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Preventing the Link Between SES and High-Risk Behaviors: "Value-Added" Education, Drug Use and Delinquency in High-Risk, Urban Schools

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Abstract

We examined whether schools achieving better than expected educational outcomes for their students influence the risk of drug use and delinquency among urban, racial/ethnic minority youth. Adolescents (n=2,621), who were primarily African American and Hispanic and enrolled in Chicago public schools (n=61), completed surveys in 6th (aged 12) and 8th (aged 14) grades. Value-added education was derived from standardized residuals of regression equations predicting school-level academic achievement and attendance from students' sociodemographic profiles and defined as having higher academic achievement and attendance than that expected given the sociodemographic profile of the schools' student composition. Multilevel logistic regression estimated the effects of value-added education on students' drug use and delinquency. After considering initial risk behavior, value-added education was associated with lower incidence of alcohol, cigarette and marijuana use; stealing; and participating in a group-against-group fight. Significant beneficial effects of value-added education remained for cigarette and marijuana use, stealing and participating in a group-against-group fight after adjustment for individual- and school-level covariates. Alcohol use (past month and heavy episodic) showed marginally significant trends in the hypothesized direction after these adjustments. Inner-city schools may break the links between social disadvantage, drug use and delinquency. Identifying the processes related to value-added education in order to improve school environments is warranted given the high costs associated with individual-level interventions.

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Keywords

Schools; Drug use; Delinquency; Urban; Adolescents

Introduction

Alcohol, tobacco, other drug use, and violent and delinquent behaviors contribute to significant morbidity and mortality among youth and influence health outcomes into adulthood (Centers for Disease Control and Prevention 2010). A youth's propensity for early initiation of substance use and delinquency may result from a complex interplay of multiple levels of influence occurring at the individual, social, environmental and organizational levels (Flay and Petraitis 1994; Szapocznik and Coatsworth 1999), suggesting that successful prevention requires multi-level and multi-component efforts (Komro and Toomey 2002). One important level for prevention of high-risk behaviors is the school environment. Schools are a prominent socialization agent for adolescents and research has suggested that the school environment may influence high-risk behaviors (Aveyard et al. 2004; Evans-Whipp et al. 2004; Wilson et al. 2001). However, questions regarding the extent to which the school environment influences development of drug use and delinquent behavior beyond individual- and neighborhood-level factors remain.

Emerging evidence suggests that individual- and neighborhood-level factors do not entirely explain variance in substance use patterns between schools, and characteristics of the schools themselves may account for this variation (Aveyard et al. 2004; Bisset et al. 2007; Markham et al. 2008). Two traditional explanations of these inter-school variations are the contagion model and social disorganization theories (Ennett et al. 1997). The contagion model suggests norms reinforcing or discouraging substance use are transmitted through peer modeling and reinforcement (Hill 1971). However, the contagion model would need to account for why some schools provide a good environment for contagion to spread while others do not allow this. Social disorganization theories have long been used to explain adolescent delinquency and posit that absence of community-level social control mechanisms contribute to the spread of delinquency (Bursick 1988; Ennett et al. 1997). This theory focuses on explaining criminal behaviors, rather than health behaviors. However, Ennett et al. (1997) suggested it could also be applied to substance use patterns in schools.

A new theory developed by Markham and Aveyard (2003) suggests that schools promote health indirectly through school organization, curriculum development, and pedagogic practice, rather than directly through health education programs. They propose schools optimize student functioning through the provision of appropriate instructional (i.e., knowledge and skills) and regulatory (i.e., appropriate behavior) order and operationalize this process using a measure called "value-added education." Value-added education is a contextual measure of the school, whereby, given the sociodemographic pupil composition, the school performs better than expected on academic success and truancy/attendance rates, which may be indicative of school support and control (Aveyard et al. 2004; Bisset et al. 2007). They hypothesize that some schools transmit these values more effectively (Bernstein 1996; Daniels et al. 1996), which may contribute to a health- and achievement-promoting school identity.

Aveyard, Markham and colleagues explored the novel concept of value-added education as a characteristic of health-promoting schools using samples of schools within the U.K. (Aveyard et al. 2004; Markham et al. 2008). They used a framework that school support and control influence student behaviors and examined whether attending schools providing value-added education was associated with lower risk of substance use. Value-added

education (i.e., those schools with higher than expected academic achievement and attendance given the profile of the student body) resulted in a decreased smoking prevalence among 11–16 year old students (Aveyard et al. 2004). A subsequent study further revealed that value-added education was associated with reduced risk of early alcohol initiation, heavy alcohol consumption and regular illicit drug use (Bisset et al. 2007). Through their work, Aveyard et al. (2005) concluded that "inter-school variation in smoking prevalence is not entirely caused by differences in pupil composition but is due to differences in the onset of smoking arising because of unmeasured school factors operating on pupils' decisions" (page 55). They identified a need for "considerable research" to understand how "complex social organizations like schools influence pupils' health and health-related behaviors" (Aveyard et al. 2005; page 63).

The purpose of this study is to replicate and extend Aveyard and Markham's work examining the protective effects of value-added education on tobacco use (Aveyard et al. 2005), early initiation of alcohol, heavy drinking and regular illicit drug use (Bisset et al. 2007; Markham et al. 2008). We add delinquent behaviors as other outcomes of interest, as there is a strong correlation between delinquency and higher rates of alcohol and other substance use (Barnes et al. 2002; Wilson et al. 2001). Aveyard and Markham's previous research on effects of "value-added" education occurred in the U.K., primarily with white, middle-class students in grades 7–11. We examined whether this same relationship holds true for urban, low income, racial/ethnic minority adolescents in the U.S. Replication of this work among urban, racial/ethnic minority youth was particularly important because African American and Hispanic youth disproportionately reside in metropolitan cities (U.S. Census Bureau 2000), are the fastest growing segments of the U.S. population (U.S. Census Bureau 2003), and are at increased risk for drug use and delinquency (Arkes 2007; Duncan et al. 2002; Hill and Angel 2005). Thus, this study tested the validity of the new explanatory approach for understanding schools as health promoting. Findings may guide future health promotion efforts in schools among ever-growing populations of youth who are disproportionately at risk for maladaptive behavioral outcomes.

Methods

Study Design and Participants

Data were part of a longitudinal group-randomized controlled trial of an alcohol preventive intervention for racial/ethnic minority urban youth [Project Northland Chicago (PNC); see Komro et al. 2004, 2008 for complete description of the project's research design, participant recruitment, intervention components, and outcomes]. Youth in 61 public schools in Chicago participated in the trial. From a list of all Chicago Public Schools (CPS), schools were selected that included grades 5–8, had low mobility rates (less than 25%) and had 30 or more students per grade. Schools and their surrounding community areas were matched on ethnicity, poverty, mobility, and reading and math test scores and randomized into intervention (n=29 schools) or control (n=32 schools) conditions. Recruited schools were similar to those throughout Chicago with respect to racial/ethnic composition and test scores (Komro et al. 2008). The goals of the PNC intervention were to change personal, social and environmental factors that support alcohol use among young adolescents and included 3 years of: (1) peer-led classroom curricula, (2) parental involvement and education, (3) peer leadership and youth-planned community service projects, and (4) community organizing and environmental neighborhood change. At the end of the intervention, there were no significant intervention effects on alcohol use, drug use, or any hypothesized mediating variables, including norms supportive of use, resistance self-efficacy, and parental monitoring and communication (Komro et al. 2008).

The subsample for the present study comprised the 2,621 students enrolled in the 61 PNC study schools who completed surveys at the beginning of 6th (age 12) and end of 8th (age 14) grades. Students were predominantly African American and Hispanic (36.4% and 33.2%, respectively); had a relatively equal gender distribution (49.4%) male; lived in two-parent households (56.6%); and were low-income (67.3%). Tables 1 and 2 present a complete description of the school and sample characteristics, respectively. The subsample included students from both the intervention and control conditions, and treatment condition was controlled for in analyses.

Data Collection

Student Surveys—Repeated cross-sectional surveys, with an embedded cohort of youth, were administered in study schools during the autumn of 2002, spring of 2003, spring of 2004, and spring of 2005, when the students were in 6th, 7th and 8th grades. Thus, the embedded cohort had potential to complete four surveys, one baseline (autumn of 2002) and three follow-ups (spring 2003, 2004, and 2005) during the intervention activities. Surveys were administered using standardized protocols by three-person teams of trained university-based research staff interviewers. Response rates ranged from 91% to 96% each year. Prior to survey administration, parents and students were given the opportunity to refuse participation. Parent consent, student assent, and PNC data collection protocols were approved by the University of Minnesota Institutional Review Board for the Protection of Human Subjects, with secondary data analyses approved by the University of Florida Institutional Review Board.

School & Neighborhood Characteristics—Data describing the schools and neighborhoods where the students lived were collected from three sources: (1) a self-report survey of parents whose children were participating in the PNC trial conducted in fall 2002 (n=1,945; 74% response rate; see Komro et al. 2008 for a complete description), (2) publically available school records retrieved annually from CPS (Chicago Public Schools 2010), and (3) Census 2000 data for each study community (U.S. Census Bureau 2009). All of these data were aggregated to the school level.

Measures

School Characteristics—Publically available data on schools' attendance and standardized test scores were used to create the measure of value-added education. Data are aggregated for the entire school, rather than at the individual student level. Measurement of academic success was derived from the proportion of students in each school meeting or exceeding the national norm for reading and math (i.e., achievement). Measurement of attendance was derived from the proportion of students present for school each day averaged over the academic year. Three-year averages corresponding to the academic years the cohort was enrolled (2002–2003; 2003–2004; 2004–2005) were used to improve reliability of these measures.

The value-added measure was obtained in two steps, following the original procedures used by Aveyard and Markham (Aveyard et al. 2004; Markham et al. 2008). First, two linear regression models were constructed where the proportions of daily attendance and students meeting or exceeding national reading and math norms were outcomes. Several school characteristics were specified as predictors in each model, including racial/ethnic composition and the proportions of students who were low-income, male, spoke English at home, and lived in two-parent households. The schools' percentage mobility was also included. Schools do not routinely publish indicators of gender, the use of English at home, and the number of two-parent households, so these were aggregated for each school from

our PNC survey data. Data for all other indicators were only available at the school level. Three-year averages were also used for all predictor variables to improve reliability.

The standardized residuals represent the difference between the observed attendance and achievement and what would have been expected based on the sociodemographic composition of the student body. Principal components analysis (PCA) was then used to identify the number of factors adequately explaining the variance in the standardized residuals. PCA was conducted with the residuals from both regression models included and a varimax rotation specified. PCA identified a single factor with Eigenvalue > 1 that explained 80% of the variance in both the achievement and attendance model residuals. The continuous factor from this analysis was the value-added score. Schools with a principal component, or value-added, score of 0 would have observed achievement and attendance rates that would not have differed from their expected achievement and attendance rates when expectations were based on the sociodemographic characteristics of the student population. A value-added score of plus or minus 1 indicated a school with performance 1 standard deviation (SD) above or below the average of zero, respectively.

Seven schools (n=232 students) were identified with a value-added score greater than or equal to 1 SD above average. These schools were termed “value-added,” in reference to above average performance given the characteristics of the student population. Conversely, five schools (n=189 students) were identified with scores less than or equal to 1 SD below average. These were termed “value-attenuated,” as their performance was lower than expected given the schools’ student body profile. The remaining 49 schools had scores between +0.99 and −0.99 and were termed “normative.” The normative schools were the reference category for the drug use and delinquency outcomes analyses. The value-added score was trichotomized due to nonlinear relationships between the continuous value-added measure and the outcomes, where quadratic terms were necessary for all models (i.e., the higher order terms were significant and led to improvements in model fit). To simplify, and improve interpretability, we used the categorical value-added measure.

Individual-Level Outcome Measures—Alcohol use in 8th grade was assessed with two items from the Monitoring the Future study (Johnston et al. 2009): “During the last 30 days, on how many occasions, or times, have you had alcoholic beverages to drink?” and “Think back over the last 2 weeks, on how many occasions or times have you had five or more alcoholic drinks in a row?”. Response options were dichotomized to reflect “0 occasions” versus “1 or more occasions.”

One item from the Monitoring the Future study (Johnston et al. 2009) assessed cigarette use in 8th grade: “During the last month, have you smoked a cigarette?”. Response options were 0 = “no” and 1 = “yes.”

Marijuana use in 8th grade was assessed with one item from the Monitoring the Future study (Johnston et al. 2009): “During the last 30 days, on how many occasions, or times, if any, have you used marijuana?”. Response options were dichotomized to reflect “0 occasions” versus “1 or more occasions.”

Two items assessed violent and delinquent behaviors in 8th grade: “During the last month, how often have you stolen something from a store?” and “During the last month, how many times have you taken part in a fight where a group of your friends were against another group?”. Response options were dichotomized to reflect “never” and “1 or more times.”

Covariates—A perceived neighborhood problems scale was created using seven items from the parent survey: “Below is a list of urban problems. Please check how much of a

problem each of the following is on the block where you live: … drug dealing?"; "… unsupervised youth?"; "…people drinking alcohol on the street?"; "…too many stores that sell alcohol?"; "…lack of supervised activities for youth?"; "…too many alcohol advertisements?"; and "…poor police response?" (Cronbach's alpha: 0.93, range 7–35). Response options were 1 = "not a problem," 3 = "a minor problem," and 5 = "a serious problem." A higher score indicated greater perceived neighborhood problems. The school-level mean for this scale was calculated and used in the present study.

An area deprivation index was created using 17 Census 2000 indicators: educational distribution (percentage of population with less than 9 years and 12 or more years of education), unemployment rate, occupational composition, median family income, income disparity, median home value, median gross rent, median monthly mortgage, home ownership rate, family poverty rate, population below 150% of poverty threshold, single-parent household rate, percentage of households without a motor vehicle, telephone and/or complete plumbing, and household crowding. The creation of this scale is described in more detail elsewhere (Tobler et al. 2009). This scale displayed good internal consistency (Cronbach's alpha: 0.87). Higher scores indicated greater area deprivation. The school-level mean for this scale was calculated and used in the present study.

Parental monitoring and communication were assessed with a five-item scale from the student survey: "How often do/does you/your" "…parent or guardian ask you about what you are doing in school?"; "…parent or guardian praise you when you do a good job?"; "… eat dinner with a parent or guardian?"; "…parent or guardian have a conversation with you that lasts 10 min or more?"; and "…parent or guardian ask you where you are going or who you will be with?". Response options were 0 = "Never," 1 = "Hardly Ever," 3 = "Sometimes," 4 = "A lot," and 5 = "All the time." A higher score indicated more parental monitoring and communication (Cronbach's alpha: 0.88; range, 0–20). Student-level scores on this scale were used in the present study (Mean=15.07, SD=3.50).

Individual/Student academic problems were assessed with one item from the student survey: "During the last month, how often have you done poorly on a test or important school project?". Response options were 1 = "Never," 2 = "1–3 times," and 3 = "4 or more times." The mean for this item was 1.78 (SD=0.65).

Baseline measures of student gender, race/ethnicity, language spoken at home, number of years living in the U.S., receipt of free or reduced-price lunch, and treatment condition were selected for inclusion as covariates in the analyses. Race/ethnicity was coded such that Hispanics, white and "other" race/ethnicity youth were compared to African Americans. Gender was coded such that girls were the referent group. Language spoken at home was coded such that English was the referent group. Number of years living in the U.S. was coded such that "all your life" was the referent group. Receipt of free, or reduced-price, lunch was coded such that "yes" was compared to "no" and "not sure."

The covariates were selected for inclusion in analyses because they represent important contributors to drug use and delinquency at the individual, home and community levels and all showed significant bivariate associations with the outcome variables. Thus, the effect of value-added education was estimated while controlling for other important contributors and highlighted its unique contribution to high-risk behaviors. All covariates were centered at zero.

Statistical Analyses

Multilevel logistic regression was used to examine the influence of schools' value-added status on each student drug use and delinquency outcome in 8th grade. Analyses were

conducted with SAS PROC GENMOD, a procedure in SAS designed to fit statistical models where the response is not normally distributed. The models were built in stages, following procedures outlined by Muller and Fetterman (2002). First, we examined and eliminated collinearity among the predictors. The following individual/student-level items were eliminated due to collinearity with one or more variables that remained in the model: language spoken at home, number of years living in the U.S. and receipt of free or reduced-price lunch. Eliminated school-level variables included: perceived neighborhood strength and neighborhood and police preventive actions. All of the eliminated variables showed correlations greater than 0.70 with one or more of the variables remaining in the model. Second, the categorical value-added variable was added to a base model adjusting for students' baseline value of the outcome variable. We included this potential confounder in the base model to illustrate the robust associations of schools' value-added education beyond individual-level initial risk behavior. Next, several additional school- and student-level covariates were added to each model to examine and control for further confounding, including PNC treatment status, perceived neighborhood problems around schools, area deprivation, parental monitoring, and students' race/ethnicity, gender, and academic problems. Lastly, we calculated odds ratios (OR) and 95% confidence intervals (CI) for each predictor and covariate across each outcome. Schools were specified as a nested random effect in all models to account for effects of the study design (i.e., students nested within schools).

Missing Data

Youth in the PNC cohort who were present and completed surveys at the beginning of 6th and end of 8th grade were eligible for inclusion in analyses (n=2,621; cohort follow-up rate 61%). The analysis sample included 2,505–2,508 students, as a result of missing values. Maximum likelihood estimation was used, which is one of two recommended approaches for analyses with missing data (Schafer and Graham 2002). There were no statistically significant differences between the analysis sample (i.e., youth who completed surveys at the beginning of 6th and end of 8th grade) and those who only completed surveys at the beginning of 6th grade (n=1,638) across gender and parental monitoring. However, the analysis sample had significantly more dual parent households (χ^2 (1)=53.40, p<.0001) than those who only completed surveys in 6th grade. Additionally, fewer youth in the analysis sample were low-income (χ^2 (2)=13.98, p=0.001) or reported alcohol (χ^2 (1)=16.14, p<0.001 and χ^2 (1)=32.42, p<.0001 for past month and heavy episodic use, respectively), cigarette (χ^2 (1)=11.49, p=0.001) and marijuana (χ^2 (1)=24.23, p<.0001) use, as well as stealing (χ^2 (1)=16.90, p<0.0001), participating in a group-against-group fight (χ^2 (1)=32.98, p<.0001), and academic problems (t (4,227)=3.60, p<0.001) in the past month during 6th grade compared to those lost to follow-up. Among racial/ethnic subgroups, African American youth were more likely to be lost to follow-up than Hispanic, white, and "other" race/ethnicity youth (χ^2 (5)=88.51, p<0.0001).

Results

Table 3 presents the base and adjusted models for all drug use and delinquency outcomes considered. Value-added education was associated with significantly decreased odds of recent alcohol use [OR=0.60 (CI: 0.42–0.88) and OR= 0.44 (CI: 0.23–0.84) for past month and heavy episodic use, respectively], cigarette use [OR=0.48 (CI: 0.26–0.86)], marijuana use [OR=0.29 (CI: 0.15–0.57)], stealing [OR= 0.56 (CI: 0.35–0.92)] and participating in a group-against-group fight [OR=0.69 (CI: 0.50–0.96)] among 8th grade students relative to normative education, after controlling for students' baseline risk behavior. When additional school- and individual-level confounders were considered (i.e., PNC treatment status, perceived neighborhood problems around schools, treatment condition, area deprivation,

parental monitoring, and students' race/ethnicity, gender, and academic problems), significant protective effects for value-added education remained for cigarette [OR=0.45 (CI: 0.24–0.85)] and marijuana use [OR=0.33 (CI: 0.17–0.66)], stealing [OR=0.56 (CI: 0.33–0.95)] and participating in a group-against-group fight [OR=0.67 (CI: 0.47–0.96)]. The effects on monthly [OR=0.75 (CI: 0.50–1.12)] and heavy episodic [OR=0.58 (CI: 0.29–1.15)] alcohol use were in the hypothesized direction and marginally significant.

Discussion

Value-added education (i.e., those schools with higher than expected academic achievement and attendance given the profile of the student body) was associated with lower incidence of recent alcohol, cigarette and marijuana use and delinquent behaviors in 8th grade when considering initial risk behavior. After adjustment for individual- and school-level covariates, value-added education remained a significant beneficial influence on cigarette and marijuana use, stealing and participation in a group-against-group fight and showed marginally significant trends in the hypothesized direction for monthly and heavy episodic alcohol use. There were no significant differences in drug use and delinquency between value-attenuated (i.e., those schools with worse academic achievement and attendance given the profile of the student body) and normative schools.

Many racial/ethnic minority youth reside in urban cities (U.S. Census Bureau 2000) and are at increased risk for a number of maladaptive social and behavioral outcomes, including drug use and delinquency, related to their unique environments (Arkes 2007; Duncan et al. 2002; Hill and Angel 2005). Findings from this study suggest that some inner-city schools may protect socially disadvantaged inner-city, racial/ethnic minority, early adolescents from high-risk behaviors. Thus, efforts to improve or achieve value-added education among inner-city schools may potentially reduce problem behaviors. The magnitude of effects suggests that drug use and delinquency may be reduced by 25% on average with school-level interventions improving student academic achievement and attendance. This is in contrast to individual-level interventions that show 8% to 10% reductions (Tobler et al. 2000; Tobler and Stratton 1997) and are expensive in terms of cost and time.

Markham and Aveyard (2003) suggest that school organization, curriculum development, and pedagogic practice may contribute to value-added schools out-performing schools with similar sociodemographic compositions. For example, value-added schools may transmit instructional (i.e., knowledge and skills) and regulatory (i.e., appropriate behavior) order more effectively (Bernstein 1996; Daniels et al. 1996), which may contribute to a health- and achievement-promoting school identity (Markham et al. 2008), However, the specific procesees remain unclear. Studies suggest that who provides the support and how control is defined and enforced may be important contributors to attendance and achievement (Bishop 2004; Klem and Connell 2004; Lee and Smith 1999; Sanders 1998). More research is needed to elucidate the specific processes that contribute to enhanced school-level support and control to inform efforts promoting child and adolescent well-being in high-risk areas.

It is interesting to note that the effects of value-added education were reduced when including other important individual-, home- and community-level variables. In particular, one covariate, individual-level academic problems, was a significant risk factor for all of the high-risk behaviors we examined; yet, the protective effects of schools' value-added education persisted. It has been well established that individual academic achievement is protective against a number of deleterious behaviors among youth (Hawkins et al. 1992). However, findings here suggest that school-level academic achievement and attendance remain important in protecting against drug use and delinquency, even beyond that of the individual. This is consistent with Rose's work describing population-based approaches to

public health positing that contributors to many diseases and risky behaviors may differ both within and across populations (e.g., schools; Rose 1992) and suggests that prevention should occur at both the individual and school level. Thus, educators' efforts to ameliorate individual risk should persist and occur in concert with efforts to improve schools' academic achievement and attendance.

The present study was a replication of work conducted in the U.K. by Aveyard, Markham and colleagues among primarily White, middle-class, 11 to 16 year old youth (Aveyard et al. 2004; Bisset et al. 2007; Markham et al. 2008). Our findings support the validity of their explanatory approach to understanding the health promoting capacities of schools, showing that value-added education may significantly reduce the risk of drug use and delinquency among youth beyond a number of important individual- and school-level factors. However, this study differed from those previous in three important ways. First, we investigated delinquency in addition to substance use. Second, our sample of schools and youth were from inner-city Chicago and were characterized largely by great sociodemographic disadvantage, high rates of problem behavior, and low educational attainment. That we saw significant protective effects of value-added education among such a high-risk population is noteworthy. Third, our data allowed us to consider additional contributors to educational achievement and attendance in the creation of the value-added score and other important confounders to the influence of value-added education on drug use and delinquency. Specifically, we additionally considered language spoken at home, family composition, and the mobility of schools' pupil populations in the creation of the value-added score and perceived neighborhood problems and parental monitoring and communication in estimating the effects of value-added education. Consideration of these additional variables lent to a more comprehensive determination of value-added education and conservative estimates of its protective effects.

This study has three primary limitations. First, it could be argued that the independent effects of value-added education are the result of insufficient control of confounding neighborhood-, school- or individual-level risk factors. Future studies may consider additional measures of neighborhood deprivation and disorder and/or school and family environment and attachment. Our data precluded inclusion of additional measures. However, we were able to control for more potential confounders at each level of influence than considered previously and the protective effect of value-added education persisted. Second, this sample was derived from an alcohol prevention study and there may be some bias in observed effects related to treatment group assignment. This bias is likely to be minimal, as we appropriately controlled for treatment group assignment in all analyses and no significant effects of the PNC intervention have been observed (Komro et al. 2008). Lastly, outcomes are self-reported, single-item measures, which may limit their reliability.

Limitations notwithstanding, findings from this study support Aveyard, Markham and colleagues' concept of value-added education and suggest that inner-city schools may break the strong link between social disadvantage and drug use and delinquency among adolescents. While the present study is primarily generalizeable to other samples of urban, racial/ethnic minority, low-income early adolescents, findings are consistent with those observed in primarily White, middle-class students in the U.K. Thus, findings have been robust to considerable variations in context and highlight school-level academic achievement and attendance as important targets for the promotion of student wellbeing. Future research should identify specific processes related to value-added education to further inform preventive efforts. Considered together with the high financial and temporal costs associated with individual-level interventions, efforts to improve the school environment may be warranted.

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Table 1

School characteristics (*N*=61)

	Mean	SD	Min.	Max.
% Male	49.41	7.11	33.25	64.98
% Two-parent households	46.16	20.64	11.99	77.29
% English spoken at home	77.48	25.56	21.03	1.00
% Low-income	78.27	23.23	9.23	99.27
% Mobility	18.94	8.67	5.67	58.70
% Daily attendance	92.29	10.08	30.30	96.87
% At or above national norm for reading and math	50.34	19.75	10.87	96.40
% African American	53.49	44.32	20.00	100.00
% Hispanic	27.05	32.54	0.00	99.57
% White	15.21	22.11	0.00	77.97
% Asian	4.43	12.12	0.00	54.80
% Native American	0.22	0.66	0.00	3.60
Perceived neighborhood problems[1]	21.25	4.39	7.00	35.00
Area deprivation[2]	−33.37	31.88	−115.83	61.89

[1] Scores on this scale ranged from 7 to 35, with a higher score indicating greater perceived neighborhood problems

[2] Scores on this scale ranged from −115 to 62, with a higher score indicating greater deprivation

Table 2

Student Characteristics (*N*=2,621)

Characteristic	% "Yes"
Demographics	
Male	49.43
Live in two-parent households	56.57
Speak English at home	68.84
Low-income (receive free or reduced-price lunch)	67.29
Lived in the U.S. all of life	87.26
African American	36.43
Hispanic	33.19
White	15.33
Other race/ethnicity	15.05
Outcomes	
Alcohol use in past month, 6th grade	6.57
Alcohol use in past month, 8th grade	22.97
Heavy episodic alcohol use, 6th grade	3.40
Heavy episodic alcohol use, 8th grade	8.92
Cigarette use in past month, 6th grade	1.29
Cigarette use in past month, 8th grade	9.89
Marijuana use in past month, 6th grade	1.72
Marijuana use in past month, 8th grade	12.10
Stealing in past month, 6th grade	8.42
Stealing in past month, 8th grade	13.29
Group-against-group fight in past month, 6th grade	24.73
Group-against-group fight in past month, 8th grade	30.58

Table 3

Effects of value-added education on past month drug use and delinquency in 8th grade

	Alcohol Use						Heavy Episodic Alcohol Use					
	Estimate	**SE**	**p-value**	**OR[1]**	**LCL[2]**	**UCL[3]**	**Estimate**	**SE**	**p-value**	**OR[1]**	**LCL[2]**	**UCL[3]**
Base Model												
Baseline[4]	1.238	0.163	<.0001	3.45	2.51	4.75	1.384	0.255	<.0001	3.99	2.42	6.58
Value-added School[5]	−0.503	0.190	0.008	0.60	0.42	0.88	−0.828	0.333	0.013	0.44	0.23	0.84
Value-attenuated School[5]	−0.039	0.218	0.856	0.96	0.63	1.47	−0.106	0.326	0.744	0.90	0.47	1.70
Adjusted Model												
Baseline[4]	1.189	0.169	<.0001	3.28	2.36	4.57	1.318	0.267	<.0001	3.74	2.21	6.30
Value-added School[5]	−0.286	0.205	0.164	0.75	0.50	1.12	−0.550	0.353	0.117	0.58	0.29	1.15
Value-attenuated School[5]	−0.061	0.229	0.789	0.94	0.60	1.47	−0.121	0.344	0.724	0.89	0.45	1.74
Academic Problems[6]	0.249	0.076	0.001	1.28	1.11	1.49	0.386	0.110	<.001	1.47	1.19	1.83
Perceived Neighborhood Problems[7]	0.032	0.013	0.010	1.03	1.01	1.06	0.022	0.018	0.227	1.02	0.99	1.06
Treatment[8]	0.077	0.106	0.468	1.08	0.88	1.33	−0.012	0.154	0.938	0.99	0.73	1.34
Area Deprivation[9]	0.002	0.002	0.288	1.00	1.00	1.01	0.003	0.003	0.183	1.00	1.00	1.01
Parental Monitoring & Communication[10]	−0.016	0.014	0.260	0.98	0.96	1.01	−0.022	0.020	0.274	0.98	0.94	1.02
Hispanic[11]	0.566	0.119	<.0001	1.76	1.39	2.22	0.530	0.174	0.002	1.70	1.21	2.39
White[11]	0.598	0.167	<.001	1.82	1.31	2.52	0.618	0.239	0.010	1.86	1.16	2.96
Other Race/Ethnicity[11]	0.062	0.169	0.716	1.06	0.76	1.48	−0.180	0.270	0.504	0.84	0.49	1.42
Male	−.133	0.099	0.180	0.88	0.72	1.06	0.147	0.145	0.311	1.16	0.87	1.54
	Cigarette Use						Marijuana Use					
	Estimate	SE	P-value	OR[1]	LCL[2]	UCL[3]	Estimate	SE	P-value	OR[1]	LCL[2]	UCL[3]
Base Model												
Baseline[4]	1.231	0.397	0.002	3.42	1.57	7.46	1.862	0.318	<.0001	6.44	3.45	12.00
Value-added School[5]	−0.744	0.305	0.015	0.48	0.26	0.86	−1.221	0.332	<.001	0.29	0.15	0.57
Value-attenuated School[5]	−0.334	0.337	0.323	0.72	0.37	1.39	−0.016	0.277	0.954	0.98	0.57	1.69
Adjusted Model												

	Alcohol Use						Heavy Episodic Alcohol Use					
	Estimate	**SE**	**p-value**	**OR[1]**	**LCL[2]**	**UCL[3]**	**Estimate**	**SE**	**p-value**	**OR[1]**	**LCL[2]**	**UCL[3]**
Baseline[4]	1.143	0.409	0.005	3.14	1.41	6.99	1.644	0.328	<.0001	5.18	2.72	9.84
Value-added School[5]	−0.801	0.324	0.013	0.45	0.24	0.85	−1.104	0.348	0.002	0.33	0.17	0.66
Value-attenuated School[5]	−0.430	0.352	0.222	0.65	0.33	1.30	−0.141	0.291	0.627	0.87	0.49	1.54
Academic Problems[6]	0.344	0.104	0.001	1.41	1.15	1.73	0.397	0.097	<.0001	1.49	1.23	1.80
Perceived Neighborhood Problems[7]	0.012	0.018	0.510	1.01	0.98	1.05	0.046	0.017	0.006	1.05	1.01	1.08
Treatment[8]	0.066	0.145	0.650	1.07	0.80	1.42	0.096	0.136	0.478	1.10	0.84	1.44
Area Deprivation[9]	−0.004	0.002	0.100	1.00	0.99	1.00	0.000	0.002	0.904	1.00	1.00	1.00
Parental Monitoring & Communication[10]	−0.023	0.019	0.239	0.98	0.94	1.01	−0.019	0.018	0.291	0.98	0.95	1.02
Hispanic[11]	0.144	0.172	0.403	1.15	0.82	1.62	−0.416	0.152	0.006	0.66	0.49	0.89
White[11]	0.622	0.222	0.005	1.86	1.21	2.88	−0.245	0.222	0.270	0.78	0.51	1.21
Other Race/Ethnicity[11]	0.186	0.225	0.408	1.20	0.77	1.87	−0.346	0.209	0.099	0.71	0.47	1.07
Male	0.121	0.139	0.383	1.13	0.86	1.48	0.388	0.129	0.003	1.47	1.14	1.90
	Stealing						Group-Against-Group Fight					
	Estimate	SE	p-value	OR[1]	LCL[2]	UCL[3]	Estimate	SE	p-value	OR[1]	LCL[2]	UCL[3]
Base Model												
Baseline[4]	1.331	0.159	<.0001	3.78	2.77	5.17	1.229	0.096	<.0001	3.42	2.83	4.13
Value-added School[5]	−0.574	0.250	0.022	0.56	0.35	0.92	−0.368	0.166	0.026	0.69	0.50	0.96
Value-attenuated School[5]	−0.414	0.303	0.172	0.66	0.36	1.20	0.015	0.201	0.941	1.02	0.68	1.51
Adjusted Model												
Baseline[4]	1.165	0.167	<.0001	3.21	2.31	4.45	1.097	0.101	<.0001	3.00	2.46	3.65
Value-added School[5]	−0.577	0.270	0.033	0.56	0.33	0.95	−0.402	0.182	0.027	0.67	0.47	0.96
Value-attenuated School[5]	−0.409	0.316	0.195	0.66	0.36	1.23	−0.113	0.212	0.596	0.89	0.59	1.35
Academic Problems[6]	0.314	0.093	0.001	1.37	1.14	1.64	0.208	0.072	0.004	1.23	1.07	1.42
Perceived Neighborhood Problems[7]	0.008	0.015	0.621	1.01	0.98	1.04	0.019	0.019	0.110	1.02	0.98	1.06
Treatment[8]	−0.056	0.130	0.669	0.95	0.73	1.22	0.066	0.099	0.508	1.07	0.88	1.30
Area Deprivation[9]	−0.002	0.002	0.467	1.00	0.99	1.00	0.000	0.002	0.806	1.00	1.00	1.00

	Alcohol Use						Heavy Episodic Alcohol Use					
	Estimate	**SE**	**p-value**	**OR[1]**	**LCL[2]**	**UCL[3]**	**Estimate**	**SE**	**p-value**	**OR[1]**	**LCL[2]**	**UCL[3]**
Parental Monitoring & Communication[10]	−0.028	0.017	0.102	0.97	0.94	1.01	0.006	0.013	0.631	1.01	0.98	1.03
Hispanic[11]	−0.188	0.144	0.193	0.83	0.62	1.10	−0.771	0.111	<.0001	0.46	0.37	0.57
White[11]	−0.230	0.210	0.275	0.79	0.53	1.20	−0.783	0.161	<.0001	0.46	0.33	0.63
Other Race/Ethnicity[11]	−0.275	0.199	0.167	0.76	0.51	1.12	−0.846	0.152	<.0001	0.43	0.32	0.58
Male	0.489	0.124	<.0001	1.63	1.28	2.08	0.255	0.094	0.006	1.29	1.07	1.55

[1] Odds ratio

[2] Lower 95% confidence limit

[3] Upper 95% confidence limit

[4] Baseline level of the outcome variable

[5] Normative schools are the referent group

[6] A higher score on this item indicates more academic problems

[7] Scores on this scale ranged from 7 to 35, with a higher score indicating greater perceived neighborhood problems

[8] PNC treatment condition relative to the control

[9] Scores on this scale ranged from −115 to 62, with a higher score indicating greater deprivation

[10] Scores on this scale ranged from 0 to 20, with a higher score indicating greater parental monitoring

[11] African Americans are the referent group