

**Relationships between Student Substance Use, Risk, and Protection  
in Kansas Schools and Students' 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

Final Report

May, 2006

## Abstract

This report examined relationships between demographic and social/behavioral characteristics of student populations in Kansas schools and the average academic test scores of students in those schools. Data on the percent of students eligible for free or reduced price lunch, the percent of male students, and the percent of nonwhite students in each school building, along with building average achievement test scores in reading and math for 7<sup>th</sup> and 10<sup>th</sup> grade students for the years 2000 through 2003 were obtained from the Kansas Department of Education. Data on student substance use and risk and protective factors that predict adolescent problem behavior assessed by the Kansas Communities That Care survey conducted in 2000 through 2003 were obtained from the Kansas Department of Social and Rehabilitation Services. Pearson correlation coefficients were computed to assess the degree of relationship between each of the demographic, substance use, and risk and protective factor averages at the school building level, and the average reading and math achievement test scores at each school. Among the demographic characteristics, percent eligible for free or reduced price lunch and percent nonwhite showed moderate to strong negative relationships with academic test scores. That is, schools with higher percentages of students eligible for free and reduced price lunch and nonwhite students had lower average test scores, accounting for 17% to 31% and 6% to 27% of the variation in test scores across schools, respectively, averaging across the 4 years. Percent male was not related to test scores. The prevalence of student substance use in schools was also negatively related to student test scores in most comparisons, accounting for 2% to 17% of the variation in test scores across schools averaging across years. Almost all of the risk and protective factor average scores were also significantly related to average test scores, with higher average risk scores and lower average protective factor scores corresponding to lower average test scores. These relationships accounted for 1% to 25% of the variation in test scores across schools averaging across years. Relationships between substance use/risk/protective factors and test scores were found both within and across grade cohorts, and after controlling for the demographic characteristics of the students within the schools. These findings suggest that prevention programs that reduce student substance use and risk factors while increasing protective factors in student populations are likely to improve the achievement test scores of the students in those schools.

## Introduction

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 factors that predict increased likelihood of problems and protective factors that moderate or mediate risk to predict decreased 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 and directly reducing youth problems (Durlak, 1998; Elliot, 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 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. 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 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 (Wang et al., 1997), and all can be impacted by school-based preventive interventions (Gottfredson, 2001; Greenberg et al., 2003; Hawkins et al., 1999; Hawkins et al., 2001). There is also evidence that substance use and delinquency are major predictors of school dropout (Battin-Pearson et al., 2000).

Following passage of the No Child Left Behind Act of 2001, school administrators are facing increased mandates 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 focus on test scores is forcing school administrators to prioritize where and how to devote resources in order to meet these requirements. 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 hesitant 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 increasing academic achievement (Kaftarian, Robinson, 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**

Much of the research on predictors of academic achievement has focused on demographic characteristics of student populations such as gender, race and ethnicity, and poverty, and the No Child Left Behind Act requires schools to track the annual yearly progress of students in groups defined by these variables. Thus, in examining relationships between a broader array of risk and protective factors and academic test scores, it is important to control for the effects of these demographic characteristics. Research on these factors is reviewed briefly in this section.

*Gender.* While there have been many reports of a gender gap in achievement, with boys generally performing at lower levels than girls (Gorard, et al., 2001; Epstein, et al., 1998; Francis, 2000; 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. 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 SES, Battin-Pearson and her colleagues (2000) 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/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 et al., 1990; Steinberg et al., 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 et al., 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, 2002; Smith, Brooks-Gunn, & Klebanov, 1997). Conger and his colleagues (1997) found that 10<sup>th</sup> 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 10<sup>th</sup> 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, Catalano, & Miller, 1991), 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 8<sup>th</sup> graders and more than one third of 10<sup>th</sup> 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 et al., 2001; Jeynes, 2002; Hawkins et al., 1992) and to drop out of school (Garnier, Stein, & Jacobs, 1997; Janosz & LeBlanc, 1996; Krohn et al., 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 et al., 1997; Hawkins et al., 2001; Hymel et al., 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 7<sup>th</sup> grade, predicted higher scores on the Washington Assessment of Student Learning (WASL) tests when the students were in the 10<sup>th</sup> grade. Conversely, alcohol and cigarette use, aggressive behavior, attention problems, and negative behavior of peers measured in 7<sup>th</sup> grade predicted lower scores on the 10<sup>th</sup> grade WASL. These findings were maintained after controlling for students' gender, race and ethnicity, SES, and 4<sup>th</sup> 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 social 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). 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.

This report describes findings from an analysis of relationships between the prevalence of student alcohol, tobacco and other drug use, and the levels of risk and protective factors that predict adolescent problem behaviors in Kansas public schools, and the average achievement test scores of students within those schools. Each of these relationships is examined individually, such that efforts to reduce the prevalence of each type of substance and each risk factor, as well as efforts to increase each protective factor can be assessed in terms of their relevance for increasing students' academic achievement test scores. Since school-based prevention programs are often delivered universally to all students, and since school performance in improving student achievement is evaluated at the school building level, the associations between substance use, risk and protective factors and academic achievement is assessed at the school building, rather than individual level. While other studies have documented the effects of individual student's exposure to specific risk and protective factors and their academic achievement (e.g., Fleming et al, in press), few studies have examined relationships between the levels of a broad array of risk and protective factors in schools and the achievement test scores of students in those schools (Hansen et al., 2003; Mandell et al., 2003).

## **Method**

Statistical analyses consisted of school-level correlations between academic test score data and school characteristics from the Kansas State Assessment as well as correlations between academic test score data and substance use/risk factor/protective factor data from the Kansas Communities That Care Youth Survey. In each data set, school building identifiers were removed and replaced with a number code that allowed the researchers to match the two sets of data at the school building level without being able to identify any individual schools. Specifically, data collected each year from 2000 to 2003 were used to calculate annual mean reading and math test scores, percentage of students receiving free or reduced price lunch, percentage nonwhite students, percentage male students, prevalence of substance use, and mean risk/protective factor scale scores for each school building. For each year, four sets of comparisons were possible: For reading, 8<sup>th</sup>-grade school-level test scores were matched with 8<sup>th</sup>-grade substance use and risk/protective factor data, and 11<sup>th</sup>-grade test scores were matched with 10<sup>th</sup>-grade substance use and risk/protective factor data by school building. For math, 7<sup>th</sup>-grade



school-level test scores were matched with 8<sup>th</sup>-grade substance use and risk/protective factor data, and 10<sup>th</sup>-grade test scores were matched with 10<sup>th</sup>-grade substance use and risk/protective factor data, also by school building. Thus, analyses consisted of one within-cohort and one cross-cohort comparison for each of the annual reading and math outcomes. Furthermore, for each of the within-cohort and cross-cohort comparisons, analyses consisted of both (a) unadjusted bivariate associations between academic outcomes and substance use/risk factor/protective factor data, and (b) partial correlations between these variables controlling statistically for the effects of other student-population characteristics. For Years 2000 and 2001, these characteristics included the percentage of students who were nonwhite and the percentage of students eligible for free or reduced lunch in each school. For Years 2002 and 2003, data on the percentage of male students in each school were also available and were included as an additional control variable.

All reported correlations represent Pearson product moment correlation coefficients ( $r$ ). These correlations indicate the degree of linear association between two variables and range from -1 (indicating a perfect inverse linear relationship) to +1 (indicating a perfect direct linear relationship). Values closer to zero indicate weaker relationships with a value of zero indicating no linear relationship between variables. Cohen (1992) suggested that a Pearson product moment coefficient of .10 indicates a “small” positive relationship, a value of .30 indicates a “medium” positive relationship, and a value of .50 represents a “large” positive relationship; however, these benchmarks should be interpreted in light of the nature of the data and study design.

Additionally, the Pearson product moment correlation can be squared to produce the *coefficient of determination* ( $r^2$ ). This statistic represents the proportion of total variability in the sample explained by the linear relationship between two variables. Coefficients of determination can range from 0 (indicating no ability for one variable to explain the variation in the other variable) to 1 (indicating that one variable explains 100% of the variation in the other variable). In this report, all correlations with Type I error rates below .05 were considered to be statistically significant.

## Analysis Samples

The numbers of schools (and students) in each data set and in the final analysis samples are presented in Table 1. For example, in 2000, reading test score data were available for 34,262 8<sup>th</sup>-grade students in 398 schools and 29,280 11<sup>th</sup>-grade students in 347 schools. For that same year, math test score data were available for 33,767 7<sup>th</sup>-grade students in 387 schools and 32,181 10<sup>th</sup>-grade students in 348 schools. Data for school characteristics were available for a subset of schools with achievement test score data (the numbers of schools with school characteristic data are presented in Table DC). Data from the 2000 Kansas Communities That Care Youth Survey on substance use and risk/protective factors were available for 15,091 8<sup>th</sup>-grade students in 202 schools and 14,246 10<sup>th</sup>-grade students in 188 schools. From these data sets, students missing school identification codes, reporting inconsistent or extreme levels of substance use (e.g., using marijuana, cocaine, LSD, and inhalants 40 or more times within the past 30 days), or belonging to schools with less than 10 students per school were omitted from the analyses. Thus, in Year 2000, matching test score data to substance use/risk factor/protective factor data resulted in analysis samples of 174 schools (consisting of a total of 17,828 students) for the unconditional analysis (i.e., no control variables) of 8<sup>th</sup>-grade reading scores and 171 schools (17,427 students) for the unconditional analysis of 7<sup>th</sup>-grade math scores. Missing data in control variables used in the conditional analyses (i.e., partial correlations) further reduced the available sample sizes. Conditional analysis of 8<sup>th</sup>-grade reading test scores in 2000 consisted of 151 schools (16,553 students) and conditional analysis of 7<sup>th</sup>-grade math test scores in 2000 consisted of 144 schools (15,695 students).

Family risk and protective factors were not included in all school surveys; therefore, effective sample sizes for these factors represent a subset of the larger analysis sample. For example, in 2000, analysis of family risk and protective factors were limited to 105 schools (9,436 students) in the unconditional analysis of 8<sup>th</sup>-grade reading test scores and 102 schools (9,370 students) in the unconditional analysis of 7<sup>th</sup>-grade math test scores (not shown in Table 1).

Schools included in the unconditional analysis samples were compared to schools excluded from the analysis due to missing substance use or risk/protective factor data on schools' mean reading

and math test scores. Out of the 16 comparisons, only 3 were statistically significant. In Year 2000, schools included in the unconditional analysis had a mean 7<sup>th</sup>-grade math test score of 51.5 (SD = 7.6) whereas schools not included in the analysis had a mean math test score of 49.7 (SD = 8.1),  $F(1, 385) = 4.77, p = .030$ . Conversely, in 2001, schools in the unconditional analyses had significantly *lower* 8<sup>th</sup>-grade reading test scores than schools not included in the analyses,  $M_s = 80.7$  and  $82.0, SD_s = 4.0$  and  $4.0$ , respectively,  $F(1, 401) = 10.45, p = .001$ . And in 2003, the opposite trend was found again with schools in the unconditional analyses having significantly *higher* 11<sup>th</sup>-grade reading test scores than schools not included in the analyses,  $M_s = 80.4$  and  $78.6, SD_s = 10.0$  and  $3.6$ , respectively,  $F(1, 348) = 5.55, p = .001$ . In each case, the effect size, a measure of the degree of the difference, was small. This indicates that, in the three instances where differences were found, differences in test scores between the sample schools and all Kansas schools were small. In general, sample schools were similar to schools excluded from the analysis.

## Results

Characteristics of schools included in the final analysis samples are presented in Table 2. School-level correlations between mean reading/math test scores and the three school characteristics used as control variables are presented in Table 3 by year and grade. Because the achievement test scores and school characteristics were sampled from the same cohort of students within each year, correlations represent within-cohort comparisons. School-level correlations among mean reading test scores and substance use/risk/protective factors are presented in Tables 4 through 7 (for Years 2000 through 2003, respectively). For these same years, school-level correlations among mean math test scores and substance use/risk/protective factors are presented in Tables 8 through 11, respectively. Each table displays bivariate correlations of achievement test scores with each of 5 substance use measures, 24 risk factors, and 9 protective factors. In 2003 (Tables 7 and 11), data on an additional risk factor, Peer-Individual Intention to Use Drugs, were available and included in the analyses. Within each table, Pearson product moment correlations from unconditional analyses and partial correlations from analyses controlling for the effects of possible confounding variables are presented for both the within-cohort and cross-cohort comparisons. For example, in Table 4 (Year 2000), within-cohort analyses represent correlations

between school-level mean reading test scores for 8<sup>th</sup>-graders and school-level mean substance use/risk/protective factors for the 8<sup>th</sup>-graders in those schools. Cross-cohort analyses in Table 4 represent correlations between school-level mean reading test scores for 11<sup>th</sup>-graders and school-level mean substance use/risk/protective factors for 10<sup>th</sup>-graders in the same schools from the same year.

*Associations Among Achievement Test Scores and School Characteristics.* As shown in Table 3, correlations generally showed medium to strong negative relationships between school-level achievement test scores and percentages of students receiving free or reduced price lunches and percentages of nonwhite students across all four years. Correlations between reading/math test scores and the percentage of male students in schools (for 2002 and 2003) were universally nonsignificant suggesting no relationship between this variable and achievement test scores. Coefficient of determination values (averaged across all four years) for the relationships between achievement test scores and free or reduced price lunch ranged from a low of .17 for Grade 11 reading test scores to a high of .31 for Grade 7 math test scores, suggesting that, on average, between 17% and 31% of the variation in school-averaged achievement test scores could be accounted for by proportions of students receiving free or reduced price lunches. Coefficient of determination values (again, averaged across all four years) for the relationships between achievement test scores and percentages of nonwhite students were somewhat smaller ranging from .06 for Grade 11 reading test scores to .27 for Grade 7 math test scores. This suggests that, on average, between 6% and 27% of the variation in achievement test scores could be accounted for by proportions of nonwhite students in schools.

*Associations Among Achievement Test Scores and Substance Use.* Results of correlations among reading/math test scores and substance use measures showed small- to large-sized negative correlations across all substance use measures for different years and cohort comparisons. Generally, correlations for both reading and math test scores appeared to be strongest for 30-day marijuana use. Within-cohort comparisons (Grade 8 school-mean reading test scores correlated with Grade 8 school-mean substance use) of unconditional reading test scores across the four years of data resulted in 18 of the 20 examined correlations being statistically significant. Thirteen of these remained statistically significant after school characteristics were included in

the conditional analyses. For math, all of the unconditional within-cohort (Grade 10 school-mean math test scores correlated with Grade 10 school-mean substance use) analyses for 2000 and 2001 were statistically significant; however, only 4 of the 10 correlations were significant in 2002 and 2003. Across all four years, 12 of the 14 significant unconditional within-cohort correlations remained statistically significant when school characteristics were controlled.

Across the four years of reading test score data, correlations from cross-cohort comparisons (Grade 11 school-mean reading test scores with Grade 10 substance use measures) were less consistent. For example, in Year 2000, none of the five examined substance use measures was significantly related to reading test scores in the unconditional models; however, in Year 2001, all five substance use measures were significantly related to reading test scores and, in Years 2002 and 2003, two of the five substance use measures were significantly related to reading test scores. Generally, controlling for school characteristics in the conditional models did not diminish these associations. Cross-cohort comparisons for math test scores (Grade 7 school-mean math test scores with Grade 8 substance use measures) were somewhat more stable with 14 of the 20 examined unconditional correlations demonstrating significant associations. However, fewer than half (43%) of the 14 significant correlations remained statistically significant in the conditional analyses.

*Associations Among Achievement Test Scores and Risk Factors.* Results indicated that all risk factors were negatively associated with reading and math test scores in some years and cohort comparisons. Large within-cohort correlations with both reading and math test scores were evident for several risk factors across all years (e.g., Family History of Antisocial Behavior, Early Initiation of Antisocial Behavior, and Antisocial Peers). Within-cohort comparisons from unconditional analyses of reading test scores indicated that 85 of the 97 (89%) examined correlations were statistically significant. Similarly, within-cohort comparisons from unconditional analyses of math test scores indicated that 75 of the 97 (78%) examined correlations were statistically significant. Introduction of school characteristics as control variables in conditional analyses did not diminish the within-cohort associations among reading test scores and risk factors in Years 2000 and 2001; however, in Years 2002 and 2003, the converse was true with approximately half of these significant correlations becoming

nonsignificant in the conditional models. Conditional analyses of math test scores statistically controlling for characteristics of schools indicated virtually no reduction in the number of significant within-cohort correlations among the examined risk factors.

Cross-cohort comparisons also indicated significant negative associations between reading/math test scores and risk factors; however these associations were not as consistent from year to year as those for the within-cohort comparisons. For example, although only 9 out of the 24 (38%) correlations among reading test scores and risk factors in Year 2000 were significant, 20 of the 24 (79%) correlations in Year 2001 were significant. For math test scores, the number of significant cross-cohort correlations from unconditional models ranged from a low of 14 out of 24 (58%) in Year 2000 to a high of 22 out of 24 (92%) in Year 2002. Of these, approximately one-quarter (26% in 2003) to a little over one-half (58% in 2001) ceased to be significant in the conditional analyses.

*Associations Among Achievement Test Scores and Protective Factors.* Results of unconditional within-cohort analyses indicated significant positive associations with achievement test scores for the majority of examined protective factors. Across all four years, medium to large correlations with both reading and math test scores were found for Community Opportunities for Prosocial Involvement, and small to medium correlations were found for School Rewards for Prosocial Involvement, Social Skills, and Belief in the Moral Order. Except for correlations with reading test scores in 2003, conditional analyses controlling for school characteristics generally did not diminish the within-cohort associations among achievement scores and protective factors. Results from the unconditional cross-cohort analyses indicated that, except for Year 2000, almost all protective factors were significantly associated with both reading and math test scores. Again, introduction of school characteristics as control variables in conditional cross-cohort analyses generally did not diminish the associations among achievement test scores and protective factors.

### **Conclusions and Implications for Policy and Practice**

The results 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), and aggregate group level (Mandel et al., 2002). The findings add to the existing literature by demonstrating that aggregate school-building levels of substance use, risk, and protection are related to the achievement test scores of students within those schools, including students in grades other than those reporting on levels of substance use, risk and protection.

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 related to the average 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 suggest 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 correlated school building means on both the predictors (substance use and risk and protective factors) and outcomes (achievement test scores). Such group-level correlations among individual-level data can be unreliable and heavily dependent on the sample of groups included in the analysis. This can be seen in the year-to-year variation in the magnitude of the correlations observed. Thus, in interpreting these results one should consider the overall pattern observed. Also, these analyses reveal associations between cross-sectional data, so one cannot assume causality in the relationships between substance use and risk and protective factors and academic outcomes. Future analyses examining the possible effects of changes in 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.

#### 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 (2003) found, in a survey of school administrators, that many were not familiar with the Principles of Effectiveness. 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 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, 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 Kansas Communities That Care 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 et al., 2005). The profiles of risk and protection provided by the KSCTC Survey 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, 2003; Hawkins et al., 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; Elliot, 1998; Greenberg et al., 1999; Hawkins & Catalano, 2005; 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 (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, can have a substantial impact on the social, emotional, and academic development of our youth.

## References

- Abbot, M. L., & Joireman, J. (2001). *The relationships among achievement, low income, and ethnicity across six groups of Washington State students*. Seattle: Washington School Research Center.
- Arthur, M. W., Hawkins, J. D., Pollard, J. A., Catalano, R. F., & Baglioni, A. J., Jr. (2002). Measuring risk and protective factors for substance use, delinquency, and other adolescent problem behaviors: The Communities That Care Youth Survey. *Evaluation Review, 26*, 575-601.
- Battin-Pearson, S., Newcomb, M. D., Abbott, R. D., Hill, K. G., Catalano, R. F., & Hawkins, J. D. (2000). Predictors of early high school dropout: A test of five theories. *Journal of Educational Psychology, 92*, 568-582.
- Becker, B., & Luthar, S. (2002). Social-Emotional Factors Affecting Achievement Outcomes Among Disadvantaged Students: Closing the Achievement Gap. *Educational Psychologist, 37*, 197-214.
- Cohen, J. (1992). A power primer. *Psychological Bulletin, 112*, 155-159.
- Coie, J. D., Watt, N. F., West, S. G., Hawkins, J. D., Asarnow, J. R., Markman, H. J., et al. (1993). The science of prevention. A conceptual framework and some directions for a national research program. *American Psychologist, 48*, 1013-1022.
- Conger, R. D., Conger, K. J., & Elder Jr., G. H. (1997). Family economic hardship and adolescent adjustment: Mediating and moderating processes. In G. J. Duncan & J. Brooks-Gunn (Eds.), *Consequences of growing up poor* (pp. 288-310). New York: Russell Sage Foundation.
- Considine, G., & Zappala. (2002). Factors influencing the educational performance of students from disadvantaged backgrounds. In T. Eardley & B. Bradbury (Eds.), *Competing Visions: Refereed Proceedings of the National Social Policy Conference 2001* (pp. 91-107). Sydney: University of New South Wales.
- Department of Education. (1998). *Turning the Tide in schools: Individual School Drug Education Strategy guidelines*. Melbourne: Australian Drug Foundation.
- Drug Strategies. (1996). *Making the grade: A guide to school drug prevention programs*. Washington, DC: Drug Strategies.
- Durlak, J. A. (1998). Common risk and protective factors in successful prevention programs. *American Journal of Orthopsychiatry, 68*, 512-520.
- Eamon, M. K. (2002). Influences and mediators of the effect of poverty on young adolescent depressive symptoms. *Journal of Youth and Adolescence, 31*, 231-242.
- Elias, M. J., Zins, J. E., Graczyk, P. A., & Weissberg, R. P. (2003). Implementation, sustainability, and scaling up of social-emotional and academic innovations in public schools. *School Psychology Review, 32*, 303-319.
- Elias, M. J., Zins, J. E., Weissberg, R. P., Frey, K. S., Greenberg, M. T., Haynes, N. M., et al. (1997). *Promoting social and emotional learning: Guidelines for educators*. Alexandria, VA: Association for Supervision and Curriculum Development.
- Ellickson, P. L. (1995). Schools. In R. H. Coombs & D. Ziedonis (Eds.), *Handbook on drug abuse prevention: A comprehensive strategy to prevent the abuse of alcohol and other drugs* (pp. 93-120). Needham Heights, MA: Allyn & Bacon.

- Ellickson, P. L., Tucker, J. S., & Klein, D. J. (2001). High-risk behaviors associated with early smoking: Results from a 5-year follow-up. *Journal of Adolescent Health, 28*, 465-473.
- Elliott, D. S. (1998). *Blueprints for violence prevention*. Boulder, CO: Center for the Study and Prevention of Violence, Institute of Behavioral Science, University of Colorado at Boulder.
- Elliott, D. S., & Mihalic, S. (2004). Issues in disseminating and replicating effective prevention programs. *Prevention Science, 5*, 47-52.
- Epstein, D., Elwood, J., Hey, V., & Maw, J. (Eds.). (1998). *Failing boys? Issues in gender and achievement*. Buckingham/Philadelphia: Open University Press.
- Farkas, G. (2003). Racial Disparities and Discrimination in Education: What Do We know, How Do We Know It, and What Do We Need to Know? *The Teachers College Record, 105*, 1119-1146.
- Fleming, C. B., Haggerty, K. P., Catalano, R. F., Harachi, T. W., Mazza, J. J., & Gruman, D. H. (2005). Do social and behavioral characteristics targeted by preventive interventions predict standardized test scores and grades? *Journal of School Health, 75*, 342-349.
- Francis, B. (2000). *Boys, Girls, and Achievement: Addressing the Classroom Issues*. New York: RoutledgeFalmer.
- Garnier, H. E., Stein, J. A., & Jacobs, J. K. (1997). The process of dropping out of high school: A 19-year perspective. *American Educational Research Journal, 34*, 395-419.
- Glaser, R. R., Van Horn, M. L., Arthur, M. W., Hawkins, J. D., & Catalano, R. F. (2005). Measurement properties of the Communities That Care Youth Survey across demographic groups. *Journal of Quantitative Criminology, 21*, 73-102.
- Gorard, S., Rees, G., & Salisbury, J. (2001). Investigating the patterns of differential attainment of boys and girls at school. *British Educational Research Journal, 27*, 125-139.
- Gottfredson, D. C. (2001). *Schools and delinquency*. Cambridge: Cambridge University Press.
- Greenberg, M. T., Domitrovitch, C., & Bumbarger, B. (1999). *Preventing mental disorder in school-age children: A review of the effectiveness of prevention programs*. University Park, PA: Center for Mental Health Services (SAMHSA) by the Prevention Research Center, Pennsylvania State University.
- Greenberg, M. T., Weissberg, R. P., O'Brien, M. U., Zins, J. E., Fredericks, L., Resnik, H., et al. (2003). Enhancing School-Based Prevention and Youth Development Through Coordinated Social, Emotional, and Academic Learning. *American Psychologist, 58*, 466-474.
- Guo, G. (1998). The timing of the influences of cumulative poverty on children's cognitive ability and achievement. *Social Forces, 77*, 257.
- Gutman, L. M., Sameroff, A. J., & Eccles, J. S. (2002). The Academic Achievement of African American Students During Early Adolescence: An Examination of Multiple Risk, Promotive, and Protective Factors. *American Journal of Community Psychology, 30*, 367-399.
- Halle, T., Kurtz-Costes, B., & Mahoney, J. L. (1997). Family Influences on School Achievement in Low-Income, African American Children. *Journal of Educational Psychology, 89*, 527-537.
- Hallfors, D., & Godette, D. (2002). Will the 'Principles of Effectiveness' improve prevention practice? Early findings from a diffusion study. *Health Education Research, 17*, 461-470.

- Hallfors, D. D., Godette, D., Sporer, A., & Pankratz, M. M. (2000). *Drug free schools survey: Report of results*. Chapel Hill, NC: School of Public Health, The University of North Carolina.
- Han, L., & Hoover, H. D. (1994, April). *Gender differences in achievement test scores*. Presented at the Annual Meeting of the National Council on Measurement in Education, New Orleans, LA.
- Hantman, I., & Crosse, S. (2000). *Progress in prevention. Report on the National Study of Local Education Agency Activities under the Safe and Drug Free Schools and Communities Act*. Rockville, MD: U.S. Department of Education.
- Hanson, T.L., & Austin, G.A. (2003). *Student health risks, resilience, and academic performance in California: Year 2 report, longitudinal analyses*. San Francisco, CA: WestEd.
- Hawkins, J. D., & Catalano, R. F. (2004). *Communities That Care: Prevention strategies guide*. South Deerfield MA: Channing Bete.
- Hawkins, J. D., Catalano, R. F., & Arthur, M. W. (2002). Promoting science-based prevention in communities. *Addictive Behaviors, 27*, 951-976.
- Hawkins, J. D., Catalano, R. F., Kosterman, R., Abbott, R., & Hill, K. G. (1999). Preventing adolescent health-risk behaviors by strengthening protection during childhood. *Archives of Pediatrics and Adolescent Medicine, 153*, 226-234.
- Hawkins, J. D., Catalano, R. F., & Miller, J. Y. (1992). Risk and protective factors for alcohol and other drug problems in adolescence and early adulthood: Implications for substance-abuse prevention. *Psychological Bulletin, 112*, 64-105.
- Hawkins, J. D., Guo, J., Hill, K. G., Battin-Pearson, S., & Abbott, R. D. (2001). Long-term effects of the Seattle Social Development intervention on school bonding trajectories. *Applied Developmental Science: Special issue: Prevention as altering the course of development, 5*, 225-236.
- Hymel, S., Comfort, C., Schonert-Reichl, K., & McDougall, P. (1996). Academic failure and school dropout: The influence of peers. In J. Jovonen & K. R. Wentzel (Eds.), *Social motivation: Understanding children's school adjustment*. (pp. 313-345). New York, NY: Cambridge University Press.
- Janosz, M., & Le Blanc, M. (1996, November). *The heterogeneity of school dropouts and the links with drug use and delinquency*. Presented at the annual meeting of the American Society of Criminology, Chicago.
- Jeynes, W. H. (2002). The Relationship between the Consumption of Various Drugs by Adolescents and their Academic Achievement. *American Journal of Drug and Alcohol Abuse, 28*, 15-35.
- Johnston, L. D., O'Malley, P. M., Bachman, J. G., & Schulenberg, J. E. (2005). *Monitoring the Future national results on adolescent drug use: Overview of key findings, 2004*. NIH Publication No. 05-5726. Bethesda, MD: National Institute on Drug Abuse.
- Kaferian, S., Robertson, E., Compton, W., Davis, B. W., & Volkow, N. (2004). Blending Prevention Research and Practice in Schools: Critical Issues and Suggestions. *Prevention Science, 5*, 1-3.
- Kawashima, K., Durlak, J., & Weissberg, R. (2005). *Positive Youth Development: How Well Does It Work?* Presented at the Prevention Science to Public Health: Promoting Well-Being in the Population, 13th Annual Meeting of the Society for Prevention Research, Washington, D.C.

- Keith, T. Z., & Keith, P. B. (1993). Does parental involvement affect eighth-grade student achievement? Structural analysis of national data. *School Psychology Review, 22*, 474-496.
- Korenman, S., Miller, J. E., & Sjaastad, J. E. (1995). Long-term poverty and child development in the United States: Results from the NLSY. *Children and Youth Services Review, 17*, 127-155.
- Krohn, M. D., Thornberry, T. P., Collins-Hall, L., & Lizotte, A. J. (1995). School dropout, delinquent behavior, and drug use: An examination of the causes and consequences of dropping out of school. In B. K. Howard (Ed.) *Drugs, crime, and other deviant adaptations: Longitudinal studies. Longitudinal research in the social and behavioral sciences: An interdisciplinary series.* (pp. 163-183). New York: Plenum Press.
- Malecki, C. K., & Elliott, S. N. (2002). Children's social behaviors as predictors of academic achievement: A longitudinal analysis. *School Psychology Quarterly, 17*, 1-23.
- Mandell, D., Hill, S., Carter, L., & Brandon, R. (2002). *The impact of substance use and violence/delinquency on academic achievement for groups of middle and high school students in Washington.* Seattle: U of Washington.
- Mau, W. C., & Lynn, R. (2000). Gender differences in homework and test scores in mathematics, reading and science at tenth and twelfth grade. *Psychology, Evolution, and Gender, 2*, 119-125.
- Mrazek, P. J., & Haggerty, R. J., Eds.; Committee on Prevention of Mental Disorders, Institute of Medicine. (1994). *Reducing risks for mental disorders: Frontiers for prevention intervention research.* Washington, DC: National Academy Press.
- National Institute on Drug Abuse. (1997). *Preventing drug use among children and adolescents: A research-based guide. (National Institutes of Health Publication Number 97-4212).* Bethesda, MD: National Institutes of Health.
- Orthner, D. K., Cook, P. G., Rose, R. A., & Randolph, K. (2002). Welfare reform, poverty, and children's performance in school: Challenges for the school community. *Children & Schools, 24*, 105.
- Patterson, C. J., Kupersmidt, J. B., & Vaden, N. A. (1990). Income Level, Gender, Ethnicity, and Household Composition as Predictors of Children's School-Based Competence. *Child Development, 61*, 485-494.
- Pollard, J. A., Hawkins, J. D., & Arthur, M. W. (1999). Risk and protection: Are both necessary to understand diverse behavioral outcomes in adolescence? *Social Work Research, 23*, 145-158.
- Ringwalt, C. L., Ennett, S., Vincus, A., Thorne, J., Rohrbach, L. A., & Simons-Rudolph, A. (2002). The prevalence of effective substance use prevention curricula in U.S. middle schools. *Prevention Science, 3*, 257--265.
- Ryan, A. M. (2001). The Peer Group as a Context for the Development of Young Adolescent Motivation and Achievement. *Child Development, 72*, 1135-1150.
- Silvia, E. S., & Thorne, J. (1997). *School-based drug prevention programs- A longitudinal study in selected school districts.* Research Park, NC: Research Triangle Institute.
- Simons-Rudolph, A. P., Ennett, S. T., Ringwalt, C. L., Rohrbach, L. A., Vincus, A. A., & Johnson, R. E. (2003). The Principles of Effectiveness: Early awareness and plans for implementation in a national sample of public schools and their districts. *Journal of School Health, 73*, 181-185.

- Smith, J., Brooks-Gunn, J., & Klebanov, P. (1997). Consequences of living in poverty for young children's cognitive and verbal ability and early school achievement. In G. Duncan & J. Brooks-Gunn (Eds.), *Consequences of growing up poor*. New York: Russell Sage Foundation.
- Steinberg, L., Dornbusch, S. M., & Brown, B. B. (1992). Ethnic Differences in Adolescent Achievement: An Ecological Perspective. *American Psychologist* June 1992;47(6):723-729, 47, 723-729.
- Tobler, N. S., Roona, M. R., Ochshorn, P., Marshall, D. G., Streke, A. V., & Stackpole, K. M. (2000). School-based adolescent drug prevention programs: 1998 meta-analysis. *Journal of Primary Prevention*, 20, 275-336.
- U.S. Department of Education. (2003). *No Child Left Behind: Accountability and AYP*. Retrieved August 3, 2005, from <http://www.ed.gov/admins/lead/account/ayp203/accountabilityayp03.pdf>.
- U.S. Department of Health and Human Services. (1999). *Mental health: A report of the Surgeon General*. Rockville, MD: U.S. Department of Health and Human Services, Substance Abuse and Mental Health Services Administration, Center for Mental Health Services, National Institutes of Health, National Institute of Mental Health.
- U.S. Department of Health and Human Services. (2001). *Youth violence: A report of the Surgeon General*. Rockville, MD: U.S. Department of Health and Human Services, Substance Abuse and Mental Health Services Administration, Center for Mental Health Services, National Institutes of Health, National Institute of Mental Health.
- Van Houtte, M. (2004). Why boys achieve less at school than girls: the difference between boys' and girls' academic culture. *Educational Studies*, 30, 159-173.
- Wang, M. C., Haertel, G. D., & Walberg, H. J. (1997). Learning influences. In H. J. Walberg & G. D. Haertel (Eds.), *Psychology and Educational Practice* (pp. 119-211). Berkeley, CA: McCatchan.
- Washington Kids Count. (2001). *Exploring disparities in education achievement: The impact of school funding - Technical Report*. Seattle, WA: Human Services Policy Center, Evans School of Public Affairs, University of Washington.
- Weissberg, R. P., & Greenberg, M. T. (1998). School and community competence-enhancement and prevention programs. In I. E. Siegel & K. A. Renninger (Eds.), *Handbook of child psychology: Vol. 4. Child psychology in practice* (5th ed., pp. 877-954). New York: Wiley.
- Wentzel, K. R. (1991). Relations between social competence and academic achievement in early adolescence. *Child Development*, 62, 1066-1078.
- Zins, J. E., Bloodworth, M. R., Weissberg, R. P., & Walberg, H. J. (2004). The Scientific Base Linking Social and Emotional Learning to School Success. In J. E. Zins, R. P. Weissberg, M. C. Wang, & H. J. Walberg (Eds.), *Building Academic Success on Social and Emotional Learning* (pp. 3-22). New York, NY: Teachers College Press.