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Community-level Effects of Individual and Peer Risk and Protective Factors on Adolescent Substance Use

Elizabeth A. Egan¹, M. Lee Van Horn², Kathryn C. Monahan¹, Michael W. Arthur¹, and J. David Hawkins¹

¹University of Washington

²University of South Carolina

Abstract

The association between community-aggregated levels of peer and individual risk and protective factors and prevalence of adolescent substance use was examined in repeated cross-sectional data among youth in 41 communities ranging in population from 1,578 to 106,221. The association between community levels of these peer and individual risk and protective factors in 2000 and substance use 2 years later was examined by using within-cohort analyses (e.g., sixth grade in 2000 predicting eighth grade in 2002) and cross-cohort analyses (e.g., sixth grade in 2000 predicting sixth grade in 2002). In both within- and across-cohort analyses, community-aggregated levels of peer and individual risk and protective factors predicted the prevalence of adolescent substance use 2 years later, suggesting that focusing on elevated peer and individual risk factors and depressed peer and individual protective factors at the community level to guide the selection of preventive interventions may be a viable strategy for community efforts to prevent adolescent substance use community wide.

Keywords

risk and protective factors; substance use; community-level effects; adolescence

Characteristics of adolescents and their peers, such as their attitudes, beliefs, and behaviors, can impact the likelihood that youth will use substances (Hawkins, Catalano, & Miller, 1992; Petraitis, Flay, & Miller, 1995; Sale, Sambrano, Springer, & Turner, 2003). Indeed, some research suggests that risk factors in the individual and peer domains are stronger predictors of substance use during adolescence than are risk factors in other domains such as the community or family (Wright & Pemberton, 2004). For example, adolescent and peer-group attitudes that are positive toward substance use lead to greater risk of current and future substance use among youth (Sale et al., 2003). If a youth and/or a youth's peer group has positive attitudes about the consumption of alcohol, the social context the youth experiences is likely one of a positive social norm toward the consumption of alcohol – leading to increased risk of consumption of alcohol (Petraitis et al., 1995).

While it is well documented that youths are influenced by the immediate social context that they experience, such as the peer group, it is less clear how the average attitudes, beliefs, and behaviors of individuals and peers across an entire community can impact substance use. More generally, while youth are clearly impacted by proximal indicators of risk, such as

their own attitudes and beliefs and the attitudes and beliefs of their immediate peer group, it is less clear how overall levels of individual risk and peer risk within a community impact youths' likelihood of using substances during adolescence. To the extent that the attitudes, beliefs, and behaviors of adolescents and their peers within a given community contribute to the prevailing social climate within that community, these individual and peer-group-level characteristics could theoretically lead to a community-level social climate which impacts adolescent substance use across the whole community. If it is the case that aggregate levels of individual and peer risk and protective factors in a community impact adolescent substance use community wide over time, this would suggest the design and implementation of community-level prevention programs that are focused on individual and peer risk factors that are elevated in the community and/or on individual and peer protective factors that are depressed or low in the community. Community-wide approaches toward prevention and intervention guided by evidence of elevated individual or peer risks in the community and depressed individual and peer protective factors in the community could play an important role in decreasing the prevalence adolescent substance use community wide. From a public health perspective, universal preventive interventions focused on reducing elevated individual and peer risks and depressed individual and peer protective factors in the entire adolescent population of a community could hold promise for decreasing substance use and promoting positive youth development community wide. Yet, to date, it remains unclear whether community aggregated levels of individual and peer domain risk and protection are predictive of the prevalence of adolescent substance use in a community. The present study aims to fill this void by examining how community levels of exposure to individual and peer risk and protective factors as reported by population samples of students in a community are related to the prevalence of adolescent substance use 2 years later.

Research suggests that there is a core set of individual and peer-group characteristics that increase risk for and protect against substance use during adolescence (Hawkins et al., 1992). A number of risk factors have been identified for youth involvement in substance use. At the individual disposition level, individual rebelliousness and sensation seeking are linked with increased externalizing behavior, including substance use (Martin et al., 2004; Trocki, Drabble, & Midanik, 2009). Moreover, favorable attitudes to antisocial behavior and drugs, low perceived risks of drug use, association with antisocial peers, peer drug use, and perceived rewards for involvement in antisocial behavior are associated with greater substance use during adolescence (Petraitis et al., 1995). In contrast, greater social skills and a belief in the moral order are associated with a lower likelihood of substance use during adolescence (Hawkins et al., 1992). While each of these individual and peer characteristics contributes to adolescent substance use, it remains unclear how the aggregate levels of these risk and protective factors within a community contribute to the prevalence of adolescent substance use. That is, does the level of risk and protection on average within a community contribute to an adolescent's own substance use?

In recent years, a number of researchers have begun to investigate if aggregate levels of risk and protective factors at the school level contribute to adolescent problem behaviors. Kumar and colleagues (2002) used 8th-, 10th-, and 12th-grade data from the 1999 Monitoring the Future survey to test whether school-level disapproval of substance use predicts students' substance use (Kumar et al., 2002). Even after controlling for individual student's disapproval and other student and school characteristics, the school norm concerning use of each respective substance was significantly related to use of these substances, with higher school disapproval related to less substance use across all grades. Similarly, Swaim (2003) investigated the school-level effects of perceived harm and perceived availability of drugs on marijuana use among 12th graders from 187 public high schools throughout the United States (Swaim, 2003). While both individual-level characteristics were related to marijuana

use at the aggregated school level, at the individual level, only perceived availability of marijuana was associated with marijuana use.

While there is evidence that aggregated individual and peer risk and protective factors at the school level are associated with concurrent adolescent substance use, it is unclear how community-level aggregation may predict future substance use. Previous research suggests that this may be an important next step for research. Community leaders' assessments of risk and protective factors in a given community are highly correlated with individual risk and protection, and are predictive of substance use within that community (Van Horn, Hawkins, Arthur, & Catalano, 2007). Moreover, individuals' perceptions of their community are associated with individual substance use (Hawkins et al., 1992), and community characteristics are associated with the aggregate levels of substance use within that community (Hawkins, Van Horn, & Arthur, 2004; Hays, Hays, & Mulhall, 2003). Another study using data aggregated at the community level to predict future substance use found that community levels of 15 risk and protective factors (7 factors in the community domain and 8 in the family domain) predicted greater alcohol use 2 years later among the same cohort of youth, and predicted substance use among individuals in younger cohorts (Fagan, Van Horn, Hawkins, & Arthur, 2007).

While individual characteristics aggregated at the school level have been linked to substance use (Kumar et al., 2002; Swaim, 2003), and community and family characteristics aggregated at the community level (Fagan et al., 2007; Van Horn et al., 2007) have been linked to adolescent substance use, it remains unclear how individual and peer characteristics aggregated within a community contribute to adolescent substance use. If community stakeholders assess and use levels of risk and protection within their own communities for prevention planning purposes, it is important to understand if community levels of risk and protection are related to adolescent substance use. Thus, the goal of the present study is to examine how individual and peer characteristics aggregated at the community level at one time point can impact substance use 2 years later (a) within the same cohort of youth and (b) in a new cohort of youth in the same grade. Findings of relations across cohorts that replicate those within the same cohorts provide evidence that these relations are, indeed, contextual effects and not simply individual-level relations aggregated to the community level. That is, evidence of cross-cohort associations between community-aggregated risk and protection and adolescent substance use as reported by one cohort of adolescents indicate that the social context of a given community at one time can have a lasting impact on adolescent substance use in subsequent cohorts that do not include the same individuals who initially reported exposure to individual and peer risk and protective factors.

Methods

Participants

The present study uses data from the Diffusion Study, a cross-sectional study of risk and protective factors, substance use, and delinquency in 41 small to medium-sized communities in seven U.S. states. In order to be included in the study, each community had to be an incorporated town with clearly identified geographic boundaries and a local government that operated within the geographic boundaries. Individuals in Grades 6, 8, and 10 were recruited to participate in the Communities That Care (CTC) Youth Survey. Passive consent procedures were used and all youth in participating schools had the option of participating unless a parent actively asked that the child not be included in the study. Children assented at the time of data collection. All public school students in Grades 6, 8, and 10 from the 41 communities were eligible to participate, and youths were surveyed in 2000 and 2002. Of eligible youth within the school in 2000, 71.3% of 6th graders, 66.2% of 8th graders and

57.1% of 10th graders completed the interview. Of eligible youth within the school in 2002, 83.4% of 6th graders, 81.7% of 8th graders, and 73% of 10th graders completed the interview. Individual students were not followed longitudinally; rather, the CTC Youth Survey was administered anonymously to youth. Notably, there is overlap of individuals in the cohorts surveyed longitudinally because many youths who provided information in the sixth grade in 2000 likely completed the survey again in 2002 as eighth-grade students, but as the survey was conducted anonymously, it is impossible to ascertain the degree of overlap. There was likely no overlap in the repeated cross-sectional cohorts, that is sixth graders surveyed in 2000 and sixth graders surveyed in 2002, for example.

The communities involved in the study were relatively small (range 1,578 to 106,221 total population) and the number of juveniles in the population ranged from 201 to 12,350. The communities ranged from 44% to 52% male and 64% to 98% Caucasian (1% – 65% reported Hispanic ethnicity across communities). The average participation rate across communities calculated using school enrollment figures ranged from 38% to 89% in 2000, with an average participation rate of 70% across all grades. In 2002; participation ranged from 53% to 85%, with an average of 76% of eligible students completing surveys. The resulting sample consisted of 20,421 youths in 2000, and 24,453 youths in 2002. On average, 166 and 199 youths were surveyed at each grade level in each community in 2000 and 2002, respectively. Across both waves of data collection, 49% of the respondents were male; 72% identified as White, 8% Hispanic, 5% African-American, 5% Asian-American, 3% Native-American, and 8% identified as “Other.” Table 1 displays demographic information by year and grade.

To protect against bias in adolescent self-reports, multiple screening tools were used to eliminate surveys that showed evidence of dishonest or inconsistent reporting. Individuals were eliminated if they (a) reported that they had not responded honestly to the survey, (b) reported any use of a fictitious drug in the past month, (c) reported using the fictitious drug two or more times in their lifetime, or (d) had more than one inconsistent or unreasonable pattern of responses. Inconsistent or unreasonable response patterns included monthly substance use that was greater than lifetime use, improbable frequency of drug use, improbable frequency of antisocial behavior, same frequency of high drug use for all substances, reports of age of first use greater than current age, current age inconsistent with grade, and reports of living with all 16 types of family members listed in the response options. In the current sample, 3.5% of cases were eliminated in 2000 based upon questionable responding and 5.1% of cases were eliminated in 2002.

Measures

Students completed the Communities That Care (CTC) Youth Survey in school during a single class period. The CTC survey is a self-report instrument designed for adolescents between ages 11 and 18 that measures a broad array of risk and protective factors across multiple ecological domains (Arthur, Hawkins, Pollard, Catalano, & Baglioni, 2002). A previous study of over 10,000 students in Grades 6, 8, and 10 found the survey to have an average alpha coefficient of .78 across all scales and found expected correlations between each risk and protective factor with problem behaviors (Arthur et al., 2002). Using confirmatory factor analysis, another study of 172,628 6th-, 8th-, 10th-, and 12th-grade students from seven states found that, with minor modifications, the measurement model fit the data well and was invariant across racial/ethnic groups and gender (Glaser, Van Horn, Arthur, Hawkins, & Catalano, 2005). Across grades, all but the factor means were found to be invariant, with mean levels of some risk and protective factors changing with age. In addition to risk and protection, lifetime and past-month substance use data were collected using questions adopted from the Monitoring the Future survey (Johnston, O'Malley, &

Bachman, 2000). A list of the items comprising each measure is provided in Appendix A of Glaser et al. (2005).

Substance use measures—Single items were used in the current study to assess lifetime use of alcohol (“*On how many occasions [if any] have you had alcoholic beverages [beer, wine, or hard liquor] to drink in your lifetime – more than just a few sips?*”), cigarettes (“*Have you ever smoked cigarettes?*”), and lifetime use of marijuana (“*On how many occasions [if any] have you used marijuana in your lifetime?*”). Response options for Lifetime Cigarette Use ranged from *Never* (0) to *Regularly Now* (4). Response options for Lifetime Alcohol and Lifetime Marijuana Use ranged from *0 Occasions* (0) to *40 or More Occasions* (6). Single items were also used in the current study to assess use of cigarettes, alcohol, and marijuana in the last 30 days. Response options for 30-day use of cigarettes ranged from *Not At All* (0) to *Two Packs or More per Day* (6). Response options for 30-day alcohol and marijuana use ranged from *0 occasions* (0) to *40 or More Occasions* (6). In addition, a single item assessed the number of times the respondent had engaged in binge drinking over the last 2 weeks. Response options ranged from *None* (0) to *10 or more times* (5). Because the data were highly skewed, dichotomous markers were created to indicate *no substance use* (0) versus *any use* (1) for alcohol, cigarettes, and marijuana.

Risk and protective measures—The current study focused on the risk and protective factors in the peer/individual domain of the CTC youth survey (see Fagan et al., 2007 for an examination of the contextual effects of the factors in the community and family domains). The peer /individual domain included eight measures of risk (rebelliousness, favorable attitudes toward antisocial behavior, favorable attitudes toward drug use, low perceived risks of drug use, interaction with antisocial peers, friends’ use of drugs, sensation seeking, and rewards for antisocial involvement), and two measures of protection (social skills and belief in the moral order).

Results suggested that each of the measures of risk and protective factors had adequate reliability at the individual level (α) and at the community level (β): rebelliousness (3 items, e.g., “*I ignore rules that get in my way.*”; $\alpha = .74$; $\beta = .88$); favorable attitudes toward antisocial behavior (5 items, e.g., “*How wrong do you think it is for someone your age to take a handgun to school?*”; $\alpha = .81$; $\beta = .87$); favorable attitudes toward drug use (4 items, e.g., “*How wrong do you think it is for someone your age to drink beer, wine or hard liquor regularly?*”; $\alpha = .86$; $\beta = .95$), perceived risks of drug use (4 items, e.g., “*How much do you think people risk harming themselves if they smoke one or more packs of cigarettes per day?*”; $\alpha = .79$; $\beta = .90$); interaction with antisocial peers (6 items, e.g., “*In the past year, how many of your best friends have been suspended from school?*”; $\alpha = .80$; $\beta = .88$); friends’ use of drugs (4 items, e.g., “*In the past year, how many of your best friends have smoked cigarettes?*”; $\alpha = .85$; $\beta = .93$); sensation seeking (3 items, e.g., “*How many times have you done what feels good no matter what.*”; $\alpha = .81$; $\beta = .87$); and rewards for antisocial involvement (4 items, e.g., “*What are the chances you would be seen as cool if you smoked marijuana?*”; $\alpha = .82$; $\beta = .91$). Reliability was also adequate for individual/peer protective measures: social skills (4 items; $\alpha = .65$; $\beta = .88$), where students were asked to choose what they would do in various social problem situations; and belief in the moral order (4 items, e.g., “*I think it’s okay to cheat at school.*”; $\alpha = .73$; $\beta = .92$). Coefficient alphas by year and by year and grade were similar to alphas for the entire sample and are available upon request. Response options varied depending on the item, with examples including *Very False* (1) to *Very True* (4), and *None of My Friends* (0) to *Four of My Friends* (4).

The risk and protective factor scales were created by standardizing and then averaging all the items reported by students for each risk and protective factor. Because the present study

was interested in how community levels of individual and peer risk contribute to adolescent substance use, community-level aggregates were created by averaging each risk and protective factor scale within each community and grade level. Table 2 displays the means, standard deviations, and minimum and maximum scores of the individual and peer risk and protective factors at the community level in 2000.

Data Analyses

Missing data—All missing data were addressed with multiple imputations at the item level. The procedure MI in SAS 9.0 was used to create 10 imputed datasets and the procedure MIANALYZE in SAS was used to combine results across imputations to derive unbiased standard errors to ensure valid inferences from statistical tests.

Analysis plan—A generalized linear mixed model with random community intercepts in the SAS macro GLIMMIX was used to run two sets of analyses. In the first set of analyses, the within-cohort analyses, community levels of risk and protection in 2000 were used to predict prevalence of substance use across communities in 2002 at the higher grade level. Thus, community levels of risk and protective factors reported by students in the sixth grade were used to predict students' substance use 2 years later among students in the eighth grade (note that there was likely to be considerable overlap between the students in the sixth grade in 2000 and those in the eighth grade in 2002). Likewise, 8th-grade community levels of risk and protection were used to predict the prevalence of substance use across communities 2 years later among students in the 10th grade. The association between each community-level risk and protective factor and substance use is analyzed separately.

In the second set of analyses, the cross-cohort analyses, community levels of risk and protection in 2000 were used to predict the prevalence of student substance use across communities in 2002 within the same grade level. Thus, community levels of risk and protection reported by 6th graders in 2000 were used to predict the prevalence of student substance use among a subsequent cohort of 6th graders in 2002 in the same community; 8th-grade levels of risk and protection in 2000 were used to predict 8th graders' substance use in 2002; and 10th-grade levels of risk and protection in 2000 were used to predict 10th graders' substance use in 2002 across communities.

Both sets of analyses adjusted for differences between communities on individual-level covariates. Specifically, models were adjusted for age, sex, and race, which was coded as European American or not. Within a hierarchical multilevel framework, these covariates were entered at level 1 in the model. Community levels of risk and protection (community-aggregated individual data on risk and protective factors) were entered at level 2 in the model. Parameter estimates and odds ratios reflect differences in the level-1 response (adolescent substance use) and are interpreted as the effects of community-level predictors on student's logit for substance use. Notably, the parameter estimates are the expected effect of community aggregates on outcomes. Because all respondents from the same community have the exact same value for the aggregate measure, these models cannot predict individual differences within communities. Instead, analyses indicate the extent to which community levels of risk and protection are associated with youth outcomes across communities. Analyses are conducted on missing data and all available data are used. The sample size is equal to the number of individuals in each grade for the outcome (individual level $N = 8,581$ 6th graders, $N = 8,117$ 8th graders, and $N = 7,755$ 10th graders in 2002; community level $N = 24$). Significance levels were corrected group-wise using a Bonferroni correction across the seven substance use outcomes for each risk and protective factor to adjust for the increased likelihood that some results would be significant by chance.

Results

Within-cohort Analyses

Beta weights in log units, standard errors, and odds ratios of relations between community levels of individual and peer risk and protective factors in 2000 and prevalence of substance use within the same cohort are displayed in Table 3 for 6th grade in 2000 to 8th grade in 2002, and Table 4 for 8th grade in 2000 to 10th grade in 2002. All significant relations were in the expected direction, with higher risk at the community level predicting greater likelihood of substance use, and higher protection at the community level predicting lesser likelihood of substance use.

Range of significant relations—Analyses of risk factors aggregated at the community level in sixth grade in 2000 predicting the prevalence of student substance use across communities in the eighth grade in 2002 revealed odds ratios for risk factors that ranged from 1.21 (for community levels of perceived risk of drug use in sixth grade predicting eighth-grade prevalence of students' lifetime alcohol use) to 1.35 (for community levels of friends' drug use in sixth grade predicting eighth-grade prevalence of student cigarette use in the past month). The significant odds ratios for protective factors ranged from .76 (community levels of belief in the moral order in sixth grade predicting prevalence of eighth-grade students' lifetime cigarette use) to .83 (community levels of belief in the moral order in sixth grade predicting prevalence of eighth-grade students' lifetime alcohol use).

The patterns of relations between community levels of individual and peer risk factors and later students' substance use were similar in the 8th- to 10th-grade cohort to those found in the 6th- to 8th-grade cohort. The odds ratios for significant risk factors ranged from 1.23 (community levels of rewards for antisocial involvement in 8th grade predicting prevalence of 10th-grade students' alcohol use in the past month) to 1.39 (community levels of favorable attitudes towards drugs in 8th grade predicting prevalence of 10th-grade students' lifetime alcohol use). For significant protective factors, the odds ratios ranged from .71 (community levels of social skills in 8th grade predicting prevalence of 10th-grade students' lifetime alcohol use) to .81 (community levels of belief in the moral order in 8th grade predicting prevalence of 10th-grade student alcohol use in the past month).

Similarities between grades—In both cohorts, individual and peer risk and protective factors aggregated at the community level predicted some form of student substance use across communities 2 years later, with two exceptions. Community levels of sensation seeking and community levels of interactions with antisocial peers did not predict later substance use in either cohort.

Differences between grades—Table 5 shows that more significant relations were found between individual and peer risk and protective factors measured in the 8th grade predicting 10th-grade substance use than were found between individual and peer risk and protective factors measured in the 6th grade predicting 8th-grade substance use. Community levels of rebelliousness, perceived risk of drug use, and social skills were stronger predictors of substance use in the 8th- to 10th-grade cohort than in the 6th- to 8th-grade cohort. The opposite pattern is true for favorable attitudes towards antisocial behavior at the community level, which was associated with more substance use in the 6th- to 8th-grade cohort than in the 8th- to 10th-grade cohort.

Cross-cohort Analyses

Beta weights in log units, standard errors, and odds ratios of relations between community-level risk and protective factors in a given grade in 2000 and the prevalence of student

substance use across communities in that same grade 2 years later are presented in Tables 6 through 8. Table 6 displays the impact of aggregate community levels of sixth-grade individual and peer risk and protective factors in 2000 predicting prevalence of student substance use in communities in a subsequent cohort of sixth graders in 2002. Table 7 presents aggregate community levels of eighth-grade individual and peer risk and protective factors in 2000 predicting the prevalence of student substance use in a subsequent cohort of eighth graders in 2002 in the same communities. Table 8 presents aggregate community levels of 10th-grade individual and peer risk and protective factors in 2000 predicting students' substance use in a subsequent cohort of 10th graders in 2002 in the same communities. Once again, all significant relations were in the expected direction, with higher risk predicting greater likelihood of future substance use at the community level and higher protection predicting lesser likelihood of future substance use among a subsequent cohort of youth in the same community.

Range of significant relations—Across two cohorts of sixth graders, the odds ratios of significant risk factors ranged from 1.16 (community levels of rewards for antisocial involvement predicting the prevalence of a subsequent cohort of prevalence of lifetime alcohol use), to 1.36 (community levels of favorable attitudes toward antisocial behaviors predicting the prevalence of a subsequent cohort of students' lifetime marijuana use in the same community). For protective factors, significant odds ratios ranged from .75 (community levels of belief in the moral order predicting the prevalence of a subsequent cohort of prevalence of students' lifetime cigarette use in the same community) to .83 (community levels of social skills predicting the prevalence of a subsequent cohort of students' lifetime alcohol use in the same community).

Examining relations between risk and protective factors experienced by eighth graders in 2000 and substance use reported by eighth graders in the same communities 2 years later, the odds ratios of significant risk factors ranged from 1.22 (community levels of rewards for antisocial involvement among eighth graders in 2000 predicting monthly alcohol use reported by a subsequent cohort of eighth graders in the same communities in 2002) to 1.32 (community levels of favorable attitudes toward drugs and perceived risk of drug use among eighth graders in 2000 predicting lifetime alcohol use reported by a subsequent cohort of eighth graders in 2002 in the same communities). For protective factors, significant odds ratios ranged from .75 (community levels of social skills among eighth graders in 2000 predicting the prevalence of lifetime alcohol use reported by a subsequent cohort of eighth graders in 2002 in the same community) to .80 (community levels of belief in the moral among eighth graders in 2000 predicting the prevalence of lifetime alcohol use reported by a subsequent cohort of eighth graders in 2002 in the same communities).

Across two cohorts of 10th graders from 2000 to 2002, the odds ratios of significant risk factors ranged from 1.23 (community levels of perceived risk of drug use among 10th graders in 2000 predicting the prevalence of binge drinking reported by a subsequent cohort of 10th graders in the same communities in 2002) to 1.44 (community levels of friends' drug use among 10th graders in 2000 predicting the prevalence of lifetime alcohol use reported by a subsequent cohort of 10th graders in the same communities in 2002). For protective factors, significant relations ranged from .69 (community levels of social skills among 10th graders in 2000 predicting the prevalence of lifetime alcohol use reported by 10th graders in the same communities in 2002) to .79 (community levels of belief in the moral order among 10th graders in 2000 predicting the prevalence of lifetime alcohol use reported by a subsequent cohort of 10th graders in the same communities in 2002).

Similarities between grades—At both 8th and 10th grades, several of the individual and peer risk and protective factors measured at the community level predicted substance use

reported by a subsequent cohort of students in the same grade in the community 2 years later. However, as in the within-cohort analyses, at the community level, interaction with antisocial peers and sensation seeking were unrelated to any substance use outcomes in these cross-cohort analyses.

Differences between grades—Table 5 shows that there were more significant relations between risk and protective factors and students' substance use across the 10th-grade cohorts than across either the 6th- or 8th-grade cohorts. Perceived risk of drug use, friends' drug use, rewards for antisocial involvement, and social skills measured at the community level predicted all seven drug use outcomes across the 10th-grade cohorts. Fewer significant relations were found between these factors and substance use among students in subsequent cohorts at sixth and eighth grades. Still, three significant relations across the sixth-grade cohorts and five significant relations across the eighth-grade cohorts were found between friends' drug use reported by an earlier cohort and drug use outcomes reported by those in that grade 2 years later. Four significant relations across the sixth-grade cohorts and three significant relations across the eighth-grade cohorts were found between social skills reported by an earlier cohort and drug use outcomes reported by those in that grade 2 years later. In contrast, more significant relations were found between favorable attitudes toward antisocial behaviors and belief in the moral order among those in sixth grade in 2000 and drug use outcomes reported by those in sixth grade 2 years later than across the other two grade cohorts.

Discussion

In recent years, researchers have begun to investigate how characteristics at the community level may impact individual behavior. It is possible that individual and peer characteristics aggregate within a community to form a social or normative climate that can affect the behavior of other individuals in that community. Results of the present study indicate that individual and peer risk and protective factors aggregated at the community level predict the substance use of adolescents in communities both within cohorts and across cohorts during adolescence. The similarity in findings across the within-cohort and cross-cohort analyses suggests that, when aggregated to the community level, individual and peer risk factors are contextual factors that not only place the individual reporting them at risk (Hawkins, Catalano, & Arthur, 2002; Hawkins et al., 1992), but also affect the future drug using behaviors of other youths in the community. Similarly, individual and peer protective factors measured at the community level also appear to inhibit drug using behaviors of individuals both within and across cohorts community wide. That is, the levels of individual and peer risk and protective factors in a community at one time point influence future adolescent substance use both within a cohort and across cohorts of students. These findings suggest the potential value of universal community-level interventions designed to reduce risk factors and enhance protective factors within the entire adolescent population of a community. From a public health perspective, universal prevention efforts to diminish individual and peer domain risks and elevate individual and peer domain protection across a given community may be key to leading to community-wide declines in adolescent substance use.

Across both within-cohort and cross-cohort analyses, a number of community-level measures of individual and peer risk and protective factors emerged as consistent predictors of adolescent substance use: favorable attitudes toward drugs (risk factor), low perceived risks of drug use (risk factor), friends' drug use (risk factor), social skills (protective factor), and belief in the moral order (protective factor). While these factors were consistently related to substance use, some developmental variation in the strength of these effects was found. The most pronounced example of this variability was found for favorable attitudes toward antisocial (i.e., delinquent) behavior, which predicted almost all forms of substance

use in the 6th- to 6th- and 6th- to 8th-grade analyses, but only lifetime use of substances in the 8th- to 10th-grade cohort, and only one form of substance use in the 8th- to 8th- and 10th- to 10th-grade cross-cohort analyses. These findings support the contextual nature of attitudes and beliefs aggregated to the community level and suggest that favorable attitudes toward antisocial behavior at the community level are particularly salient in early adolescence.

The finding of significant contextual effects for favorable attitudes toward drugs is consistent with those of Kumar and colleagues (2002), but stands in contrast to Swaim (2003). Differences between measurement and methods in these studies may explain the different findings. First, Swaim studied marijuana perceptions and use exclusively, whereas the current study examined the combined perceived risks of cigarette, marijuana, and alcohol use on the separate behaviors of smoking, drinking, and marijuana use. Second, Swaim examined 12th graders, whereas the current study examined 6th, 8th, and 10th graders. Third, Swaim studied relations at the same point in time, whereas the current study examined predictive relations across a 2-year lag. Fourth, Swaim studied school effects whereas the current analysis studied community effects. Finally, Swaim controlled for perceived harm at the individual level before entering it in the model at the school level. In Swaim's model, the individual-level relation between perceived harm and substance use was significant. One interpretation of this finding is that the relation between perceived harm and substance use occurred at the individual rather than the school level. Another interpretation of this finding is that group-level perceptions of harm influenced individual perceptions of harm, which then influenced substance use behaviors. Thus, individual perceptions could have mediated the relation between group perceptions and substance use. Further studies to test these hypotheses are warranted.

The most obvious similarity across all models tested here was the absence of relations between community levels of the risk factors of sensation seeking and interaction with antisocial peers, and the prevalence of students' substance use in communities 2 years later. A number of studies have identified sensation seeking as a trait with biological underpinnings that is related to substance use initiation, frequency, and quantity (Cooper, Wood, Orcutt, & Albino, 2003; Desrichard & Denarié, 2005; Hittner & Swickert, 2006; Martin et al., 2002). Although an individual's level of sensation seeking might be expected to predict subsequent substance use for that individual, it is harder to see the mechanism by which community levels of a personality characteristic of sensation seeking would influence an individual's substance use. The data are consistent with this interpretation.

With regard to interaction with antisocial peers, Table 2 reveals that, on a scale of 0 to 4, the mean community level of interaction with antisocial peers was 0.27, with a minimum community score of 0.05 and a maximum community score of 0.72. Although an individual's interaction with antisocial peers has been shown to correlate with individual substance use (Arthur et al., 2002), and the community level of this factor may reflect the number of antisocial peers in a community, the community base rates and cross-community variation may be sufficiently low in the present study as to constrain potential observed relations due to restricted variance in the predictor variable. Nonetheless, the present findings suggest that some predictors of substance use at the individual level are not necessarily predictors of substance use at the community level.

Although the present study is strengthened by its large sample size, statistical modeling methods used, and focus on within- and across-cohort effects, it is nonetheless limited in several respects. First, community levels of risk and protection were obtained by aggregating self-reports of risk and protection obtained from youths who also reported on substance use outcomes. Prior research suggests that the evidence for community-level

effects of these risk and protective factors is stronger when measures of the predictors are obtained independently of the measures of outcomes (Van Horn et al., 2007). This may have affected the findings of the present study. However, this limitation is mitigated by the analyses, which examined the relations between risk and protective factors reported by one cohort of youths and substance use reported by a different cohort of youths in the same grade 2 years later. Moreover, given the focus of this study on risk and protective factors in the peer and individual domains, it is difficult to imagine another method to assess adolescents' attitudes and beliefs. A second limitation of the present study is that we were unable to estimate the percentage of youths in the within-cohort analyses who completed the survey at both waves. In the within-cohort analyses, some youths completed both the 6th- and 8th-grade surveys and some youths completed both the 8th- and 10th-grade surveys, but given the anonymous nature of the surveys, the proportions in each cohort who completed surveys at both waves are not known. This opens the possibility that results of the within-cohort analyses reflect the effects of the risk and protective exposure of these individuals in 2000 on their own self-reported drug use in 2002 rather than a contextual effect. However, the consistency of findings across the within-cohort and cross-cohort analyses reduces concerns about this threat. A third limitation of the present study is that we do not account for familial or community differences in socioeconomic status. However, we did control for other potential predictors of drug use including age, gender, and race/ethnicity. Similarly, we do not know to what extent selection effects (i.e., parents choosing to live in certain communities), impacted the level of observed individual and peer risk factors within a given community. This remains an important question for future research. It is also the case that other community-level variables that were not measured here, such as collective efficacy and social control, may impact adolescent substance use. Finally, the communities enrolled in the present study are small- to moderately sized towns with distinct geographical boundaries and their own governments. In these towns, community-wide levels of individual and peer risk factors predicted the prevalence of adolescent drug use in subsequent years and in subsequent cohorts, indicating the contextual effects of these factors at the community level. It is not clear how the results found here would generalize to suburban or urban settings. It is possible that neighborhoods or school catchment areas may have greater contextual influences on adolescent drug use in settings with larger and more diverse populations than these freestanding incorporated towns. Research is needed that examines associations between community levels of risk and protection and adolescent substance use outcomes in suburban and urban areas.

The results of the present study indicate that, when aggregated to the community level, individual and peer risk and protective factors predict future adolescent substance use in communities. The findings suggest that universal or community-level approaches to prevention of adolescent substance use may simultaneously reach large numbers of youths while also changing aggregate levels of factors that contribute to substance use during adolescence. Moreover, the findings suggest that a focus on reducing elevated individual and peer-related risk factors and strengthening individual and peer-related protective factors in communities could have beneficial effects in reducing adolescent substance use community wide.

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Table 1

Sample Descriptive Information by Grade and Survey Year

Grade	Survey year							
	2000				2002			
	6th	8th	10th	Total	6th	8th	10th	Total
Mean age	11.66	13.69	15.66	13.57	11.65	13.66	15.66	13.59
Percent male	49	49	49	49	50	48	48	49
Percent White	67	73	74	71	66	73	78	72
Percent Hispanic	8	8	6	7	9	9	8	9
Percent African American	5	5	5	5	5	5	4	4
Percent Asian American	8	7	9	8	8	7	8	8
Percent Native American	3	2	2	3	5	3	2	4
Percent other	9	6	5	6	7	3	0	3
Total N	7224	6941	6256	20421	8581	8117	7755	24453
Minimum N in city	35	25	26	25	27	33	24	24
Maximum N in city	409	351	356	409	434	409	356	434
Mean N in city	190	178	165	178	215	198	194	202

Table 2
Community-Level Descriptive Information by Grade for Risk and Protective Factors Measured in 2000

	Grade														
	6th					8th					10th				
	Min	Max	Mean	SD		Min	Max	Mean	SD		Min	Max	Mean	SD	Total
Peer/individual risk															
Rebelliousness (1–4)	1.34	2.29	1.66	0.16	1.72	2.25	1.93	1.93	0.13	1.72	2.26	2.03	0.12	1.34	2.29
Favorable attitudes toward antisocial behavior(1–4)	1.18	1.55	1.35	0.08	1.40	1.88	1.66	1.66	0.11	1.61	2.05	1.74	0.10	1.18	2.05
Favorable attitudes toward drugs (1–4)	1.03	1.34	1.18	0.07	1.20	1.97	1.59	1.59	0.18	1.40	2.23	1.92	0.19	1.03	2.23
Perceived risk of drug use (1–4)	0.49	1.05	0.73	0.12	0.49	1.23	0.86	0.86	0.16	0.59	1.26	0.99	0.15	0.49	1.26
Interaction with antisocial peers (0–4)	0.05	0.33	0.16	0.07	0.10	0.57	0.30	0.30	0.11	0.18	0.72	0.36	0.11	0.05	0.72
Friends' drug use (0–4)	0.07	0.50	0.27	0.10	0.36	1.64	0.90	0.90	0.26	0.87	2.10	1.46	0.26	0.07	2.10
Sensation seeking (1–4)	1.55	2.61	2.11	0.22	2.27	3.23	2.69	2.69	0.21	2.54	3.49	3.02	0.24	1.55	3.49
Rewards for antisocial involvement (1–5)	1.10	1.46	1.27	0.10	1.25	2.11	1.66	1.66	0.22	1.39	2.09	1.78	0.17	1.10	2.11
Peer/individual protection															
Social skills (1–4)	3.07	3.50	3.31	0.10	2.71	3.33	2.97	2.97	0.15	2.59	3.16	2.85	0.14	2.59	3.50
Belief in the moral order (1–4)	3.04	3.73	3.41	0.14	2.67	3.36	2.97	2.97	0.15	2.59	3.01	2.85	0.10	2.59	3.73
															3.08
															0.28

Within-cohort Relations of Average Community Risk and Protection Measured in Sixth Grade in 2000 with Individual Student Drug Use Measured Among Eighth Graders in 2002

6th – 8th grade (N = 8,117)	Lifetime alcohol			Monthly alcohol			Binge drinking			Lifetime cigarette			Monthly cigarette			Lifetime marijuana			Monthly marijuana		
	β	SE	OR	β	SE	OR	β	SE	OR	β	SE	OR	β	SE	OR	β	SE	OR	β	SE	OR
Peer / individual risk																					
Rebelliousness	.13	.07	1.14	.16	.07	1.17	.20	.07	1.22	.15	.07	1.16	.16	.08	1.18	.14	.07	1.15	.18	.08	1.20
	τ (SE) = .14(.04)			τ (SE) = .13(.04)			τ (SE) = .12(.04)			τ (SE) = .15(.04)			τ (SE) = .19(.06)			τ (SE) = .14(.04)			τ (SE) = .18(.06)		
Favorable attitudes toward antisocial behavior	.22	.06	1.25	.23	.07	1.25	.25	.07	1.29	.24	.07	1.27	.22	.08	1.24	.22	.07	1.24	.28	.08	1.32
	τ (SE) = .12(.03)			τ (SE) = .11(.04)			τ (SE) = .11(.04)			τ (SE) = .12(.03)			τ (SE) = .17(.06)			τ (SE) = .12(.04)			τ (SE) = .14(.05)		
Favorable attitudes toward drugs	.21	.06	1.24	.21	.07	1.23	.22	.07	1.25	.27	.06	1.31	.27	.08	1.31	.21	.07	1.24	.23	.08	1.26
	τ (SE) = .12(.03)			τ (SE) = .12(.04)			τ (SE) = .12(.04)			τ (SE) = .11(.03)			τ (SE) = .15(.05)			τ (SE) = .12(.04)			τ (SE) = .16(.06)		
Perceived risk of drug use	.19	.06	1.21	.12	.07	1.12	.12	.07	1.13	.26	.06	1.30	.28	.07	1.32	.14	.07	1.16	.12	.08	1.13
	τ (SE) = .12(.03)			τ (SE) = .14(.04)			τ (SE) = .15(.05)			τ (SE) = .11(.03)			τ (SE) = .14(.05)			τ (SE) = .14(.04)			τ (SE) = .19(.07)		
Interaction with antisocial peers	.12	.07	1.13	.13	.07	1.14	.14	.07	1.15	.19	.07	1.21	.17	.08	1.18	.12	.07	1.13	.14	.09	1.15
	τ (SE) = .14(.04)			τ (SE) = .14(.04)			τ (SE) = .14(.05)			τ (SE) = .14(.04)			τ (SE) = .19(.06)			τ (SE) = .14(.04)			τ (SE) = .19(.07)		
Friends' drug use	.18	.07	1.20	.21	.07	1.23	.21	.07	1.24	.29	.06	1.34	.30	.07	1.35	.24	.06	1.28	.25	.08	1.29
	τ (SE) = .12(.04)			τ (SE) = .12(.04)			τ (SE) = .11(.04)			τ (SE) = .09(.03)			τ (SE) = .13(.05)			τ (SE) = .10(.03)			τ (SE) = .14(.06)		
Sensation seeking	-.01	.07	0.99	-.02	.08	0.98	.11	.08	1.12	-.05	.08	0.96	-.13	.09	0.88	-.06	.08	0.94	-.01	.10	.99
	τ (SE) = .16(.04)			τ (SE) = .16(.05)			τ (SE) = .16(.05)			τ (SE) = .17(.05)			τ (SE) = .21(.06)			τ (SE) = .16(.05)			τ (SE) = .21(.07)		
Rewards for antisocial involvement	.21	.06	1.23	.22	.07	1.25	.18	.07	1.19	.25	.06	1.29	.28	.08	1.32	.20	.07	1.22	.22	.08	1.25
	τ (SE) = .12(.03)			τ (SE) = .12(.04)			τ (SE) = .14(.05)			τ (SE) = .11(.03)			τ (SE) = .15(.05)			τ (SE) = .13(.04)			τ (SE) = .17(.06)		
Peer / individual protection																					
Social skills	-.18	.07	0.83	-.18	.07	0.84	-.20	.07	0.82	-.25	.06	0.78	-.24	.08	0.79	-.22	.07	0.80	-.24	.08	0.79
	τ (SE) = .13(.04)			τ (SE) = .13(.04)			τ (SE) = .13(.04)			τ (SE) = .11(.03)			τ (SE) = .17(.05)			τ (SE) = .11(.04)			τ (SE) = .15(.06)		
Belief in the moral order	-.18	.06	0.83	-.14	.07	0.87	-.16	.07	0.86	-.27	.06	0.76	-.26	.08	0.77	-.20	.07	0.81	-.21	.08	0.81
	τ (SE) = .12(.04)			τ (SE) = .14(.07)			τ (SE) = .14(.05)			τ (SE) = .10(.03)			τ (SE) = .16(.05)			τ (SE) = .12(.04)			τ (SE) = .17(.06)		

Note. Parameters indicated in bold are significant with a group-wise alpha level for all outcomes of .05. Models adjusted for age, sex and race/ethnicity.

Within-cohort Relations of Average Community Risk and Protection Measured in 8th grade in 2000 with Individual Student Drug Use Measured Among 10th Graders in 2002

Table 4

8th – 10th grade (N = 7,755)	Lifetime alcohol			Monthly alcohol			Binge drinking			Lifetime cigarette			Monthly cigarette			Lifetime marijuana		
	β	SE	OR	β	SE	OR	β	SE	OR	β	SE	OR	β	SE	OR	β	SE	OR
Peer / individual risk																		
Rebelliousness	.24	.08	1.27	.23	.07	1.26	.24	.07	1.27	.22	.07	1.24	.19	.07	1.21	.21	.07	1.24
	τ (SE) = .20(.06)			τ (SE) = .14(.04)			τ (SE) = .13(.04)			τ (SE) = .12(.04)			τ (SE) = .14(.04)			τ (SE) = .12(.04)		
Favorable attitudes toward antisocial behavior	.27	.08	1.31	.20	.07	1.22	.18	.07	1.20	.20	.06	1.22	.17	.07	1.18	.22	.07	1.24
	τ (SE) = .11(.03)			τ (SE) = .15(.04)			τ (SE) = .15(.05)			τ (SE) = .12(.04)			τ (SE) = .14(.04)			τ (SE) = .12(.04)		
Favorable attitudes toward drugs	.33	.07	1.39	.24	.07	1.28	.20	.08	1.22	.28	.06	1.33	.28	.07	1.33	.24	.06	1.27
	τ (SE) = .15(.04)			τ (SE) = .14(.04)			τ (SE) = .15(.05)			τ (SE) = .08(.03)			τ (SE) = .09(.03)			τ (SE) = .11(.03)		
Perceived risk of drug use	.32	.08	1.37	.26	.07	1.30	.23	.07	1.26	.30	.06	1.35	.29	.07	1.34	.27	.06	1.31
	τ (SE) = .16(.05)			τ (SE) = .13(.04)			τ (SE) = .14(.04)			τ (SE) = .08(.03)			τ (SE) = .09(.03)			τ (SE) = .10(.03)		
Interaction with antisocial peers	.02	.09	1.02	.00	.08	1.00	-.02	.08	0.98	.08	.07	1.09	.08	.07	1.08	.06	.07	1.06
	τ (SE) = .25(.07)			τ (SE) = .19(.05)			τ (SE) = .19(.06)			τ (SE) = .15(.04)			τ (SE) = .16(.05)			τ (SE) = .16(.05)		
Friends' drug use	.27	.08	1.31	.21	.07	1.23	.19	.08	1.21	.29	.06	1.34	.23	.07	1.26	.23	.07	1.26
	τ (SE) = .18(.05)			τ (SE) = .15(.04)			τ (SE) = .15(.05)			τ (SE) = .08(.03)			τ (SE) = .12(.04)			τ (SE) = .12(.03)		
Sensation seeking	.07	.09	1.07	.07	.08	1.07	.12	.08	1.13	.04	.07	1.04	-.06	.08	0.94	.09	.07	1.09
	τ (SE) = .25(.07)			τ (SE) = .19(.05)			τ (SE) = .18(.05)			τ (SE) = .16(.05)			τ (SE) = .17(.05)			τ (SE) = .16(.04)		
Rewards for antisocial involvement	.25	.08	1.29	.20	.07	1.23	.16	.07	1.18	.22	.06	1.25	.19	.07	1.22	.21	.06	1.24
	τ (SE) = .19(.05)			τ (SE) = .15(.04)			τ (SE) = .16(.05)			τ (SE) = .11(.03)			τ (SE) = .13(.04)			τ (SE) = .12(.04)		
Peer / individual protection																		
Social skills	-.34	.07	0.71	-.27	.07	0.76	-.24	.07	0.79	-.27	.06	0.76	-.27	.07	0.76	-.27	.06	0.76
	τ (SE) = .14(.04)			τ (SE) = .12(.04)			τ (SE) = .14(.04)			τ (SE) = .09(.03)			τ (SE) = .10(.03)			τ (SE) = .10(.03)		
Belief in the moral order	-.29	.08	0.75	-.21	.07	0.81	-.18	.08	0.84	-.22	.06	0.80	-.22	.07	0.80	-.23	.06	0.79
	τ (SE) = .17(.05)			τ (SE) = .14(.04)			τ (SE) = .16(.05)			τ (SE) = .10(.03)			τ (SE) = .12(.04)			τ (SE) = .11(.03)		

Note. Parameters indicated in bold are significant with a groupwise alpha level for all outcomes of .05. Models adjusted for age, sex and race/ethnicity.

Table 5
Number of Significant Predictive Effects Observed Across all Seven Outcomes for Each Model

Model for grade cohorts	6 to 6	6 to 8	8 to 8	8 to 10	10 to 10
Peer / individual risk					
Rebelliousness	0	1	1	5	0
Favorable attitudes toward antisocial behavior	5	6	1	3	1
Favorable attitudes toward drugs	4	7	3	6	6
Perceived risk of drug use	2	3	4	7	7
Interaction with antisocial peers	0	0	0	0	0
Friends' drug use	3	6	5	5	7
Sensation seeking	0	0	0	0	0
Rewards for antisocial involvement	2	4	3	4	7
Peer / individual protection					
Social skills	4	4	3	7	7
Belief in the moral order	3	4	1	5	1

Note: The number of outcomes each risk factor predicts is out of seven possible outcomes.

Table 6

Within-cohort Relations of Average Community Risk and Protection Measured in Sixth Grade in 2000 with Individual Student Drug Use Measured Among Sixth Graders in 2002

6th – 6th grade (N = 8,581)	Lifetime alcohol			Monthly alcohol			Binge drinking			Lifetime cigarette			Monthly marijuana		
	β	SE	OR	β	SE	OR	β	SE	OR	β	SE	OR	β	SE	OR
Peer / individual risk															
Rebelliousness	.12	.05	1.13	.06	.08	1.06	.09	.07	1.10	.18	.07	1.20	.16	.09	1.17
	τ (SE) = .07(.02)			τ (SE) = .16(.06)			τ (SE) = .08(.05)			τ (SE) = .12(.04)			τ (SE) = .13(.07)		
Favorable attitudes toward antisocial behavior	.17	.05	1.19	.16	.08	1.17	.25	.08	1.28	.28	.06	1.32	.30	.10	1.35
	τ (SE) = .05(.02)			τ (SE) = .15(.05)			τ (SE) = .03(.03)			τ (SE) = .08(.03)			τ (SE) = .09(.06)		
Favorable attitudes toward drugs	.19	.05	1.21	.16	.08	1.17	.18	.09	1.20	.27	.06	1.31	.30	.09	1.35
	τ (SE) = .05(.02)			τ (SE) = .15(.05)			τ (SE) = .06(.04)			τ (SE) = .09(.03)			τ (SE) = .10(.06)		
Perceived risk of drug use	.20	.04	1.23	.08	.08	1.08	.05	.08	1.06	.25	.06	1.29	.21	.09	1.23
	τ (SE) = .04(.02)			τ (SE) = .16(.06)			τ (SE) = .08(.05)			τ (SE) = .08(.03)			τ (SE) = .12(.07)		
Interaction with antisocial peers	.11	.05	1.12	.11	.08	1.12	.08	.08	1.08	.16	.07	1.18	.13	.09	1.14
	τ (SE) = .07(.02)			τ (SE) = .15(.06)			τ (SE) = .07(.05)			τ (SE) = .12(.04)			τ (SE) = .15(.08)		
Friends' drug use	.15	.05	1.16	.07	.09	1.07	.06	.09	1.07	.29	.06	1.34	.29	.09	1.34
	τ (SE) = .06(.02)			τ (SE) = .16(.06)			τ (SE) = .07(.05)			τ (SE) = .07(.03)			τ (SE) = .09(.06)		
Sensation seeking	-.05	.06	0.95	-.08	.09	0.93	.10	.10	1.11	-.02	.08	0.98	-.04	.11	0.96
	τ (SE) = .08(.03)			τ (SE) = .16(.06)			τ (SE) = .08(.06)			τ (SE) = .15(.05)			τ (SE) = .16(.08)		
Rewards for antisocial involvement	.15	.05	1.16	.15	.08	1.16	.12	.09	1.13	.21	.07	1.23	.22	.09	1.25
	τ (SE) = .06(.02)			τ (SE) = .14(.05)			τ (SE) = .07(.05)			τ (SE) = .11(.04)			τ (SE) = .13(.07)		
Peer / individual protection															
Social skills	-.19	.05	0.83	-.14	.08	0.87	-.14	.09	.87	-.27	.06	.76	-.27	.09	.76
	τ (SE) = .05(.02)			τ (SE) = .15(.06)			τ (SE) = .06(.05)			τ (SE) = .09(.03)			τ (SE) = .11(.06)		
Belief in the moral order	-.21	.05	0.81	-.10	.08	0.90	-.13	.09	.88	-.29	.06	.75	-.24	.09	.78
	τ (SE) = .04(.02)			τ (SE) = .16(.06)			τ (SE) = .06(.05)			τ (SE) = .07(.03)			τ (SE) = .11(.07)		

Note. Parameters indicated in bold are significant with a group-wise alpha level for all outcomes of .05. Models adjusted for age, sex and race/ethnicity.

Within-cohort Relations of Average Community Risk and Protection Measured in Eighth Grade in 2000 with Individual Student Drug Use Measured Among Eighth Graders in 2002

8th – 8th Grade (N = 8,117)	Lifetime alcohol			Monthly alcohol			Binge drinking			Lifetime cigarette			Monthly cigarette			Lifetime marijuana			Monthly marijuana		
	β	SE	OR	β	SE	OR	β	SE	OR	β	SE	OR	β	SE	OR	β	SE	OR	β	SE	OR
Peer / individual risk																					
Rebelliousness	.22	.06	1.24	.16	.07	1.17	.14	.08	1.16	.15	.07	1.16	.09	.09	1.10	.06	.07	1.06	.05	.09	1.06
	τ (SE)=.11(.03)			τ (SE)=.14(.04)			τ (SE)=.14(.05)			τ (SE)=.15(.04)			τ (SE)=.21(.07)			τ (SE)=.15(.05)			τ (SE)=.21(.07)		
Favorable attitudes toward antisocial behavior	.22	.06	1.25	.14	.07	1.15	.08	.08	1.09	.15	.07	1.16	.09	.09	1.09	.05	.07	1.05	.02	.09	1.02
	τ (SE)=.11(.03)			τ (SE)=.14(.04)			τ (SE)=.16(.05)			τ (SE)=.14(.04)			τ (SE)=.21(.07)			τ (SE)=.15(.05)			τ (SE)=.21(.07)		
Favorable attitudes toward drugs	.28	.06	1.32	.21	.07	1.23	.17	.07	1.19	.26	.06	1.29	.19	.08	1.21	.14	.07	1.15	.10	.09	1.10
	τ (SE)=.08(.02)			τ (SE)=.12(.04)			τ (SE)=.14(.05)			τ (SE)=.11(.03)			τ (SE)=.18(.06)			τ (SE)=.13(.04)			τ (SE)=.20(.07)		
Perceived risk of drug use	.28	.05	1.32	.21	.07	1.24	.15	.07	1.16	.27	.06	1.31	.23	.08	1.26	.13	.07	1.14	.10	.09	1.11
	τ (SE)=.08(.02)			τ (SE)=.12(.04)			τ (SE)=.14(.05)			τ (SE)=.10(.03)			τ (SE)=.16(.05)			τ (SE)=.13(.04)			τ (SE)=.19(.07)		
Interaction with antisocial peers	.09	.07	1.09	.07	.07	1.07	.07	.08	1.08	.14	.07	1.15	.11	.09	1.12	.06	.07	1.06	.00	.09	1.00
	τ (SE)=.15(.04)			τ (SE)=.16(.05)			τ (SE)=.16(.05)			τ (SE)=.15(.04)			τ (SE)=.21(.06)			τ (SE)=.15(.05)			τ (SE)=.21(.07)		
Friends' drug use	.26	.06	1.30	.23	.07	1.25	.23	.07	1.26	.28	.06	1.32	.22	.08	1.25	.20	.07	1.23	.16	.08	1.17
	τ (SE)=.09(.03)			τ (SE)=.11(.03)			τ (SE)=.11(.04)			τ (SE)=.10(.03)			τ (SE)=.17(.06)			τ (SE)=.12(.04)			τ (SE)=.19(.07)		
Sensation seeking	.00	.07	1.00	-.05	.07	0.95	.04	.08	1.05	-.06	.07	0.94	-.19	.09	0.83	-.09	.07	0.91	-.08	.09	0.92
	τ (SE)=.16(.04)			τ (SE)=.16(.05)			τ (SE)=.17(.05)			τ (SE)=.16(.04)			τ (SE)=.19(.06)			τ (SE)=.15(.04)			τ (SE)=.20(.07)		
Rewards for antisocial involvement	.23	.06	1.26	.20	.07	1.22	.15	.07	1.17	.21	.07	1.23	.15	.09	1.17	.09	.07	1.09	.09	.09	1.10
	τ (SE)=.10(.03)			τ (SE)=.13(.04)			τ (SE)=.15(.05)			τ (SE)=.13(.04)			τ (SE)=.20(.06)			τ (SE)=.15(.04)			τ (SE)=.20(.07)		
Peer / individual protection																					
Social skills	-.28	.05	0.75	-.23	.06	0.79	-.17	.07	0.85	-.24	.06	0.79	-.22	.08	0.81	-.15	.07	0.86	-.13	.08	0.88
	τ (SE)=.07(.02)			τ (SE)=.11(.03)			τ (SE)=.13(.05)			τ (SE)=.11(.03)			τ (SE)=.17(.06)			τ (SE)=.13(.04)			τ (SE)=.19(.07)		
Belief in the moral order	-.22	.06	0.80	-.16	.07	0.85	-.10	.08	0.90	-.19	.07	0.83	-.13	.09	0.87	-.08	.07	0.92	-.04	.09	0.96
	τ (SE)=.10(.03)			τ (SE)=.13(.04)			τ (SE)=.15(.05)			τ (SE)=.13(.04)			τ (SE)=.20(.06)			τ (SE)=.15(.04)			τ (SE)=.21(.07)		

Note. Parameters indicated in bold are significant with a group-wise alpha level for all outcomes of .05. Models adjusted for age, sex and race/ethnicity.

Table 8

Within-cohort Relations of Average Community Risk and Protection Measured in 10th Grade in 2000 with Individual Student Drug Use Measured Among 10th Graders in 2002

8th – 8th Grade (N = 8,117)	Lifetime alcohol			Monthly alcohol			Binge drinking			Lifetime cigarette			Monthly cigarette			Lifetime marijuana		
	β	SE	OR	β	SE	OR	β	SE	OR	β	SE	OR	β	SE	OR	β	SE	OR
Peer / individual risk																		
Rebelliousness	.08	.09	1.08	.07	.08	1.07	.16	.07	1.17	.06	.07	1.06	.05	.07	1.05	.00	.07	1.00
	τ (SE) = .24(.07)			τ (SE) = .18(.05)			τ (SE) = .16(.05)			τ (SE) = .15(.04)			τ (SE) = .16(.05)			τ (SE) = .17(.05)		
Favorable attitudes toward antisocial behavior	.20	.09	1.22	.16	.08	1.17	.22	.07	1.24	.12	.07	1.13	.05	.08	1.05	.14	.07	1.15
	τ (SE) = .21(.06)			τ (SE) = .16(.05)			τ (SE) = .14(.05)			τ (SE) = .14(.04)			τ (SE) = .16(.05)			τ (SE) = .15(.04)		
Favorable attitudes toward drugs	.35	.06	1.41	.24	.06	1.27	.17	.07	1.18	.26	.05	1.30	.31	.06	1.36	.30	.05	1.35
	τ (SE) = .11(.03)			τ (SE) = .11(.03)			τ (SE) = .15(.05)			τ (SE) = .07(.02)			τ (SE) = .07(.03)			τ (SE) = .07(.02)		
Perceived risk of drug use	.32	.07	1.37	.24	.06	1.27	.21	.07	1.23	.27	.05	1.31	.31	.06	1.36	.32	.05	1.38
	τ (SE) = .13(.04)			τ (SE) = .11(.04)			τ (SE) = .13(.04)			τ (SE) = .06(.02)			τ (SE) = .07(.03)			τ (SE) = .07(.02)		
Interaction with antisocial peers	.06	.09	1.06	.07	.08	1.07	.09	.08	1.09	.15	.07	1.16	.07	.08	1.08	.13	.07	1.13
	τ (SE) = .24(.07)			τ (SE) = .18(.05)			τ (SE) = .18(.06)			τ (SE) = .14(.04)			τ (SE) = .16(.05)			τ (SE) = .16(.04)		
Friends' drug use	.37	.06	1.44	.27	.06	1.30	.26	.07	1.30	.30	.05	1.35	.28	.06	1.32	.31	.05	1.37
	τ (SE) = .11(.03)			τ (SE) = .11(.03)			τ (SE) = .11(.04)			τ (SE) = .06(.02)			τ (SE) = .09(.03)			τ (SE) = .07(.02)		
Sensation seeking	.16	.09	1.17	.09	.08	1.09	.18	.08	1.19	.10	.07	1.11	.02	.08	1.02	.09	.08	1.09
	τ (SE) = .23(.06)			τ (SE) = .18(.05)			τ (SE) = .16(.05)			τ (SE) = .14(.04)			τ (SE) = .16(.05)			τ (SE) = .16(.05)		
Rewards for antisocial involvement	.39	.06	1.48	.30	.06	1.35	.26	.07	1.29	.28	.05	1.33	.30	.06	1.35	.30	.06	1.35
	τ (SE) = .10(.03)			τ (SE) = .10(.03)			τ (SE) = .12(.04)			τ (SE) = .07(.02)			τ (SE) = .08(.03)			τ (SE) = .08(.03)		
Peer / individual protection																		
Social skills	-.37	.07	0.69	-.29	.06	0.75	-.27	.07	0.76	-.28	.06	.75	-.30	.06	.74	-.27	.06	.76
	τ (SE) = .12(.03)			τ (SE) = .10(.03)			τ (SE) = .11(.04)			τ (SE) = .08(.03)			τ (SE) = .08(.03)			τ (SE) = .10(.03)		
Belief in the moral order	-.23	.08	0.79	-.13	.07	0.88	-.14	.08	0.87	-.12	.07	.88	-.015	.07	0.86	-.11	.07	0.90
	τ (SE) = .19(.05)			τ (SE) = .16(.05)			τ (SE) = .16(.05)			τ (SE) = .13(.04)			τ (SE) = .14(.04)			τ (SE) = .16(.04)		

Note. Parameters indicated in bold are significant with a group-wise alpha level for all outcomes of .05. Models adjusted for age, sex and race/ethnicity.