

# Effects of School-Level Norms on Student Substance Use

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This study examines the relationship between school norms of substance use disapproval (disapproval by the student body) and students' use of cigarettes, alcohol, and marijuana. Data came from nationally representative samples of 8th ( $N = 16,051$ ), 10th ( $N = 13,251$ ), and 12th ( $N = 8,797$ ) grade students, attending 150, 140, and 142 schools, respectively. These students participated in the Monitoring the Future Project in 1999. Measures of school norms of disapproval of substance use were obtained by aggregating students' personal disapproval of daily cigarette use, heavy drinking, and marijuana use within each school. Analysis using logistic nonlinear hierarchical models indicated that in general, school-level disapproval lowered the probability of students' use of these substances, controlling for their own disapproval and for student and school demographic characteristics. The beneficial effect of school-level disapproval of cigarette and marijuana use on 8th-grade students' probability of daily cigarette use and marijuana use was significantly higher than it was for the 12th-grade students. The effect of school-level disapproval of heavy drinking on the probability of students' drinking was not significantly different across the three grades. Further, a school environment of disapproval was also found to create a protective environment for those students in the 8th and 10th grades who were themselves not disapproving of daily cigarette use. These results argue for prevention programs that include creation of an overarching environment of disapproval of substance use in schools.

**KEY WORDS:** substance use; disapproval; school norms.

## INTRODUCTION

Individual attitudes and peer norms toward substance use have received considerable attention in the research literature and have been identified as important predictors of substance use by adolescents (e.g., see Hawkins *et al.*, 1992; Petraitis *et al.*, 1995). However, few researchers have examined the effect of a protective school climate or school norm of substance use disapproval on students' substance use behavior.

In this study, we use nationally representative samples of 8th-, 10th-, and 12th-grade students to examine the effect of substance use disapproval by the student body on students' use of substances, above and beyond the effect of their own personal attitudes on their substance use behavior.

## Defining School-Level Norms

Norms of behavior as reflected by the overall general attitude of students in a school toward substance use represent a more macro level influence as opposed to the more individual or micro level influence of subjective norms and personal attitudes toward substance use. Subjective norms and personal attitudes arise out of an individual's perceptions and beliefs to influence behavior (Fishbein & Ajzen, 1975). Norms of disapproval by the student body describe the existing social environment in school in terms of a general

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attitude of disapproval toward substance use.<sup>5</sup> This social environment in schools can provide opportunities or create barriers for adolescents' use of licit and illicit substances. Thus in a school where substance use is strongly disapproved by a majority of the students, those who are inclined to use substances will have to go against the norms of the student body. It is also more likely that these students will find it difficult to procure substances in a school where the prevailing norm is one of substance use disapproval.

#### Peer Context and Peer Norms Versus School Context and School Norms

Peer contexts have often been used as a proxy for school contexts. However, peer context refers mainly to students, classmates, and friends with whom adolescents associate; school context is a broader concept. Peer contexts are more proximal and therefore probably a more potent influence on adolescent substance use behavior. However, a school context in which the predominant norm is one of substance use disapproval can play a role in controlling students' use of substances apart from the role played by peer norms.

In a literature review of the effect of peers on students' substances use, Morgan and Grube (1991) suggest that the concept of "peer contexts" lacks conceptual clarity. Many researchers define peer context to include mainly close and current friends (Akers *et al.*, 1979; Chassin *et al.*, 1986; Kandel, 1985; Oetting & Beauvais, 1987; Ritter, 1988; Schulenberg *et al.*, 1999), whereas others define peer contexts to include a larger circle of friends (Brown *et al.*, 1986). The influence of peers is normally measured in terms of adolescents' awareness of subjective norms, that is, the extent of pressure adolescents perceive from their peers to engage in substance use (Finlay *et al.*, 1999; Flay *et al.*, 1987; Huba & Bentler, 1980; Kandel & Andrews, 1987; Keefe, 1992; Skinner & Cattarello, 1989; Trafimow, 2000). In addition to examining the effect of subjective norms on substance use, some researchers have examined the behavioral norms (perceived behavior)

of peer groups as a source of social control (Grube *et al.*, 1986; Hansen & Graham, 1991). Only a few studies have considered social norms that reflect the general attitude of the student body toward substance use behavior among students. Ennett *et al.* (1997) found that use of cigarettes, alcohol, and marijuana was higher among elementary school students where the general attitude toward substance use (based on aggregated individual attitudes of fifth- or sixth-grade students in the school) was more favorable. However, the scale used to measure attitude toward substance use included measures of both attitude and behavioral intentions. Additional research is needed to consider a wider range of ages and to examine the effect of the general prevailing attitude in school toward substance use on students' substance use behavior because adolescents spend a large part of their weekdays in school. Therefore, adolescents' attitudes and behaviors are likely to be shaped and molded, at least to some degree, by the prevailing climate in school. School climate, defined in terms of school norms, is reflected in the beliefs and attitudes held by the majority of the students in the school. For example, adolescents who find themselves in schools where the norm toward substance use is one of disapproval may be less likely to engage in substance use.

Most substance abuse prevention programs implemented in schools (see Dielman, 1994; Tobler, 1992; Tobler & Stratton, 1997) are geared to changing individual students' beliefs, their erroneous perceptions of the prevalence and acceptability of substance use among peers (Hansen & Graham, 1991), and developing social skills to resist peer pressures (Tobler, 1992; Tobler & Stratton, 1997). Hansen and Graham (1991) suggest the need to change students' perceptions and help them realize that most of their peers do not use substances, thereby establishing conservative norms with respect to substance use in school. To establish truly conservative norms, prevention programs must be geared to create or enhance a predominant social norm of substance use disapproval in school. An examination of the features and characteristics of many frequently implemented prevention programs indicates that few programs focus on creating a predominant social norm of substance use disapproval in school to inhibit substance use by students (Dryfoos, 1990). In this study, we examine whether a school climate that projects a social norm of substance use disapproval creates a protective environment for students who are themselves not disapproving of substance use.

<sup>5</sup>We do not directly measure the entire student body, and so we do not have a true "school"-level measure. However, in most cases we measure all the students in the relevant grade, and in almost all other cases we measure a large number of students. Thus, we believe that we are capturing the school climate that is appropriate for the students in that grade, and we refer to this as the school-level climate.

### Conceptual Basis for the Study

An ecological perspective is essential for a fuller understanding of adolescent substance use. Bronfenbrenner (1986) stressed the importance of examining the contexts in which individuals function. He and other theorists (e.g., Bandura, 1986; Magnusson, 2000) have argued that to understand behavior, we need to examine (a) the environmental sociocultural factors or the macrosystems; (b) the more proximal, situational factors or microsystems, for example, school contexts; (c) person factors, that is, the characteristics of the person engaging in the behavior; and (d) an interaction among all these factors.

Many of the theories that attempt to explain individuals' behavior focus on only one or two of these factors. For example, according to the theory of reasoned action (Fishbein & Ajzen, 1975) and the theory of planned behavior (Madden *et al.*, 1992), attitudes toward the target behavior and subjective norms—that is, the extent of pressure perceived from others to perform this behavior—acting through behavioral intentions are the most proximal determinants of behavior. Other theorists of adolescent substance use focus on interpersonal and social factors that influence substance use behavior (Bandura, 1986; Hawkins & Weis, 1985; Jessor & Jessor, 1977). An underlying assumption of the social cognitive learning theory (Bandura, 1986), social development theory (Hawkins & Weis, 1985), and problem-behavior theory (Jessor & Jessor, 1977) is that adolescents acquire favorable attitudes toward substance use from friends and parents who either use these substances or express favorable statements and attitudes toward their use. For example, research indicates that marijuana use is more common among adolescents who have friends with favorable attitudes toward marijuana use (Bailey & Hubbard, 1990; Kandel, 1985). However, the focus of these theories is on interpersonal relationships with peers and parents, and the theories are less concerned with the social context in which these interactions occur.

Flay and Petraitis (1994) indicate in their theory of triadic influence that behavior is rooted in the person's general cultural environment, current social situation, and personal characteristics. According to their theory, social settings like schools affect students' substance use behavior by affecting the attitudes, values and behaviors of other people in the same environment. In line with this argument we believe that school climate reflects the predominant

attitudes held by students in the school. Thus, a school in which most students disapprove of substance use has an environment of substance use disapproval that is likely to inhibit the substance use behavior of individual students in the school. Further, as indicated earlier, we believe that characteristics of individuals and of the school context can interact in affecting students' substance use behavior. Therefore, in this study we examined both the additive and interactive effects of students' personal disapproval of substance use and school-level substance use norms on their substance use behavior.

### Additive and Interactive Effects of Personal Attitudes and School-Level Norms on Student Substance Use: A Multilevel Approach

An attitude is more likely to be expressed behaviorally when a favorable environment supports it (Fishbein & Ajzen, 1975). Earlier research has established that there are both additive (Andrew & Kandel, 1979) and interactive effects (Grube *et al.*, 1986) of personal attitudes and subjective norms on students' substance use behavior. Grube and Morgan (1990) found that adolescents who were favorably disposed to cigarette, alcohol, or marijuana use were more likely to engage in the use of these substances when it was seen to be supported by a favorable environment. These researchers defined "favorable environment" in terms of friends' approval of substance use. This study differs from the work of these earlier researchers in two respects. First, this study focuses on the social norms of disapproval of substance use held by the student body as a whole—an index of the existing normative environment in school—and not on individuals' subjective norms or on friends' attitudes. Second, earlier studies, even those that examined school context such as school demographic characteristics, conducted analyses only at the individual level (Allison *et al.*, 1999; Roski *et al.*, 1997). This study takes a multilevel approach, wherein the school is the unit of analysis at the higher, macro level, and the student is the unit of analysis at the individual level. This multilevel framework is used to examine both the main and interactive effects of students' personal disapproval (at the individual level) and the normative environment in school (at the more macro level) on students' use of three most commonly used substances, namely, cigarettes, alcohol, and marijuana.

### Substance Use Behavior: School Norms of Disapproval and Age of the Student

Research examining developmental changes in the size of normative influences on adolescent substance use behavior is conflicting. For example, Morgan and Grube (1989) found that normative influences on adolescent smoking behavior increased from early into late adolescence and decreased thereafter. On the other hand, Eiser *et al.* (1989) did not find any differences in the effect of norms on the smoking behavior of adolescents ranging in age from 10 to 16 years. Both these studies focused on cigarette use in relation to subjective norms of behavior. We focus on three classes of substances—namely, cigarettes, alcohol, and marijuana—and examine the normative influence of the student body in school on students' use of these substances. We examine whether the relationship between normative levels of disapproval of use by the student body and substance use, and the interactive effect of normative disapproval and personal disapproval on substance use, are dependent on the specific substance (tobacco, alcohol, and marijuana) and the age of the adolescent.

National survey results on substance use from Monitoring the Future (MTF) data (Johnston *et al.*, 2000) indicate that across Grades 8, 10, and 12 use of alcohol and cigarettes, the licit substances, is more widespread than use of any illicit substance, whereas marijuana is by far the most widely used illicit substance. Grade-level differences were evident with rates of daily use of cigarettes, heavy drinking, and marijuana use in the past 30 days being higher for students in the higher grades than for students in the lower grades (Johnston *et al.*, 2000).

Disapproval of the use of these three substances across the three grades parallels (in reverse) their rate of use. Of the three substances, rate of disapproval is higher for the use of marijuana than it is for smoking cigarettes and consuming alcohol. Attitudes toward the use of these substances shift considerably with age. The lower the grade level, the higher the rate of disapproval. Thus, compared to 49% of 12th graders who disapproved of trying marijuana in 1999, 56% of 10th graders and 71% of 8th graders did so. Disapproval of alcohol use is also higher at the lower grade levels. While 64% of the 12th graders said that they disapprove of heavy drinking, 70% of 10th graders and 80% of 8th graders indicated that they disapprove of heavy drinking. In a similar vein, 70% of 12th graders, 76% of 10th graders, and 81% of 8th graders said they disapproved of smoking one or

more packs per day. These statistics suggest that differences in the rate of disapproval and rate of use are related to both the class of substance and the age of the adolescent, and that developmental shifts in disapproval of substance use are related to age-related shifts in their use. These findings relate to individual students' attitudes and behaviors. In this study, which utilizes MTF data, we examine the role played by general normative attitudes within each school on the rate of cigarette use, drinking a large amount of alcohol in a short amount of time, and marijuana use in the past month while accounting for the relation between personal disapproval of these substances and their use.

To summarize, in this study we hypothesize that (a) high levels of school norms of disapproval of substance use inhibit students' use of substance (cigarette use, heavy alcohol drinking, and marijuana use), controlling for the effect of their personal disapproval of substance use and (b) high levels of school norms of substance use disapproval have a protective effect, particularly for students who are themselves not disapproving of substance use. In addition, we will also explore whether the main and interactive effects of school norms of disapproval and students' disapproval of substance use vary by the class of substance and the age of the student.

## METHOD

The data come from the (MTF) project, an ongoing study of young Americans, conducted by the Institute for Social Research at the University of Michigan. The study design is described in detail elsewhere (Bachman *et al.*, 1996; Johnston *et al.*, 2000). Briefly, it involves nationally representative surveys of each high school senior class, beginning in 1975, and nationally representative surveys of 8th- and 10th-grade students beginning in 1991. Only the samples from 1999 are used in this study.

### Sample and Survey Procedures

A three-stage sampling procedure is employed. Stage 1 involves the selection of particular geographic areas, Stage 2 the selection of one or more schools in each area, and Stage 3 the selection of students within each school. The last stage is usually accomplished by selecting intact classes. The result of each year is an area probability sample of the 48 contiguous states. In

Table 1. Number of Students and Schools by Grade

	8th grade	10th grade	12th grade
Number of schools			
Public	120	117	123
Private	30	23	19
Number of students	16,051	13,251	8,797
Average number of students per school	107	95	62

1999, there were 150, 140, and 142 schools for the 8th, 10th, and 12th grades, respectively. A majority of the schools in all three grades were public schools (see Table 1).

Data were collected following standardized procedures via closed-ended questionnaires administered in classrooms by locally based University of Michigan representatives and their assistants. Surveys for the seniors have six different questionnaire forms that are distributed to participants in an ordered sequence that ensures six virtually identical random subsamples. All six forms include all the demographic variables and nearly all the substance use questions. Questions pertaining to students' disapproval of substance use are covered in only four of the six questionnaire forms. Because these questions are central to this study, analyses are restricted to 8,797 seniors who answered these questions.

Surveys for the 8th and 10th grades are identical and have four different questionnaire forms. Much of the questionnaire content is drawn from the 12th grade questionnaire. The key demographic variables and measures of substance use and related attitudes are generally identical for all three grades. All four forms of the 8th/10th grade questionnaires include measures of student disapproval of substance use. The sample consisted of 16,051 eighth-grade students and 13,251 tenth-grade students.

## MEASURES

### Dependent Variables: Measures of Substance Use

The dependent variables included measures of prevalence of daily cigarette use in the past 30 days, marijuana use in the past 30 days, and heavy drinking (i.e., five or more drinks in a row over the past 2 weeks). As these behaviors are relatively rare among students, all three measures of substance use are treated as dichotomous variables, with 0 (*Never*

*use*) and 1 (*Used once or more than once*). Items measuring these dependent variables are presented in the Appendix.

### Predictor Variables at the Student Level

The main predictor variables of interest at the student level included measures of students' personal disapproval of the use of these substances. Items measuring students' disapproval of substance use in the 12th grade questionnaire and the 8th/10th grade questionnaire are identical. Disapproval of cigarette use and heavy drinking were measured by a single item, whereas disapproval of marijuana use was measured by an index created by averaging students' disapproval of experimental, occasional, and regular use of marijuana (see Appendix). The three items were highly correlated, with correlations among them ranging from .65 to .81 in the 8th grade, from .64 to .83 in the 10th grade, and from .65 to .85 in the 12th grade. All the measures of disapproval of substance use were on a 3-point scale ranging between 1 (*Don't disapprove*), 2 (*Disapprove*), and 3 (*Strongly disapprove*). These scales were recoded with 1 (*Don't disapprove*), 4 (*Disapprove*), and 5 (*Strongly disapprove*) to increase the distance between students who do not disapprove of substance use and students who do disapprove and to make relationships more linear with substance use. In addition, students' personal demographic characteristics in terms of their gender, race, level of parental education, and number of parents in the household were also obtained from the survey (see Appendix).

### Predictor Variables at the School Level

Measures of students' personal disapproval of substance use<sup>6</sup> were averaged within each school to characterize the school environment for students in the relevant grade (8th, 10th, or 12th) in terms of level of substance use disapproval by all or a significant portion of the students within that grade.<sup>7</sup> In the

<sup>6</sup>All further references to "substance use" in this paper signify cigarette use in the past 30 days, heavy drinking in the past 2 weeks, and marijuana use in the past 30 days. References to "disapproval of substance use" signify to disapproval of smoking one or more packs of cigarettes per day, disapproval of heavy drinking, and disapproval of marijuana use.

<sup>7</sup>Henceforth we will refer to all or a significant portion of the students within that grade as "the student body."

case of disapproval of cigarette use and heavy drinking, this measure was obtained by averaging students' responses within each school on the single-item measures of disapproval of smoking and disapproval of heavy drinking, respectively. A measure of marijuana use disapproval by the student body was the school mean of the index of marijuana use disapproval created at the student level.

Students' responses on the level of their parents' education and composition of their household were also aggregated to the school level to obtain a measure of the average level of parental education and household composition among the student body. In addition, school-level predictors included measures of the school environment in terms of the type of school they attended (public or private), school size, and urbanicity, that is, the population density of the area in which the school is located.

#### ANALYSIS PLAN

As a first step, before examining the effect of school norms of disapproval on students' substance use, we examined the descriptive statistics of all the variables included in the study and the correlations among these variables for Grades 8, 10, and 12. The next step involved preliminary analysis of variance between schools in prevalence of substance use (daily cigarette use, heavy drinking, and marijuana use in the past 30 days) and the variance between schools in student disapproval of these substances. These analyses were conducted to determine whether there was significant variance between schools, within each of the three grade levels for the three classes of substances, that could be explained by school-level predictors like aggregated school norms of disapproval. In this step, we also examined the extent of variance in substance use and disapproval of substance use explained by school demographic characteristics, including type of school, school size, and urbanicity.

In the third and fourth steps, we tested the hypotheses that high levels of school norms of disapproval decrease substance use and that these norms are particularly beneficial for students who are themselves not disapproving of substance use.<sup>8</sup> These two steps involved examining the effect of aggregated school-level disapproval of substance use by

<sup>8</sup>Note that we are assuming that the dominant causal influence is from norms to behavior, and not the reverse.

the student body (student-level disapproval aggregated within each school) on individual students' use of these substances, controlling for their personal disapproval of substance use. These analyses were conducted for all three substances included in the study for each of the three grades. This made it possible to compare the relation between substance use behavior, personal disapproval, and disapproval by the student body across different substances and different grade levels.

In this third step, raw data were used to examine the probability of substance use (daily cigarette use, heavy drinking, and marijuana use in the past 30 days) by students who did not disapprove, disapproved, and strongly disapproved of substance use, attending schools that were in the upper, middle two, and lower quartile ranges of aggregated school-level disapproval. This involved grouping students based on their own level of disapproval and school-level disapproval. The probability of substance use by students within each of these groups was ascertained. This analysis was followed by the fourth step, namely, a multilevel hierarchical logistic regression analysis to test whether school-level disapproval of substance has an effect on students' use of substances, controlling for students' personal disapproval, and individual and school demographic characteristics.

Analyses were conducted with Hierarchical Linear Modeling (HLM 5) (Raudenbush *et al.*, 2000) using Bernoulli's logistic regression, a nonlinear hierarchical model for dichotomous outcome variables with values of 0 and 1. This logistic regression model includes two levels of analyses: Level 1 (within-school) and Level 2 (between-school). The model predicted (a) the effect of mean student disapproval aggregated within each school on the log-odds of students' use of substances controlling for the effects of student and school demographic characteristics and of students' personal disapproval on their substance use behavior; and (b) the effect of school-level disapproval on the relation between students' personal disapproval and their substance use behavior. The equation for this model is presented below.

#### Level 1

$$\begin{aligned} \eta_{ij}(\text{Log-odds of substance use}) &= \beta_{0j} + \beta_{1j}(\text{No. of parents in household}) \\ &+ \beta_{2j}(\text{Parental education}) \\ &+ \beta_{3j}(\text{African American}) + \beta_{4j}(\text{Hispanic}) \\ &+ \beta_{5j}(\text{Other}) + \beta_{6j}(\text{Female}) \\ &+ \beta_{7j}(\text{Personal disapproval}) \end{aligned}$$

Level 2

$$\beta_{0j} = \gamma_{00}(\text{Intercept}) + \gamma_{01}(\text{No. of parents in household, aggregated}) + \gamma_{02}(\text{Parental education, aggregated}) + \gamma_{03}(\text{School size}) + \gamma_{04}(\text{Urbanicity}) + \gamma_{05}(\text{Type of school}) + \gamma_{06}(\text{Aggregated disapproval}) + U_{0j}$$

$$\beta_{7j} = \gamma_{70}(\text{Intercept, personal disapproval}) + \gamma_{71}(\text{Aggregated disapproval}) + U_{7j}$$

Combining the Level 1 and Level 2 equations, we have

$$\eta_{ij}(\text{Log odds of substance use}) = \gamma_{00}(\text{Intercept}) + \gamma_{01}(\text{No. of parents in household, aggregated}) + \gamma_{02}(\text{Parental education, aggregated}) + \gamma_{03}(\text{School size}) + \gamma_{04}(\text{Urbanicity}) + \gamma_{05}(\text{Type of school}) + \gamma_{06}(\text{Aggregated disapproval}) + \beta_{1j}(\text{No. of parents in household}) + \beta_{2j}(\text{Parental education}) + \beta_{3j}(\text{African American}) + \beta_{4j}(\text{Hispanic}) + \beta_{5j}(\text{Race other}) + \beta_{6j}(\text{Female}) + \gamma_{70}(\text{Intercept, personal disapproval}) + \gamma_{71}(\text{Aggregated disapproval}) + U_{0j} + U_{7j}$$

Based on the results of this analysis, the predicted probability of substance use by student “*ij*” was calculated for the three categories of substances for each of the three grades.

$$\phi_{ij}(\text{probability of use}) = 1/[1 + \exp\{-\eta_{ij}\}] = \exp(\eta_{ij})/[1 + \exp(\eta_{ij})]$$

The assumption underlying these analyses is that shared norms of behavior within any school are likely

to influence students’ substance use behavior and the relation between students’ own attitude and the behavior in question. More specifically, a logistic regression model for nonlinear hierarchical regression was used to examine whether the norms of disapproval of substance use in school affected the probability of substance use by students and whether the norms of disapproval moderated the relationship between students’ own disapproval and probability of substance use, controlling for student and school demographic characteristics. Finally, additional calculations comparing the beta regression weights of school-level disapproval on substance use and on the relation between substance use and personal disapproval were conducted to examine whether these relationships varied by the class of substance and the age of the student.

RESULTS

Descriptives

Means and standard deviations for students’ use of substances and their personal disapproval of the use of these substances are presented in Table 2. From Table 2 it is seen that on average, students in the lower grades expressed greater levels of disapproval of cigarette, alcohol, and marijuana use, than did students in higher grades. That is, average levels of substance use disapproval by 8th-grade students were higher than by 10th- and 12th-grade students, and average disapproval levels of 10th-grade students were higher than those of 12th-grade students. Paralleling this drop in disapproval of substance use from lower to higher grades, the proportion of students

Table 2. Descriptive Statistics for Substance Use and Disapproval of Substance Use Variables

Variable	8th grade		10th grade		12th grade	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Cigarette use						
Prevalence of daily cigarette use	0.081	0.273	0.159	0.365	0.235	0.422
Disapproval of smoking one or more packs/day	4.106	1.371	3.878	1.524	3.187	1.716
Heavy drinking						
Prevalence of heavy drinking	0.152	0.359	0.256	0.437	0.311	0.460
Disapproval of heavy drinking	4.066	1.466	3.588	1.697	3.300	1.781
Marijuana use in the past 30 days						
Prevalence of marijuana use in the past 30 days	0.097	0.296	0.194	0.396	0.238	0.423
Disapproval of marijuana use	4.037	1.332	3.551	0.758	3.264	1.555

Note. The substance disapproval scale has been recoded from a scale of 1–3 to a scale of 1–5. In the new scale 1 = *Don't disapprove*, 4 = *Disapprove*, and 5 = *Strongly disapprove*.

smoking cigarettes in the past 30 days, drinking heavily, and using marijuana in the past 30 days increased from the 8th to the 12th grade.

### Relationship Among Constructs

The patterns and extent of association among variables for the three grades were very similar. Across the three grades, students who smoked on a daily basis were also more likely to drink heavily within the past 2 weeks and to have used marijuana in the past month. Across the three grades, correlations between daily cigarette use and heavy drinking ranged from  $r = .38$  to  $r = .41$ , between daily cigarette use and marijuana use from  $r = .40$  to  $r = .46$ , and between heavy drinking and marijuana use from  $r = .43$  to  $r = .44$  (unless otherwise indicated, all the correlations were significant at  $p < .001$ ). Likewise, students' disapproval of substance use was significantly correlated across substances. Thus, students who disapproved of smoking were also more likely to disapprove of heavy drinking and marijuana use. Across the three grades and the three substances these correlations ranged from  $r = .55$  for disapproval of cigarette use and disapproval of heavy drinking for the 8th-grade students, to  $r = .61$  for both disapproval of cigarette use and disapproval of marijuana use for the 8th grade and disapproval of heavy drinking and disapproval of marijuana use for the 8th and 10th grades. At the aggregate level too, disapproval of substance use by the student body was correlated across substances. These correlations ranged from  $r = .40$  between disapproval of cigarette use (aggregated) and disapproval of marijuana use (aggregated) for the 12th grade to  $r = .80$  between disapproval of cigarette use (aggregated) and disapproval of heavy drinking (aggregated) for the 8th grade.

For all three grades, disapproval of smoking one or more packs of cigarettes per day, heavy drinking, and marijuana use was associated with lower use of these substances. These correlations ranged from  $r = -.38$  to  $r = -.50$  for the 8th grade,  $r = -.47$  to  $r = -.59$  for the 10th grade, and  $r = -.44$  to  $r = -.55$  for the 12th grade. Further, aggregated school-level disapproval of substance use among the student body was significantly associated with lower substance use by students. The correlations between substance use and aggregated disapproval of substance use ranged between  $r = -.15$  and  $r = -.17$  for the 8th grade,  $r = -.18$  and  $r = -.19$  for the 10th grade, and  $r = -.17$  and  $r = -.20$  for the 12th grade. These results

suggest that there was low but significant correlation between an overall environment of substance use disapproval among the student body and substance use by students.

An examination of the correlation between substance use variables and student characteristics suggests that African American students were less likely to have smoked or engaged in heavy drinking as compared to students of other ethnic backgrounds, whereas European American students were more likely than all other ethnic groups to have engaged in these behaviors.<sup>9</sup> For all three grades, there was a small, but significant, association between gender and the use of marijuana and heavy drinking. In general, females were little less likely to engage in heavy drinking and marijuana use. While 12th-grade females were somewhat less likely than their male counterparts to have smoked cigarettes in the past 30 days, this correlation was not significant for the 8th and 10th grades. Across all three grades, at the student level, neither students' socioeconomic status, in terms of parental education, nor the number of parents in students' household was highly correlated with students' use of substances. Overall, the associations between school demographic characteristics and substance use were low (for all three grades, almost all correlations between substance use measures and school demographic characteristics were less than .1).

### Analysis of Variance

There was more variance between schools in student substance use in the higher grades than in the lower grades (see Table 3). While 5.0% of the variance in the prevalence of heavy drinking was between schools for the 8th and 10th grades, in the 12th grade 7.3% of the variance in student heavy drinking was between schools. Variance between schools in the prevalence of students' daily use of cigarettes was slightly higher (6.0%) for the 10th- and 12th-grade students than for the 8th-grade students (5.0%). From Table 3, it is seen that the variance between schools in the prevalence of marijuana use in the past

<sup>9</sup>There has been some suggestion that reported differences in substance use between African American and European American are significantly impacted by differential validity of self-reports (e.g., Bauman & Ennett, 1994). However, other research has indicated rather convincingly that the differences are largely valid (Wallace *et al.*, 1995; Wills & Cleary, 1997).



Table 3. Percentage Variance Between Schools in Substance Use and Disapproval of Substance Use

	8th grade	10th grade	12th grade
Cigarette use			
Prevalence of daily cigarette use	4.8***	5.9***	6.0***
Disapproval of smoking one or more packs/day	4.2***	5.0***	5.2***
Heavy drinking			
Prevalence of heavy drinking	4.8***	5.3***	7.3***
Disapproval of heavy drinking	5.8***	5.6***	7.3***
Marijuana use in the past 30 days			
Prevalence of marijuana use in the past 30 days	4.5***	4.0***	5.1***
Disapproval of marijuana use	6.2***	6.5***	7.0***

\* $p < .05$ . \*\* $p < .01$ . \*\*\* $p < .001$ .

30 days was lower than the variance between schools in cigarette use and heavy drinking for Grades 10 and 12.

For all three grade levels, there was significant variance between schools in students' attitude toward the use of these substances. In general, the variance between schools in students' disapproval of the use of substances was higher for the 12th grade sample than for the 8th grade sample, whereas the variance between schools for the 10th grade sample was intermediate to the 8th and 12th grade samples (except 10th grade heavy drinking). In all three grade levels, variance between schools in disapproval of heavy drinking and marijuana use in the past month was higher than variance between schools in their disapproval of daily cigarette use.

Across all three substances and for all three grades, size of the school and urbanicity were significant predictors of student substance use. However, the amount of variance these predictors explained in students' use of substances was very small, ranging from .001 to .016%. For the 12th graders the type of school students attended (public or private) did not account for any of the between-school variance in students' daily use of cigarettes, heavy drinking, or marijuana use in the past 30 days. Although it emerged as a significant predictor of substance use for the 8th and 10th grade, here again the extent of variance accounted for by this predictor was small, ranging from 0 to .006%. These results suggested that school demographic characteristics (type of school, urbanicity, and school size) accounted for very little of the variance in substance use among students in all three grades. In the next step, we examined the relation between school climate, defined in terms of students' personal disapproval of substance use aggregated to the school level, and students' use of substances.

#### Probability of Substance Use by Students in Schools in the Upper, Middle Two, and Lower Quartile Ranges of Substance Use Disapproval

Schools were categorized as being low, medium, and high on disapproval, based on the aggregate mean level of substance use disapproval within each school. Schools that were at or below the 25th percentile score on the aggregate disapproval scale were identified as "low disapproval schools." Schools whose aggregate disapproval ranged between the 25th and the 75th percentile were identified as the "medium disapproval schools," and schools with an aggregate disapproval level at or above the 75th percentile were labeled the "high disapproval schools."

Students were also categorized as low, medium, and high on disapproval of substance use. Both disapproval of smoking and disapproval of heavy drinking were measured using a single item with scale values of 1 (*Don't disapprove*), 4 (*Disapprove*), and 5 (*Strongly disapprove*). However, disapproval of marijuana use in the past month was measured by an index created from three items, with scale values of 1 (*Don't disapprove*), 4 (*Disapprove*), and 5 (*Strongly disapprove*). Therefore, it was not possible to make a clear and categorical distinction between students who did not disapprove, disapproved, and strongly disapproved of marijuana use. Students who had a scale value of 2 and below were categorized as students who did not disapprove of marijuana use, whereas students who had a scale value greater than 2 and less than or equal to 4 were categorized as students who disapproved of marijuana use. Lastly, students who had a scale value greater than 4 were categorized as students who strongly disapproved of marijuana use.

We also determined prevalence of substance use (daily cigarette use in the past 30 days, heavy drinking, and marijuana use in the past 30 days) by students

Table 4. Probability of Substance Use by Students Who Strongly Disapprove, Disapprove and Don't Disapprove of Substance Use, Attending Schools That are in the High (Upper Quartile), Medium (25th–75th Quartile), and Low (Lower Quartile) on Aggregated Disapproval of Substance Use

Student disapproval	School-level disapproval of substance use								
	Daily cigarette use			Heavy drinking			Marijuana use in the past 30 days		
	Low	Medium	High	Low	Medium	High	Low	Medium	High
8th grade									
Don't disapprove	.388	.280	.213	.512	.423	.408	.573	.334	.289
Disapprove	.109	.076	.085	.201	.169	.104	.131	.096	.071
Strongly disapprove	.028	.018	.025	.079	.058	.036	.027	.013	.008
10th grade									
Don't disapprove	.545	.48	.368	.644	.584	.449	.573	.497	.452
Disapprove	.226	.148	.085	.256	.228	.179	.139	.142	.108
Strongly disapprove	.046	.031	.025	.079	.073	.059	.028	.021	.021
12th grade									
Don't disapprove	.527	.468	.347	.689	.603	.425	.548	.473	.404
Disapprove	.136	.140	.089	.305	.220	.149	.173	.113	.119
Strongly disapprove	.052	.057	.089	.093	.090	.072	.039	.022	.024

Note. For marijuana use: A disapproval scale was created. Therefore, students on the disapproval scale 2 and below were considered low on disapproval of marijuana use. Students who have a scale value between 2 and 4 were coded medium on disapproval, and students above 4 were coded high on disapproval.

who don't disapprove, disapprove, and strongly disapprove of substance use, attending schools that were identified as low, medium, and high on disapproval of substance use. Results of these analyses are presented in Table 4 and Figs. 1–9.

Grade level was related to the probability of students' engagement in substance use. High school seniors and 10th graders had a higher mean probability of smoking cigarettes daily, drinking heavily, and using marijuana than did the 8th graders (Table 2). However, within each of these grades, the probability of using any of these substances was higher for students who did not disapprove of the use of these substances

as compared to students who did disapprove of their use (Table 4, Figs. 1–9). In addition, there was also a main effect of school climate, in terms of aggregated student disapproval of substance use, on students' use of these substances. The probability of substance use was higher in schools where aggregated school norms reflected a greater tolerance for use. This was true for all three grades and across all three substances.

In addition to these main effects of personal disapproval and norms of disapproval in school on students' use of substances, we also found that for all three grades and across all three substances, there

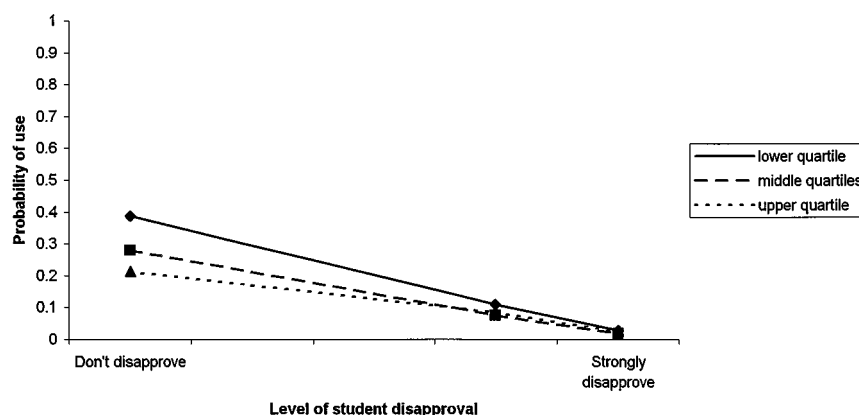


Fig. 1. Probability of daily cigarette use by eighth-grade students who don't disapprove, disapprove, and strongly disapprove of cigarette use, attending schools which are in the lower, middle, and upper ranges of disapproval of cigarette use.

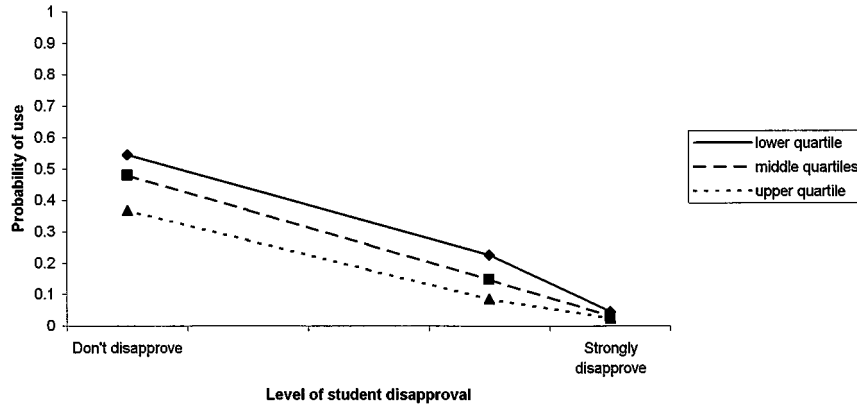


Fig. 2. Probability of daily cigarette use by 10th-grade students who don't disapprove, disapprove, and strongly disapprove of cigarette use, attending schools which are in the lower, middle, and upper ranges of disapproval of cigarette use.

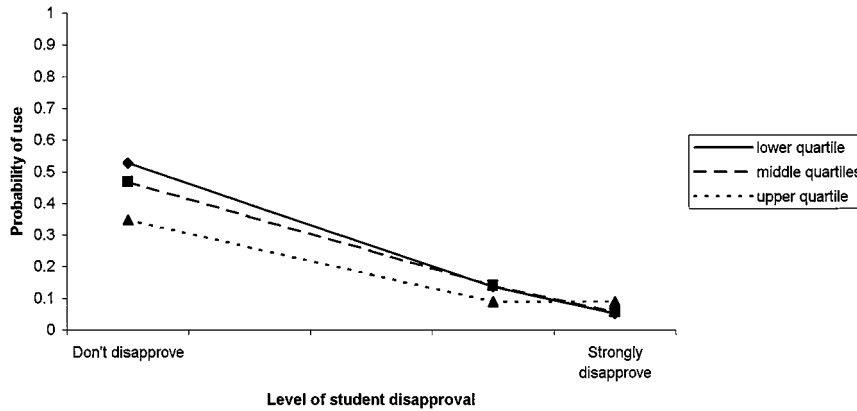


Fig. 3. Probability of daily cigarette use by 12th-grade students who don't disapprove, disapprove, and strongly disapprove of cigarette use, attending schools which are in the lower, middle, and upper ranges of disapproval of cigarette use.

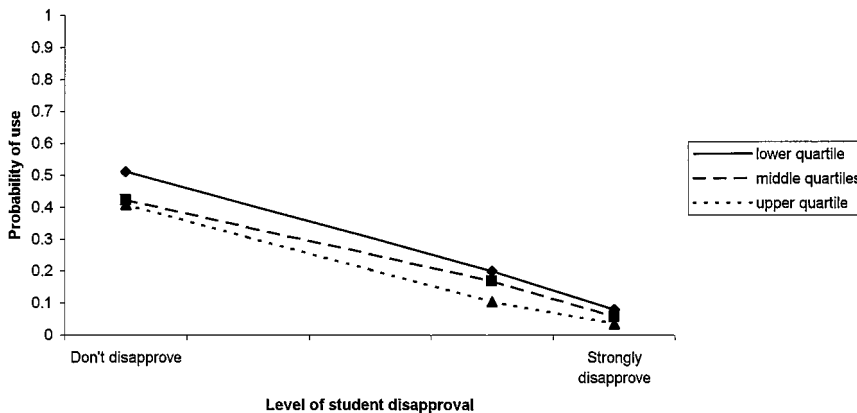


Fig. 4. Probability of heavy drinking by eighth-grade students who don't disapprove, disapprove, and strongly disapprove of heavy drinking, attending schools which are in the lower, middle, and upper ranges of disapproval of heavy drinking.

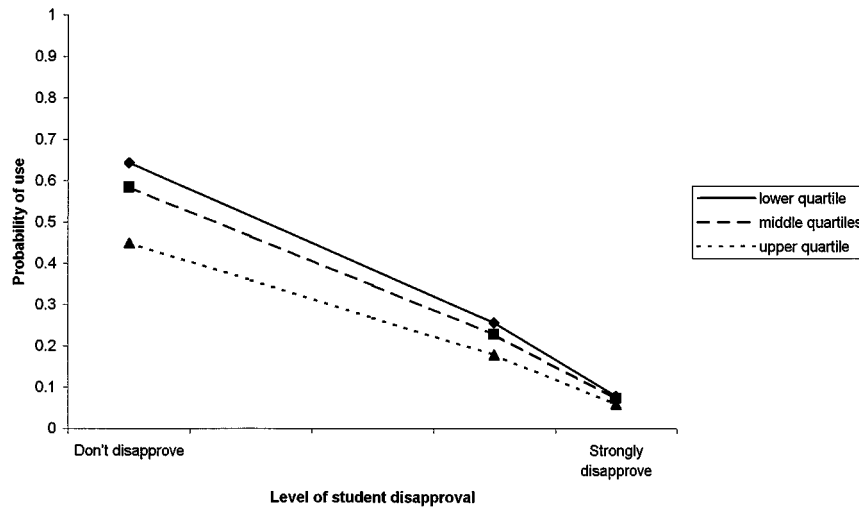


Fig. 5. Probability of heavy drinking by 10th-grade students who don't disapprove, disapprove, and strongly disapprove of heavy drinking, attending schools which are in the lower, middle, and upper ranges of disapproval of heavy drinking.

were interactive effects of these two factors on students' substance use. Although the probability of using substances was higher for students in schools where the norms reflected a greater tolerance for substances, these norms were particularly harmful for students who also did not personally disapprove of substance use. School-level disapproval had a greater impact on students who did not disapprove of substance use than that on students whose personal dis-

approval was high. Regardless of the disapproval level of the school, the probability of substance use (daily cigarette use, heavy drinking, and marijuana use in the past 30 days) by students who disapproved strongly of substance use was less than 1%. That is, the probability of substance use by high disapproval students in schools that were in the lower, middle, and upper ranges of disapproval was almost the same. However, the probability of substance use by low disapproval

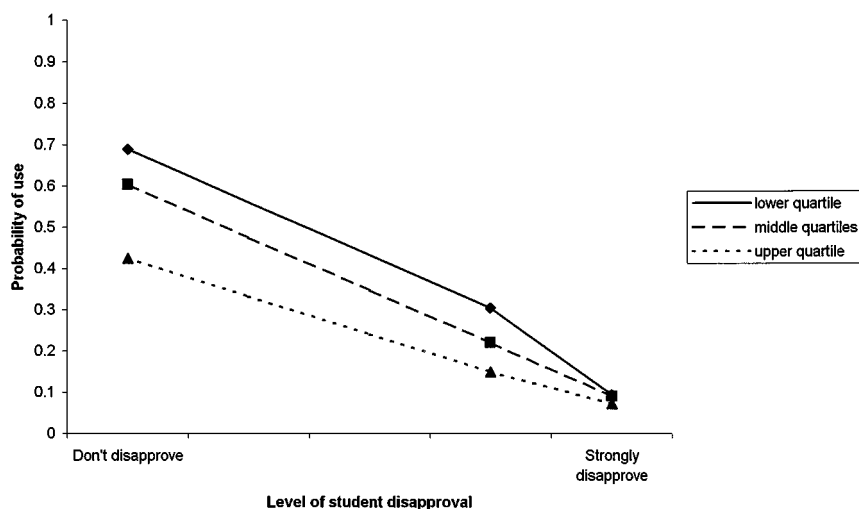


Fig. 6. Probability of heavy drinking by 12th-grade students who don't disapprove, disapprove, and strongly disapprove of heavy drinking, attending schools which are in the lower, middle, and upper ranges of disapproval of heavy drinking.

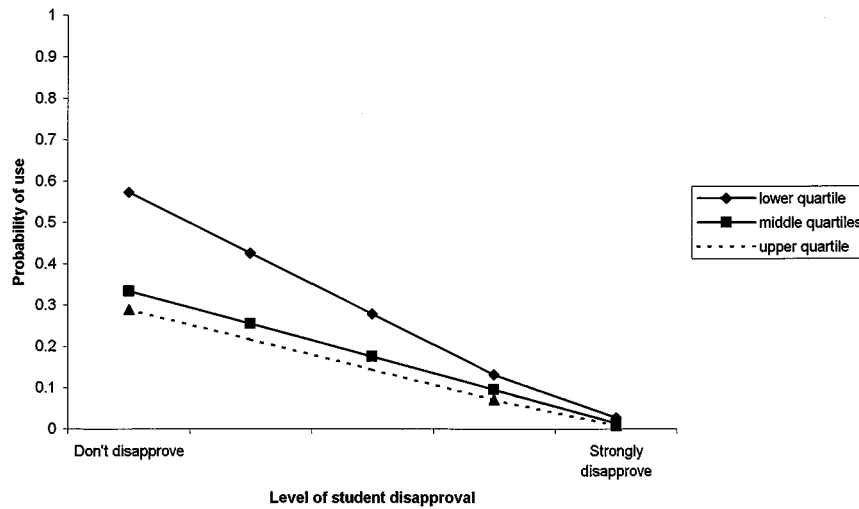


Fig. 7. Probability of marijuana use in the past 30 days by eighth-grade students who don't disapprove, disapprove, and strongly disapprove of marijuana use, attending schools which are in the lower, middle, and upper ranges of disapproval of marijuana use.

students in low disapproval schools was much higher than the probability of low disapproval students in high disapproval schools. For example, an examination of Fig. 7 and Table 4 indicates that the probability of marijuana use by high disapproval eighth-grade students, regardless of the kind of school, was almost the same (below .5%). However, the probability of marijuana use by low disapproval eighth-grade students in low disapproval schools was 5.7% compared to a probability of 2.9% for low disapproval students in high disapproval schools. This cross-level interaction effect was present for daily

cigarette use, heavy drinking, and marijuana use in the past 30 days for all the three grades (Table 4 and Figs. 1–9).

Although the results discussed above support our hypotheses, the only two factors considered in determining the probability of substance use by students were students' own attitudes of disapproval toward substance use and the school environment in terms of aggregated students' disapproval of substance use. These analyses did not account for other factors, including student and school demographic characteristics that may be related to students' use of substances.

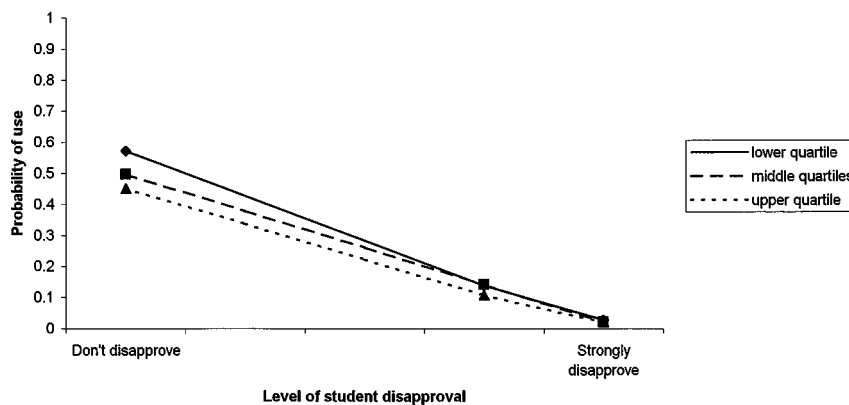


Fig. 8. Probability of marijuana use in the past 30 days by 10th-grade students how don't disapprove, disapprove, and strongly disapprove of marijuana use, attending schools which are in the lower, middle, and upper ranges of disapproval of marijuana use.

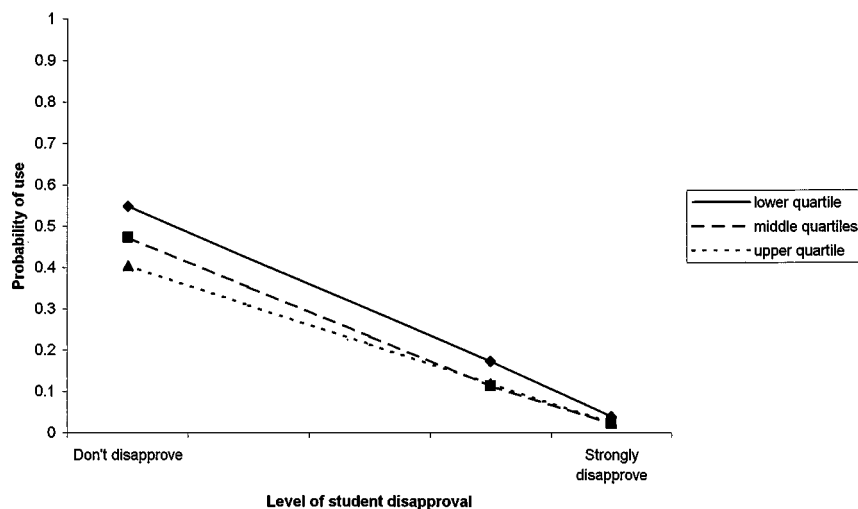


Fig. 9. Probability of marijuana use in the past 30 days by 12th-grade students who don't disapprove, disapprove, and strongly disapprove of marijuana use, attending schools which are in the lower, middle, and upper ranges of disapproval of marijuana use.

Therefore, as a next step we used multilevel hierarchical analyses to ascertain the effect of school norms of disapproval on students substance use behavior, controlling for students' own disapproval and student and school demographic characteristics.

#### Determining Probability of Substance Use by Students Using Hierarchical Modeling

We used hierarchical logistic regression analysis (HLM 5) to examine the effect of aggregated school-level disapproval on student substance use behavior controlling for their personal disapproval and student and school demographic characteristics.

#### Results of Logistic Regression Analysis

Analyses using five nested hierarchical models (Models 1–5) were conducted for each of the three substances, for Grades 8, 10, and 12, respectively. Results of the final model (Model 5) are presented in Table 5. On the basis of the results presented for Model 5, we calculated the probabilities of substance use by students who don't disapprove, disapprove, and strongly disapprove, attending schools that were at the mean level of aggregated disapproval and one standard deviation above and below the aggregated school mean disapproval. The results of these calculations are presented in Table 6. To make these

estimations, we used specific values for the predictor variables. Therefore, the estimated probability of substance use presented in Table 6 for the three grades and the three categories of substances is specific to White male students of average level of parental education, from a two-parent household, in public schools.

Across all three grades, students' personal disapproval was significantly predictive of their log-odds of substance use (Table 5). We calculated  $t$  test values comparing the beta coefficients for personal disapproval of substance use on substance use behavior among the three grades for each of the three categories of substances. The results of these calculations indicated that there was little difference between grades in the strength of the relation between disapproval of heavy drinking and the log-odds of drinking. However, the effect of personal disapproval of cigarette use on the log-odds of daily cigarette use was significantly stronger for the 8th grade ( $\gamma_{70, 8th\ grade} = -0.703, t = 2.71, p < .05$ ) and 10th grade ( $\gamma_{70, 10th\ grade} = -0.691, t = -2.56, p < .05$ ) grades as compared to the 12th grade ( $\gamma_{70, 12th\ grade} = -0.625$ ). In addition, the relation between personal disapproval of marijuana use and the log-odds of marijuana use in the past 30 days was greater ( $t = -2.70, p < .05$ ) for the 10th grade ( $\gamma_{70, 10th\ grade} = -1.101$ ) as compared to the 12th grade ( $\gamma_{70, 12th\ grade} = -1.010$ ), suggesting that for this sample of students the effect of personal disapproval on

Table 5. School Level Disapproval of Substance Use Predicting Students' Substance Use  
Student-level and school-level predictors of the log-odds of students' substance use final between-school model  
(Model 5)

Fixed effect	Cigarette use			Heavy drinking			Marijuana use			
	8th grade	10th grade	12th grade	8th grade	10th grade	12th grade	8th grade	10th grade	12th grade	
Average level of substance use	$\gamma_{00}$	-3.299**	-1.730**	-1.023**	-1.697	-0.848**	-0.770**	-3.285**	-2.142**	-1.672**
Number of parents in household (aggregated)	$\gamma_{01}$	-0.482	-0.089	-0.564	-0.092	-0.479	-0.354	-0.764	-0.312	-0.280
Parental education (aggregated)	$\gamma_{02}$	0.231	-0.059	0.083	-0.064	0.076	0.157	0.164	0.039	0.129
School size	$\gamma_{03}$	-0.047	-0.016	0.034	-0.022	0.000	0.018	0.063	-0.023	0.050
Urbanicity	$\gamma_{04}$	-0.082	-0.024	0.005	0.045	-0.036	-0.041	-0.117*	-0.010	-0.068
Type of school (public/private)	$\gamma_{05}$	0.847**	0.248	-0.007	0.190	-0.019	-0.088	0.649**	0.292*	0.151
School level disapproval (aggregated)	$\gamma_{06}$	-1.246**	-0.749**	-0.581**	-0.640**	-0.585**	-0.500**	-0.857**	-0.403**	-0.290**
Number of parents in household	$\gamma_{20}$	-0.321**	-0.326**	-0.285**	-0.248**	-0.178**	-0.028**	-0.262**	-0.147**	-0.126*
Parental education	$\gamma_{20}$	-0.206**	-0.147**	-0.082*	-0.113**	-0.038	-0.007	-0.118**	-0.102**	-0.028**
Blacks	$\gamma_{30}$	-1.139**	-1.285**	-1.622**	-0.540**	-0.588**	-0.943**	-0.215	-0.406	-0.103
Hispanic	$\gamma_{40}$	-0.100	-0.564**	-0.606**	0.173	0.182	0.045	0.186	0.181	0.070
Other	$\gamma_{50}$	-0.267*	0.037	-0.309*	-0.118	-0.137	-0.378**	-0.293**	-0.030**	-0.272**
Female	$\gamma_{60}$	0.151*	0.198**	0.135	-0.083	-0.200**	-0.491**	-0.083	-0.115	-0.132
Student disapproval of substance use	$\gamma_{70}$	-0.703**	-0.691**	-0.625**	-0.590**	-0.623**	-0.604**	-1.041**	-1.101**	-1.010**
School level disapproval (aggregated)	$\gamma_{71}$	-0.176*	-0.106*	0.013	-0.041	0.049	0.057	-0.301**	-0.052	-0.008

Note. Predictors that are bulleted are school-level variables.

\*  $p < .05$ . \*\*  $p < .01$ . \*\*\*  $p < .001$ .

Table 6. Probability of Substance Use by Students Who Strongly Disapprove, Disapprove and Don't Disapprove of Substance Use Attending Schools That are in the High (1 SD above), Medium (mean level), and Low (1 SD below) on Disapproval of Substance Use

Student disapproval	School-level disapproval of substance use								
	Daily cigarette use			Heavy drinking			Marijuana use in the past 30 days		
	Low	Medium	High	Low	Medium	High	Low	Medium	High
8th grade									
Don't disapprove	.333	.297	.245	.563	.519	.475	.495	.500	.506
Disapprove	.069	.047	.032	.186	.155	.129	.056	.042	.315
Strongly disapprove	.036	.024	.015	.178	.148	.122	.052	.038	.282
10th grade									
Don't disapprove	.507	.464	.421	.697	.619	.536	.689	.660	.631
Disapprove	.128	.098	.075	.249	.201	.161	.081	.067	.055
Strongly disapprove	.071	.052	.037	.148	.119	.095	.029	.023	.019
12th grade									
Don't disapprove	.504	.442	.381	.689	.617	.539	.658	.626	.592
Disapprove	.137	.108	.085	.249	.208	.172	.086	.075	.065
Strongly disapprove	.079	.061	.047	.150	.126	.105	.033	.029	.024

Note. Probability calculated from the results of Bernoulli's logistic regression.

lowering their use of cigarettes and marijuana was greater for students in the lower grades than it was for students in the higher grades.

Results of these analyses supported findings based on the raw data (Table 4) that school-level disapproval decreased the probability of substance use. Further, as results from Model 5 suggest, for all three substances and across the three grades, school-level disapproval inhibited students' use of substances, controlling not only for their own disapproval but also for student and school demographic characteristics.

The effect of school-level disapproval on the log-odds of substance use by students differed by grade (Table 5). This effect was generally stronger for the lower grades as compared to the higher grades. Effect of school-level disapproval of cigarette use on lowering the log-odds of students' daily use of cigarettes was significantly stronger ( $t = -2.19, p < .05$ ) for the 8th-grade students ( $\gamma_{06, 8th\ grade} = -1.246$ ) as compared to the 12th-grade students ( $\gamma_{06, 12th\ grade} = -0.581$ ). For example, the decrease in the probability of daily cigarette use for low disapproving eighth-grade students in high disapproving schools as compared to low disapproving students in low disapproving schools was .088 (Table 6). That is, there was a 26.4% drop in the probability of daily cigarette use for low disapproving eighth-grade students in high disapproving schools. For the low disapproving students 12th-grade students, the corresponding drop in probability of daily cigarette use was 24.4%. The effect of disapproval of marijuana use on decreasing the log-odds of their use of marijuana in the past 30 days was

significantly stronger ( $t = -2.22, p < .05$ ) for the eighth-grade students ( $\gamma_{06, 8th\ grade} = -0.857$ ) than it was for high school seniors ( $\gamma_{06, 12th\ grade} = -0.290$ ).

School-level disapproval had a significant effect on the relation between students' own disapproval of marijuana use and their log-odds of use of marijuana for only the eighth-grade students ( $\gamma_{71} = -0.301$ ). There was also a significant effect of school-level disapproval on the relation between students' own disapproval of cigarette use and the log-odds of daily cigarette use for the 8th graders ( $\gamma_{71, 8th\ grade} = -0.176, p < .05$ ) and 10th graders ( $\gamma_{71, 10th\ grade} = -0.106, p < .05$ ). These results indicate that a school environment of disapproval was particularly beneficial for those students in the 8th and 10th grades who were themselves not disapproving of smoking cigarettes.

Additional  $t$  tests comparing the betas for the slope across the three grades for each of the three substances indicated that the effect of school-level disapproval of marijuana use on the relation between personal disapproval of marijuana use and the log-odds of its use was significantly greater for the 8th-grade students ( $\gamma_{71, 8th\ grade} = -0.301$ ) as compared to the 10th-grade ( $\gamma_{71, 10th\ grade} = -0.052, ns; t = -3.54, p < .05$ ) and 12th-grade ( $\gamma_{71, 12th\ grade} = -0.008, ns; t = -2.99, p < .05$ ) students. Similarly, the effect of school-level disapproval of cigarette use on the relation between students' own disapproval and the log-odds of their daily use of cigarettes was significantly stronger ( $t = -2.08, p < .05$ ) for the 8th-grade students ( $\gamma_{71, 8th\ grade} = -0.176, p < .05$ ) than it was



for the 12th-grade students ( $\gamma_{1, 12\text{th grade}} = 0.013$ ). That is, school-level disapproval was more effective in decreasing the probability of marijuana and cigarette use by low disapproval students in lower grades than it was on low disapproval students in higher grades.

In general, across grades, parental education and number of parents in the household were weak predictors of students' substance use behavior. Results also indicated that African American students were less likely to have smoked cigarettes on a daily basis, drunk heavily, or ever used marijuana in the past 30 days as compared to European American students and students of other ethnic groups. Females were slightly less likely to engage in substance use than males were. Overall, none of the school demographic factors was significantly predictive of student substance use behavior.

Summarizing the results of this study, we found that (a) students' personal disapproval of substance use decreased the likelihood of their using substances—daily use of cigarettes, heavy drinking, and marijuana use in the past 30 days; (b) school-level disapproval, that is, disapproval of substance use by the student body, lowered the probability of students engaging in substance use, controlling for their own disapproval and other student and school demographic characteristics; (c) the effect of school-level disapproval of heavy drinking on the probability of students engaging in heavy drinking was not significantly different across the three grades; and (d) the beneficial effect of school-level disapproval on the probability of eighth-grade students' cigarette and marijuana use was significantly higher than it was for the 12th grade.

## DISCUSSION

This study shows that the normative climate toward substance use in school makes a difference to the probability of substance use by students. This is true across 8th, 10th, and 12th grades for daily cigarette use, heavy drinking, and marijuana use. Students are more likely to use substances when the norms in school reflect a greater tolerance for substance use. These findings hold even after controlling for students' own disapproval and for other student and school demographic characteristics.

In line with findings from earlier research, students' personal disapproval of substance use was the

most important predictor of their substance use behavior. This relation between personal attitude and behavior was examined for students in the 8th, 10th, and 12th grades. It is interesting to note that while there were no age-based differences in the effect of personal disapproval of heavy drinking on students' drinking behavior, there were age-based differences in the effect of disapproval of cigarette use on students' use of cigarettes. The effect of personal disapproval on eighth-grade students' daily use of cigarettes was greater than it was for the high school seniors. It is probable that factors like peer pressure to smoke take on added importance as students move into higher grades, resulting in personal disapproval being less effective in preventing students from smoking in the 12th grade than in the 8th grade.

Further, results from this study indicate that there are age differences in the effect of school climate on student substance use behavior. Eighth-grade students as compared to 12th-grade students are less likely to smoke cigarettes on a daily basis and to use marijuana in schools where the student body project a higher levels of disapproval of the use of these substances. Moreover, 8th-grade students as compared to 12th-grade students, particularly those students who are more inclined to smoke cigarettes on a daily basis and to use marijuana, are less likely to do so when school-level disapproval is higher. These findings suggest that it is important to create a more conservative climate of disapproval in middle schools before students become entrenched in cigarette and marijuana use behaviors.

Most substance use prevention programs are geared toward providing knowledge, changing the attitudes and behaviors of individual students, and teaching them decision-making skills to resist social influences (Tobler, 1986). However, prevention programs that focus primarily on providing individual students with knowledge and changing their attitude have proved to be ineffective (Tobler, 1986). Teaching students decision-making skills to overcome social influences to use substances like cigarettes have also not been very effective (Peterson *et al.*, 2000). As Clayton *et al.* (2000) suggest, this may be due to the fact that teaching adolescents to make the right decisions focuses on cognition and rational thinking while ignoring the affective component of social influences. Programs that focus on creating an environment of disapproval of substance use in school are likely to influence not only how students think but also how they feel about engaging in substance use. Findings from this study indicated that across grades 8, 10, and 12,

the probability of using a substance, be it cigarettes, alcohol, or marijuana, was higher in schools where the norms of disapproval reflected a greater tolerance for use of that substance. An environment of tolerance for substance use in school increased the risk of substance use by students who were themselves less disapproving of its use. This suggests that to be effective, future substance use prevention programs need to target both students and the school context. Disapproval of substance use needs to permeate the school environment. On the basis of findings from this study, we believe that a multipronged approach to prevention that targets both individual students and the school environment is likely to be more effective in reducing substance use among students as compared to traditional prevention programs that focus only on students.

## CONCLUSIONS AND LIMITATIONS

The large sample size, both in terms of number of schools and students within each of the three grades, and the multilevel analysis conducted to examine the effect of contextual factors on students' substance use add to the strength of this study. However, school-level disapproval was not measured directly as a characteristic of the school, nor was school-level disapproval obtained from data sources other than the students. School-level disapproval was an aggregated measure obtained from the student data. Although we are aware that other sources of data and measures of the school environment would have further strengthened the study, analyses using aggregated mean disapproval of substance use at the school-level as a predictor variable of students' substance use behavior are different and produce different results from the original individual level disapproval (Kreft & De Leeuw, 1998).

The effect of age on students' use of cigarettes, alcohol, and marijuana was examined using cross-sectional data from 8th-, 10th-, and 12th-grade students. It will be important to examine whether the results from this study, particularly the age-related differences, are replicated when tested with longitudinal data.

These limitations do not detract from the important message this study conveys. Schools can make a difference. School administrators, teachers, and students can all work together to create an environment where substance use is actively disapproved.

## APPENDIX

### Measure of Substance Use

#### *Cigarette Use*

How frequently have you smoked cigarettes during the past 30 days?

1. Not at all
2. Less than one cigarette per day
3. One to five cigarettes per day
4. About one-half pack per day
5. About one pack per day
6. About one and one half packs per day
7. Two packs or more per day

The item was recoded as a dichotomous variable with 0 = *Never use* and 1 = *Used once or more than once*, to indicate daily use of cigarettes in the last 30 days.

#### *Heavy Drinking*

Think back over the last two weeks. How many times have you had five or more drinks in a row?

1. None
2. Once
3. Twice
4. Three to five times
5. Six to nine times
6. Ten or more times

The item was recoded as a dichotomous variable with 0 = *Never had* and 1 = *Used once or more than once*, to indicate whether they had ever had five or more drinks in a row in the past two weeks.

#### *Marijuana Use*

On how many occasions have you used marijuana or hashish during the last 30 days?

1. 0 occasions
2. One to two occasions
3. Three to five occasions
4. Six to nine occasions
5. Ten to nineteen occasions
6. Twenty to thirty-nine occasions
7. Forty or more occasions

The item was recoded as a dichotomous variable with 0 = *Never use* and 1 = *Used once or more than once*,

to indicate whether they had ever used marijuana in the last 30 days.

### Measures of Substance Use Disapproval

Individuals differ in whether or not they disapprove of people doing certain things. Do you disapprove of people (who are 18 or older) doing each of the following? (12th grade survey).

Individuals differ in whether or not they disapprove of people doing certain things. "Do you disapprove of people doing the following?" (8th and 10th grade survey).

Smoking one or more packs of cigarettes per day.

Having five or more drinks once or twice each weekend

Trying marijuana once or twice

Smoking marijuana occasionally

Smoking marijuana regularly

Measures of disapproval were originally on a three-point scale, with 1 = *Don't disapprove*, 2 = *Disapprove*, and 3 = *Strongly disapprove*. These were recoded as 5-point scales with 1 = *Don't disapprove*, 4 = *Disapprove*, and 5 = *Strongly disapprove*.

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