2001). However, schools need clearer guidance regarding which curricula and programs have been shown to be effective and which ones have not. Efforts to provide school administrators with clear guidance regarding which strategies have been demonstrated to

be effective should be increased (e.g. Drug Strategies, 1996; Elliott, 1998; Greenberg et al., 1999; Hawkins & Catalano, 2004; National Institute on Drug Abuse, 1997; U.S. Department of Health and Human Services, 2001). It is also important for schools to invest in adequate training and support for teachers and others implementing prevention curricula in order to achieve adequate fidelity and quality of delivery of these curricula (Elliott & Mihalic, 2004).

Schools should work with community partners to reduce risk and enhance protection in other domains of students' lives. Many of the risk and protective factors found to influence students' behavior and academic performance occur in their experiences outside of school, and thus are not amenable to school-based interventions. Yet, the findings reported here indicate the relevance of these factors to the academic performance of middle and high school students. As part of a school's efforts to boost the academic achievement of its students, school officials should share their data on the risk and protective factors experienced by students with parents, community and business leaders, and other stakeholders to mobilize and coordinate efforts to reduce risk and enhance protection across the various social domains of students' lives. Comprehensive, coordinated prevention policies and programs, both within schools and in the community, could potentially have a substantial impact on the social, emotional, and academic development of our youth.

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Appendix A

Protective factors reduce the likelihood that youth will participate in risky behaviors by increasing bonds to community, family, school, and/or peers.

Community	***Community Recognition for Prosocial Involvement***	Young people are recognized by adults in the communtiy for positive participation in community activities. *Example question: "My neighbors notice when I am doing a good job and let me know about it."*
Family	***Family Opportunities for Prosocial Involvement***	Opportunities are present for children and youths to participate meaningfully in the responsibilities and activities of their family. *Example question: "My parents ask me what I think before most family decisions affecting me are made."*
	Family Recognition for Prosocial Involvement	Recognition, praise, and encouragement is provided by parents, siblings, and other family members when the child exhibits healthy behaviors. *Example question: "How often do your parents tell you they're proud of you for something you've done?"*
School	***School Opportunities for Prosocial Involvement***	Opportunities are available for youths to participate meaningfully in their classroom and school. *Example question: "In my school, students have lots of chances to help decide things like class activities and rules."*
	School Recognition for Prosocial Involvement	Recognition is given for contributions, efforts, and progress of children in school. *Example question: "My teachers praise me when I work hard in school."*
Peer-Individual	***Social Skills***	Youths display more skillful social behaviors, such as social problem-solving, better communication, refusal skills, etc. *Example question: "You are at a party at someone's house, and one of your friends offers you a drink containing alcohol. What would you say or do?"*
	Belief in the Moral Order	Youths have a positive belief system of what is "right" or "wrong". *Example question: "It is important to be honest with your parents, even if they become upset or you get punished."*

Risk factors are characteristics of communities, families, schools, adolescents and peer groups that increase the likelihood that youth will participate in problem behaviors like juvenile crime, violence, and drug and alcohol use.

Community	***Low Neighborhood Attachment***	Youths report that they are not emotionally connected to their neighborhood. *Example question: "I'd like to get out of my neighborhood."*
	Laws and Norms Favorable To Drug Use	Laws regulating alcohol and other drug sales and use are poorly enforced. Further, adults communicate that it is normative or acceptable for minors to use alcohol or other drugs. *Example question: "How wrong would most adults in your neighborhood think it is for kids your age to drink alcohol?"*
	Perceived Availability of Drugs	Young people report that it would be easy for them to obtain cigarettes, alcohol, marijuana, and other illegal drugs. *Example question: "If you wanted to get some marijuana, how easy would it be for you to get some?"*
	Perceived Availability of Handguns	Youths report that it would be easy for them to obtain a handgun. *Example question: "If you wanted to get a handgun, how easy would it be for you to get one?"*
Family	***Poor Family Management***	Parents do not provide clear expectations and rules for their children's behavior; fail to monitor their children's behavior; and/or use inconsistent or excessively harsh or severe punishment when discplining their children. *Example question: "The rules in my family are clear."*
	Antisocial Behavior Among Familiar Adults	There has been a history of problem behaviors (e.g., crime, violence, or alcohol or drug abuse or dependence) among adults the child knows. *Example question: "About how many adults have you known personally who in the past year have used marijuana, crack, cocaine, or other drugs?"*
School	***Academic Failure***	Children report poor grades and that they are not keeping up with other students academically. *Example question: "Putting them altogether, what were your grades like last year?"*
	Low Commitment to School	Youths report that school success is neither meaningful nor important to them. *Example question: "Now, thinking back over the past year in school, how often did you try to do your best work in school?"*

School Domain	***Academic Failure***	Beginning in the late elementary grades (grades 4-6), children who fall behind academically for any reason are at greater risk of drug abuse, school dropout, teen pregnancy, violence and delinquency. *Example question: "Putting them altogether, what were your grades like last year?"*
	Low Commitment to School	Factors such as not liking school, spending little time on homework, and perceiving coursework as irrelevant are predictive of drug use, violence, delinquency and school dropout. *Example question: "Now, thinking back over the past year in school, how often did you try to do your best work in school?"*
Peer - Individual Domain	***Rebelliousness***	Young people who do not feel part of society, are not bound by rules, don't believe in trying to be successful or responsible, or who take an active rebellious stance toward society, are at higher risk for delinquency, dropping out of school, and drug abuse. *Example question: "I ignore rules that get in my way."*
	Early Problem Behavior	Children who display aggressive and antisocial behavior in elementary school are at increased risk for delinquency, violence, school dropout, and drug use later in life. *Example question: "How old were you when you first attacked someone with the idea of seriously hurting them?"*
	Early Initiation of Drug Use	Early onset of drug use predicts misuse of drugs. Onset of drug use prior to the age of 15 is a consistent predictor of drug abuse, and a later age of onset of drug use has been shown to predict lower drug involvement and a greater probability of discontinuation of use. *Example question: "How old were you when you first smoked marijuana?"*
	Favorable Attitudes Toward Antisocial Behavior	Young people who accept or condone antisocial behavior are more likely to engage in a variety of problem behaviors. *Example question: "How wrong do you think it is for someone your age to steal anything worth more than $5?"*
	Favorable Attitudes Toward Drug Use	Youth who express positive attitudes toward drug use are at higher risk for subsequent drug use. *Example question: "How wrong do you think it is for someone your age to smoke marijuana?"*
	Low Perceived Risk of Drug Use	Young people who do not perceive drug use to be risky are more likely to engage in drug use. *Example question: "How much do you think people risk harming themselves (physically or in other ways) if they try marijuana once or twice?"*
	Friends' Use of Drugs	Young people who associate with peers who engage in alcohol or substance use are much more likely to engage in the same behavior. *Example question: "Think of your four best friends (the friends you feel closest to). In the past year (12 months), how many of your best friends have smoked cigarettes?"*

Table 1. Characteristics of students included in uncondtional analysis samples and statewide comparisons

Student Characteristics	Grade 7				Grade 10			
	Analysis Sample	***N***	***State* 2002-03***	***N Tested***	***Analysis Sample***	***N***	***State* 2002-03***	***N Tested***
Percent passing reading portion of the WASL	48%	50,147	48%	78,588	61%	46,713	60%	69,622
Percent passing writing portion of the WASL	55%	50,122	55%	77,990	61%	46,743	61%	68,649
Percent passing arithmetic portion of the WASL	37%	50,125	37%	70,213	39%	46,887	39%	70,213
Percent Male	51%	50,147	51%	78,588	51%	46,887	51%	70,213
Percent NonWhite	26%	50,147	27%	78,588	24%	46,887	25%	70,213
Percent Hispanic	10%	50,147	10%	78,588	10%	46,887	9%	70,213
Percent in Special Education	12%	50,147	11%	78,588	10%	46,887	9%	70,213

* Statewide data obtained from *http://reportcard.ospi.k12.wa.us* on 1/18/06, 2/22/06

Table 2. Characteristics of schools and school districts included in analysis samples and statewide comparisons

Characteristics	Grade 7						Grade 10					
	Analysis Sample	***N***	**Range**	***State* 2002-03***	***N***	**Range**	**Analysis Sample**	***N***	**Range**	***State* 2002-03***	***N***	**Range**
Schools												
Percentage passing reading portion of the WASL	47.3%	266	10 - 84%	47.6%	457	0 - 100%	57.6%	237	4 - 100%	61.1%	406	0 - 100%
Percentage passing writing portion of the WASL	53.0%	266	12 - 90%	52.1%	457	0 - 98%	56.7%	237	7 - 98%	60.2%	405	0 - 98%
Percentage passing arithmetic portion of the WASL	35.2%	266	0 - 81%	35.5%	457	0 - 100%	34.6%	237	0 - 94%	32.7%	404	0 - 94%
Average Buildling Percentage Eligible for Free or Reduced Lunch	39.4%	222	3 - 91%	39.9%^	450	.3 - 94%	32.2%	201	0 - 86.7%	34.4%^^	359	0 - 100%
Districts												
Average District Per-Student Expenditures	$8,211	170		$7,436	296		$7,943	171		$7,436	296	
Average District Enrollment**	4,629	170		3,587	284		4,278	171		3,587	284	

* Statewide data obtained from *http://reportcard.ospi.k12.wa.us* on 1/18/06, 2/22/06 and 3/2/06

^ Average percent of students eligible for free & reduced lunch in schools containing 7th grade in the 2002-03 school year.

^^ Average percent of students eligible for free & reduced lunch in schools containing 10th grade in the 2002-03 school year.

** Represents the total number of students (all grades) averaged across the 284 districts that reported students eligible for free and reduced lunch. This excludes 12 districts with very small enrollment (8-154 students). In 2002-03, there was an average annual enrollment of 972,639 students in the state, and 296 districts.

Table 3. Predictors of 10th-Grade WASL Mathematics Achievement

Predictor Variable	Unconditional Model					Conditional Model				
	B	SE	*p*	Odds Ratio	PAR %	B	SE	*p*	Adj. Odds Ratio	Adj. PAR %
Level 1 (student)										
Race/Ethnicity (White)						0.397	0.055	0.001	1.49	na
Race/Ethnicity (Non-hispanic)						0.807	0.092	0.001	2.24	na
Gender (female)						0.009	0.024	0.695	ns	na
Special education classes						2.989	0.126	0.000	19.87	na
Level 2 (school)										
Free/Reduced lunch						-0.072	0.017	0.001	1.07	na
30-day alcohol use (10th-grade)	-0.144	0.022	0.001	1.15	5.34	-0.099	0.022	0.001	1.10	3.67
30-day marijuana use (10th-grade)	-0.147	0.023	0.001	1.16	3.54	-0.113	0.023	0.001	1.12	2.71
30-day cigarette use (10th-grade)	-0.155	0.018	0.001	1.17	3.86	-0.128	0.020	0.001	1.14	3.16
Risk Factors (10th-grade)										
Number of risk factors	-0.266	0.033	0.001	1.30	na	-0.197	0.033	0.001	1.22	na
Low neighborhood attachment	-0.130	0.021	0.001	1.14	6.24	-0.071	0.023	0.003	1.07	3.38
Laws and norms favorable to drugs	-0.064	0.021	0.003	1.07	2.96	-0.048	0.017	0.006	1.05	2.24
Perceived availability of drugs	-0.074	0.022	0.001	1.08	3.10	-0.059	0.020	0.004	1.06	2.46
Perceived availability of handguns	-0.046	0.025	0.067	ns	ns	-0.030	0.022	0.176	ns	ns
Poor family management	-0.056	0.022	0.013	1.06	2.37	-0.042	0.023	0.064	ns	ns
Antisocial behavior among familiar adults	-0.106	0.019	0.001	1.11	5.22	-0.071	0.019	0.001	1.07	3.47
Academic failure	-0.120	0.021	0.001	1.13	6.10	-0.064	0.022	0.005	1.07	3.25
Low school commitment	-0.055	0.021	0.010	1.06	2.36	-0.079	0.020	0.001	1.08	3.10
Early initiation of drug use	-0.114	0.014	0.001	1.12	4.68	-0.093	0.013	0.001	1.10	3.82
Early initiation of antisocial behavior	-0.143	0.013	0.001	1.15	6.07	-0.099	0.016	0.001	1.10	4.19
Favorable attitudes to antisocial behavior	-0.081	0.022	0.001	1.08	3.68	0.034	0.021	0.101	ns	ns
Favorable attitudes towards drug use	-0.087	0.017	0.001	1.09	3.85	-0.079	0.017	0.001	1.08	3.47
Intentions to use drugs	-0.097	0.017	0.001	1.10	4.25	-0.081	0.016	0.001	1.08	3.56
Perceived risks of drug use	-0.096	0.015	0.001	1.10	3.91	-0.071	0.017	0.001	1.07	2.90
Friends' use of drugs	-0.101	0.017	0.001	1.11	3.99	-0.084	0.017	0.001	1.09	3.31
Peer rewards for antisocial involvement	0.025	0.021	0.251	ns	ns	0.020	0.019	0.291	ns	ns
Protective Factors (10th-grade)										
Number of protective factors	0.421	0.087	0.001	1.52	na	0.272	0.096	0.006	1.31	na
Community recognition for prosocial involvement	0.058	0.020	0.004	1.06	3.55	0.046	0.024	0.054	ns	ns
Family opportunities for prosocial involvement	0.077	0.023	0.001	1.08	4.10	0.055	0.021	0.009	1.06	3.11
Family recognition for prosocial involvement	0.052	0.021	0.012	1.05	2.97	0.021	0.019	0.286	ns	ns
School opportunities for prosocial involvement	0.053	0.020	0.008	1.05	3.08	0.024	0.022	0.275	ns	ns
School recognition for prosocial involvement	0.001	0.023	0.959	ns	ns	0.016	0.025	0.658	ns	ns
Social skills	0.111	0.018	0.001	1.12	6.26	0.083	0.017	0.001	1.09	4.72
Belief in the moral order	0.042	0.025	0.090	ns	ns	0.030	0.027	0.256	ns	ns
Level 3 (district)										
Per Pupil Total Expenditures						0.229	0.306	0.455	ns	na
Number of Students in District						0.000	0.000	0.714	ns	na

Note. Odds ratios for Level-2 Free/Reduced lunch, substance use, and risk factors inverted for interpretability. B = unstandardized regression coefficient. SE = standard error. p = probability. %PAR = percentage population attributable risk. Adj = adjusted (for covariates). na = not applicable. ns = nonsignificant (i.e., $p > .05$).

Table 4. Predictors of 10th-Grade WASL Reading Achievement

Predictor Variable	Unconditional Model					Conditional Model				
	B	SE	*p*	Odds Ratio	PAR %	B	SE	*p*	Adj. Odds Ratio	Adj. PAR %
Level 1 (student)										
Race/Ethnicity (White)						0.441	0.060	0.001	1.55	na
Race/Ethnicity (Non-hispanic)						0.703	0.073	0.001	2.02	na
Gender (female)						0.399	0.024	0.001	1.49	na
Special education classes						2.703	0.092	0.001	14.93	na
Level 2 (school)										
Free/Reduced lunch						-0.057	0.014	0.001	1.06	na
30-day alcohol use (10th-grade)	-0.117	0.018	0.001	1.12	4.32	-0.107	0.022	0.001	1.11	3.96
30-day marijuana use (10th-grade)	-0.102	0.022	0.001	1.11	2.42	-0.090	0.025	0.001	1.09	2.13
30-day cigarette use (10th-grade)	-0.113	0.013	0.001	1.12	2.79	-0.110	0.016	0.000	1.12	2.72
Risk Factors (10th-grade)										
Number of risk factors	-0.186	0.030	0.001	1.20	na	-0.138	0.034	0.001	1.15	na
Low neighborhood attachment	-0.099	0.018	0.001	1.10	4.75	-0.047	0.026	0.073	ns	ns
Laws and norms favorable to drugs	-0.040	0.019	0.032	1.04	1.86	-0.029	0.017	0.082	ns	ns
Perceived availability of drugs	-0.055	0.018	0.003	1.06	2.29	-0.047	0.019	0.014	1.05	1.97
Perceived availability of handguns	-0.028	0.022	0.210	ns	ns	-0.022	0.024	0.345	ns	ns
Poor family management	-0.039	0.020	0.055	ns	ns	-0.025	0.022	0.265	ns	ns
Antisocial behavior among familiar adults	-0.084	0.014	0.001	1.09	4.12	-0.059	0.019	0.003	1.06	2.91
Academic failure	-0.080	0.019	0.001	1.08	4.05	-0.037	0.026	0.152	ns	ns
Low school commitment	-0.028	0.023	0.217	ns	ns	-0.042	0.020	0.040	1.04	1.58
Early initiation of drug use	-0.082	0.013	0.001	1.09	3.37	-0.073	0.015	0.001	1.08	2.97
Early initiation of antisocial behavior	-0.087	0.013	0.001	1.09	3.69	-0.045	0.020	0.023	1.05	1.89
Favorable attitudes to antisocial behavior	-0.052	0.020	0.010	1.05	2.37	-0.016	0.025	0.514	ns	ns
Favorable attitudes towards drug use	-0.059	0.017	0.001	1.06	2.62	-0.060	0.019	0.002	1.06	2.65
Intentions to use drugs	-0.072	0.017	0.001	1.07	3.14	-0.068	0.018	0.001	1.07	2.98
Perceived risks of drug use	-0.067	0.015	0.001	1.07	2.70	-0.055	0.018	0.003	1.06	2.23
Friends' use of drugs	-0.082	0.013	0.001	1.08	3.21	-0.082	0.016	0.001	1.09	3.24
Peer rewards for antisocial involvement	0.019	0.020	0.327	ns	ns	0.020	0.021	0.350	ns	ns
Protective Factors (10th-grade)										
Number of protective factors	0.336	0.081	0.000	1.40	na	0.184	0.095	0.055	ns	na
Community recognition for prosocial involvement	0.059	0.020	0.004	1.06	3.57	0.057	0.026	0.033	1.06	3.44
Family opportunities for prosocial involvement	0.067	0.020	0.001	1.07	3.61	0.051	0.020	0.012	1.05	2.63
Family recognition for prosocial involvement	0.065	0.019	0.001	1.07	3.87	0.042	0.021	0.046	1.04	2.44
School opportunities for prosocial involvement	0.043	0.018	0.017	1.04	2.51	0.014	0.022	0.535	ns	ns
School recognition for prosocial involvement	0.001	0.022	0.956	ns	ns	0.007	0.023	0.772	ns	ns
Social skills	0.086	0.017	0.001	1.09	4.86	0.069	0.021	0.002	1.07	3.92
Belief in the moral order	0.020	0.021	0.342	ns	ns	0.009	0.025	0.722	ns	ns
Level 3 (district)										
Per Pupil Total Expenditures						0.491	0.287	0.089	ns	na
Number of Students in District						0.000	0.000	0.125	ns	na

Note. Odds ratios for Level-2 Free/Reduced lunch, substance use, and risk factors inverted for interpretability. B = unstandardized regression coefficient. SE = standard error. p = probability. %PAR = percentage population attributable risk. Adj = adjusted (for covariates). na = not applicable. ns = nonsignificant (i.e., p > .05).

Table 5. Predictors of 10th-Grade WASL Writing Achievement

Predictor Variable	Unconditional Model					Conditional Model				
	B	SE	*p*	Odds Ratio	PAR %	B	SE	*p*	Adj. Odds Ratio	Adj. PAR %
Level 1 (student)										
Race/Ethnicity (White)						0.392	0.054	0.000	1.48	na
Race/Ethnicity (Non-hispanic)						0.823	0.067	0.000	2.28	na
Gender (female)						0.704	0.026	0.000	2.02	na
Special education classes						2.720	0.094	0.000	15.18	na
Level 2 (school)										
Free/Reduced lunch						-0.078	0.015	0.000	1.08	na
30-day alcohol use (10th-grade)	-0.119	0.016	0.000	1.13	4.42	-0.113	0.017	0.000	1.12	4.18
30-day marijuana use (10th-grade)	-0.119	0.019	0.000	1.13	2.85	-0.118	0.021	0.000	1.12	2.82
30-day cigarette use (10th-grade)	-0.110	0.013	0.000	1.12	2.71	-0.109	0.014	0.000	1.11	2.68
Risk Factors (10th-grade)										
Number of risk factors	-0.226	0.026	0.000	1.25	na	-0.191	0.028	0.000	1.21	na
Low neighborhood attachment	-0.092	0.018	0.000	1.10	4.41	-0.046	0.026	0.080	ns	ns
Laws and norms favorable to drugs	-0.069	0.016	0.000	1.07	3.20	-0.062	0.015	0.000	1.06	2.87
Perceived availability of drugs	-0.072	0.016	0.000	1.07	3.01	-0.074	0.016	0.000	1.08	3.10
Perceived availability of handguns	-0.033	0.020	0.102	ns	ns	-0.014	0.021	0.490	ns	ns
Poor family management	-0.047	0.019	0.012	1.05	2.09	-0.041	0.020	0.046	1.04	1.66
Antisocial behavior among familiar adults	-0.091	0.012	0.000	1.09	4.46	-0.066	0.016	0.000	1.07	3.27
Academic failure	-0.096	0.017	0.000	1.10	4.85	-0.053	0.023	0.022	1.05	2.70
Low school commitment	-0.035	0.023	0.122	ns	ns	-0.055	0.019	0.005	1.06	2.35
Early initiation of drug use	-0.096	0.011	0.000	1.10	3.93	-0.084	0.012	0.000	1.09	3.45
Early initiation of antisocial behavior	-0.104	0.013	0.000	1.11	4.41	-0.070	0.016	0.000	1.07	2.94
Favorable attitudes to antisocial behavior	-0.061	0.017	0.000	1.06	2.78	-0.029	0.020	0.143	ns	ns
Favorable attitudes towards drug use	-0.071	0.014	0.000	1.07	3.15	-0.074	0.015	0.000	1.08	3.26
Intentions to use drugs	-0.083	0.014	0.000	1.09	3.66	-0.086	0.014	0.000	1.09	3.76
Perceived risks of drug use	-0.093	0.012	0.000	1.10	3.76	-0.090	0.014	0.000	1.09	3.64
Friends' use of drugs	-0.088	0.012	0.000	1.09	3.46	-0.089	0.013	0.000	1.09	3.52
Peer rewards for antisocial involvement	-0.016	0.018	0.381	ns	ns	-0.038	0.021	0.063	ns	ns
Protective Factors (10th-grade)										
Number of protective factors	0.423	0.078	0.000	1.53	na	0.324	0.086	0.000	1.38	na
Community recognition for prosocial involvement	0.063	0.018	0.001	1.06	3.82	0.081	0.024	0.001	1.08	4.90
Family opportunities for prosocial involvement	0.078	0.020	0.000	1.08	4.15	0.060	0.020	0.003	1.06	3.24
Family recognition for prosocial involvement	0.071	0.021	0.001	1.07	4.04	0.048	0.021	0.024	1.05	2.80
School opportunities for prosocial involvement	0.053	0.017	0.003	1.05	3.11	0.039	0.021	0.058	ns	ns
School recognition for prosocial involvement	0.009	0.022	0.693	ns	ns	0.016	0.025	0.511	ns	ns
Social skills	0.099	0.014	0.000	1.10	5.58	0.085	0.016	0.000	1.09	4.80
Belief in the moral order	0.031	0.017	0.068	ns	ns	0.019	0.020	0.346	ns	ns
Level 3 (district)										
Per Pupil Total Expenditures						0.276	0.238	0.249	ns	na
Number of Students in District						0.000	0.000	0.827	ns	na

Note. Odds ratios for Level-2 Free/Reduced lunch, substance use, and risk factors inverted for interpretability. B = unstandardized regression coefficient. SE = standard error. p = probability. %PAR = percentage population attributable risk. Adj = adjusted (for covariates). na = not applicable. ns = nonsignificant (i.e., p > .05).

Table 6. Predictors of 7th-Grade WASL Mathematics Achievement

Predictor Variable	Unconditional Model					Conditional Model				
	B	SE	*p*	Odds Ratio	PAR %	B	SE	*p*	Adj. Odds Ratio	Adj. PAR %
Level 1 (student)										
Race/Ethnicity (White)						0.472	0.055	0.001	1.60	na
Race/Ethnicity (Non-hispanic)						0.671	0.088	0.001	1.96	na
Gender (female)						0.044	0.031	0.158	ns	na
Special education classes						2.547	0.107	0.001	12.77	na
Level 2 (school)										
Free/Reduced lunch						-0.089	0.009	0.001	1.09	na
30-day alcohol use (8th-grade)	-0.029	0.005	0.001	1.03	1.05	-0.012	0.004	0.007	1.01	0.44
30-day marijuana use (8th-grade)	-0.029	0.006	0.001	1.03	0.67	-0.013	0.006	0.028	1.01	0.30
30-day cigarette use (8th-grade)	-0.023	0.007	0.002	1.02	0.55	-0.006	0.006	0.318	ns	ns
Risk Factors (8th-grade)										
Number of risk factors	-0.207	0.030	0.001	1.23	na	-0.093	0.028	0.002	1.10	na
Low neighborhood attachment	-0.070	0.017	0.001	1.07	3.37	-0.016	0.015	0.285	ns	ns
Laws and norms favorable to drugs	-0.105	0.019	0.001	1.11	4.87	-0.040	0.015	0.009	1.04	1.83
Perceived availability of drugs	-0.072	0.015	0.001	1.08	3.02	-0.034	0.013	0.010	1.03	1.42
Perceived availability of handguns	-0.066	0.017	0.001	1.07	1.68	-0.051	0.015	0.001	1.05	1.28
Poor family management	-0.044	0.022	0.053	ns	ns	-0.027	0.017	0.114	ns	ns
Antisocial behavior among familiar adults	-0.101	0.015	0.001	1.11	4.99	-0.030	0.014	0.034	1.03	1.48
Academic failure	-0.065	0.019	0.001	1.07	3.31	-0.009	0.017	0.609	ns	ns
Low school commitment	0.002	0.017	0.904	ns	ns	-0.021	0.016	0.196	ns	ns
Early initiation of drug use	-0.098	0.017	0.001	1.10	4.02	-0.040	0.016	0.011	1.04	1.63
Early initiation of antisocial behavior	-0.106	0.018	0.001	1.11	4.47	-0.026	0.015	0.090	ns	ns
Favorable attitudes to antisocial behavior	-0.073	0.018	0.001	1.08	3.30	-0.030	0.017	0.075	ns	ns
Favorable attitudes towards drug use	-0.075	0.017	0.001	1.08	3.32	-0.039	0.015	0.011	1.04	1.73
Intentions to use drugs	-0.051	0.019	0.009	1.05	2.23	-0.040	0.017	0.022	1.04	1.73
Perceived risks of drug use	-0.081	0.014	0.001	1.08	3.29	-0.034	0.014	0.018	1.03	1.38
Friends' use of drugs	-0.076	0.015	0.001	1.08	2.98	-0.029	0.014	0.039	1.03	1.12
Peer rewards for antisocial involvement	-0.064	0.013	0.001	1.07	2.79	-0.018	0.011	0.098	ns	ns
Protective Factors (8th-grade)										
Number of protective factors	0.322	0.073	0.001	1.38	na	0.121	0.062	0.052	ns	na
Community recognition for prosocial involvement	0.053	0.017	0.003	1.05	3.23	0.020	0.016	0.222	ns	ns
Family opportunities for prosocial involvement	0.025	0.026	0.341	ns	ns	0.007	0.017	0.691	ns	ns
Family recognition for prosocial involvement	0.062	0.025	0.016	1.06	4.48	0.005	0.017	0.765	ns	ns
School opportunities for prosocial involvement	0.035	0.016	0.026	1.04	2.05	0.020	0.013	0.126	ns	ns
School recognition for prosocial involvement	0.017	0.019	0.380	ns	ns	0.009	0.013	0.519	ns	ns
Social skills	0.082	0.017	0.001	1.09	4.63	0.032	0.015	0.030	1.03	1.83
Belief in the moral order	0.074	0.018	0.001	1.08	5.06	0.031	0.016	0.055	ns	ns
Level 3 (district)										
Per Pupil Total Expenditures						-0.125	0.207	0.546	ns	na
Number of Students in District						0.000	0.000	0.905	ns	na

Note. Odds ratios for Level-2 Free/Reduced lunch, substance use, and risk factors inverted for interpretability. B = unstandardized regression coefficient. SE = standard error. p = probability. %PAR = percentage population attributable risk. Adj = adjusted (for covariates). na = not applicable. ns = nonsignificant (i.e., p > .05).

Table 7. Predictors of 7th-Grade WASL Reading Achievement

Predictor Variable	Unconditional Model					Conditional Model				
	B	SE	*p*	Odds Ratio	PAR %	B	SE	*p*	Adj. Odds Ratio	Adj. PAR %
Level 1 (student)										
Race/Ethnicity (White)						0.459	0.051	0.001	1.58	na
Race/Ethnicity (Non-hispanic)						0.658	0.066	0.001	1.93	na
Gender (female)						0.148	0.025	0.001	1.16	na
Special education classes						2.386	0.073	0.001	10.87	na
Level 2 (school)										
Free/Reduced lunch						-0.090	0.007	0.001	1.09	na
30-day alcohol use (8th-grade)	-0.101	0.022	0.000	1.11	1.89	-0.022	0.015	0.158	ns	ns
30-day marijuana use (8th-grade)	-0.088	0.030	0.004	1.09	0.88	-0.020	0.022	0.382	ns	ns
30-day cigarette use (8th-grade)	-0.104	0.030	0.001	1.11	1.20	-0.044	0.023	0.058	ns	ns
Risk Factors (8th-grade)										
Number of risk factors	-0.166	0.028	0.001	1.18	na	-0.062	0.022	0.007	1.06	na
Low neighborhood attachment	-0.076	0.017	0.001	1.08	2.86	-0.022	0.012	0.067	ns	ns
Laws and norms favorable to drugs	-0.089	0.017	0.001	1.09	2.99	-0.043	0.012	0.001	1.04	1.43
Perceived availability of drugs	-0.051	0.016	0.002	1.05	1.45	-0.021	0.012	0.082	ns	ns
Perceived availability of handguns	-0.042	0.016	0.008	1.04	1.63	-0.030	0.015	0.037	1.03	1.18
Poor family management	-0.027	0.017	0.114	ns	ns	-0.028	0.012	0.023	1.03	1.15
Antisocial behavior among familiar adults	-0.093	0.013	0.001	1.10	3.69	-0.033	0.011	0.003	1.03	1.29
Academic failure	-0.068	0.019	0.001	1.07	3.28	-0.022	0.013	0.090	ns	ns
Low school commitment	0.022	0.017	0.183	ns	ns	-0.012	0.014	0.406	ns	ns
Early initiation of drug use	-0.075	0.016	0.001	1.08	2.10	-0.019	0.013	0.134	ns	ns
Early initiation of antisocial behavior	-0.094	0.015	0.001	1.10	3.10	-0.022	0.010	0.036	1.02	0.71
Favorable attitudes to antisocial behavior	-0.058	0.018	0.001	1.06	1.88	-0.019	0.012	0.125	ns	ns
Favorable attitudes towards drug use	-0.053	0.016	0.001	1.05	1.54	-0.021	0.012	0.084	ns	ns
Intentions to use drugs	-0.025	0.017	0.134	ns	ns	-0.010	0.013	0.456	ns	ns
Perceived risks of drug use	-0.061	0.013	0.001	1.06	2.38	-0.014	0.011	0.203	ns	ns
Friends' use of drugs	-0.052	0.014	0.001	1.05	1.51	-0.008	0.010	0.416	ns	ns
Peer rewards for antisocial involvement	-0.049	0.012	0.001	1.05	2.41	-0.006	0.010	0.550	ns	ns
Protective Factors (8th-grade)										
Number of protective factors	0.272	0.066	0.001	1.31	na	0.105	0.050	0.037	1.11	na
Community recognition for prosocial involvement	0.048	0.016	0.004	1.05	2.77	0.017	0.013	0.191	ns	ns
Family opportunities for prosocial involvement	0.028	0.022	0.196	ns	ns	0.012	0.012	0.324	ns	ns
Family recognition for prosocial involvement	0.067	0.026	0.011	1.07	4.48	0.012	0.015	0.417	ns	ns
School opportunities for prosocial involvement	0.016	0.015	0.258	ns	ns	0.013	0.011	0.261	ns	ns
School recognition for prosocial involvement	0.014	0.017	0.416	ns	ns	0.018	0.010	0.073	ns	ns
Social skills	0.058	0.018	0.002	1.06	4.01	0.023	0.014	0.096	1.03	1.83
Belief in the moral order	0.071	0.015	0.001	1.07	4.55	0.029	0.011	0.010	1.03	1.89
Level 3 (district)										
Per Pupil Total Expenditures						0.184	0.269	0.495	ns	na
Number of Students in District						0.001	0.001	0.868	ns	na

Note. Odds ratios for Level-2 Free/Reduced lunch, substance use, and risk factors inverted for interpretability. B = unstandardized regression coefficient. SE = standard error. p = probability. %PAR = percentage population attributable risk. Adj = adjusted (for covariates). na = not applicable. ns = nonsignificant (i.e., p > .05).

Table 8. Predictors of 7th-Grade WASL Writing Achievement

Predictor Variable	Unconditional Model					Conditional Model				
	B	SE	*p*	Odds Ratio	PAR %	B	SE	*p*	Adj. Odds Ratio	Adj. PAR %
Level 1 (student)										
Race/Ethnicity (White)						0.293	0.042	0.001	1.34	na
Race/Ethnicity (Non-hispanic)						0.576	0.067	0.001	1.78	na
Gender (female)						0.752	0.021	0.001	2.12	na
Special education classes						2.384	0.052	0.001	10.85	na
Level 2 (school)										
Free/Reduced lunch						-0.019	0.002	0.001	1.02	na
30-day alcohol use (8th-grade)	-0.134	0.025	0.001	1.14	2.54	-0.054	0.023	0.023	1.06	0.99
30-day marijuana use (8th-grade)	-0.120	0.030	0.001	1.13	1.22	-0.053	0.028	0.061	ns	ns
30-day cigarette use (8th-grade)	-0.127	0.028	0.001	1.13	1.48	-0.064	0.025	0.012	1.07	0.73
Risk Factors (8th-grade)										
Number of risk factors	-0.193	0.029	0.001	1.21	na	-0.102	0.029	0.001	1.11	na
Low neighborhood attachment	-0.067	0.016	0.001	1.07	2.52	-0.025	0.014	0.087	ns	ns
Laws and norms favorable to drugs	-0.102	0.017	0.001	1.11	3.45	-0.056	0.016	0.001	1.06	1.88
Perceived availability of drugs	-0.067	0.016	0.001	1.07	1.91	-0.039	0.015	0.012	1.04	1.13
Perceived availability of handguns	-0.064	0.016	0.001	1.07	2.47	-0.048	0.017	0.006	1.05	1.87
Poor family management	-0.049	0.020	0.015	1.05	1.90	-0.039	0.016	0.018	1.04	1.53
Antisocial behavior among familiar adults	-0.089	0.014	0.001	1.09	3.53	-0.032	0.014	0.024	1.03	1.25
Academic failure	-0.064	0.018	0.001	1.07	3.08	-0.009	0.015	0.542	ns	ns
Low school commitment	0.008	0.017	0.635	ns	ns	-0.021	0.016	0.181	ns	ns
Early initiation of drug use	-0.093	0.015	0.001	1.10	2.62	-0.049	0.014	0.001	1.05	1.37
Early initiation of antisocial behavior	-0.096	0.015	0.001	1.10	3.17	-0.032	0.013	0.014	1.03	1.06
Favorable attitudes to antisocial behavior	-0.068	0.018	0.001	1.07	2.20	-0.029	0.014	0.039	1.03	0.92
Favorable attitudes towards drug use	-0.067	0.016	0.001	1.07	1.95	-0.036	0.015	0.018	1.04	1.04
Intentions to use drugs	-0.045	0.017	0.010	1.05	1.34	-0.031	0.016	0.051	ns	ns
Perceived risks of drug use	-0.077	0.014	0.001	1.08	3.00	-0.037	0.011	0.001	1.04	1.45
Friends' use of drugs	-0.075	0.015	0.001	1.08	2.19	-0.033	0.014	0.018	1.03	0.94
Peer rewards for antisocial involvement	-0.052	0.012	0.001	1.07	3.14	-0.020	0.012	0.091	ns	ns
Protective Factors (8th-grade)										
Number of protective factors	0.272	0.068	0.001	1.31	na	0.136	0.059	0.023	1.15	na
Community recognition for prosocial involvement	0.035	0.017	0.043	1.04	2.00	0.019	0.014	0.179	ns	ns
Family opportunities for prosocial involvement	0.033	0.026	0.205	ns	ns	0.016	0.016	0.301	ns	ns
Family recognition for prosocial involvement	0.064	0.025	0.012	1.07	4.48	0.012	0.018	0.502	ns	ns
School opportunities for prosocial involvement	0.019	0.016	0.227	ns	ns	0.012	0.014	0.401	ns	ns
School recognition for prosocial involvement	0.018	0.016	0.283	ns	ns	0.029	0.013	0.035	1.03	1.64
Social skills	0.066	0.018	0.001	1.07	4.58	0.021	0.014	0.125	ns	ns
Belief in the moral order	0.072	0.017	0.001	1.07	4.64	0.034	0.015	0.029	1.03	2.19
Level 3 (district)										
Per Pupil Total Expenditures						-0.218	0.228	0.342	ns	na
Number of Students in District						0.000	0.000	0.149	ns	na

Note. Odds ratios for Level-2 Free/Reduced lunch, substance use, and risk factors inverted for interpretability. B = unstandardized regression coefficient. S standard error. p = probability. %PAR = percentage population attributable risk. Adj = adjusted (for covariates). na = not applicable. ns = nonsignificant (i.e., p > .05).