School-Level Longitudinal Predictors of Alcohol, Cigarette, and Marijuana Use

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Abstract:

This study analyzed measures aggregated at the school level to identify key predictors of drinking alcohol, binge drinking, smoking cigarettes, and using marijuana. Using data collected from 6th through 12th grade students between 2011 and 2015, we identify school-level variables that predict school-level prevalence in the subsequent year. Data included prior year assessments of: (1) school-wide prevalence, (2) perceived ease of access to drugs, (3) perceived adult disapproval of drug use, (4) perceived peer disapproval of drug use, and (5) perceived prevalence of drug use. We regressed grade-level behaviors on predictor variables from the previous school year. In middle schools, prior grade prevalence and prior grade perceived norms were significant predictors of subsequent grade prevalence. For high schools, prior year prevalence, aggregated peer norms, and perceived ease of access predicted subsequent use. These analyses provide evidence that a school's culture is predictive of changes in prevalence over time.

Keywords: adolescence | alcohol | cigarettes | marijuana | school-level | grade-level | regression

Article:

Since 1991, the Monitoring the Future (MTF) project has annually administered surveys to approximately 50,000 nationally representative samples of 8th, 10th, and 12th grade students [1]. There have been notable decreases in the prevalence of alcohol and cigarette use. The greatest reduction in use has been for cigarettes. Past 30-day cigarette use among high school seniors dropped from 33.5% for the 1991–1995 cohort to 10.5% for the 2012–2016 cohort. Both the base rate and the 8th to 12th grade trajectory declined. The prevalence of alcohol has decreased as well with 12th grade past 30-day prevalence dropping from 51.3% for the cohort that was in 8th grade in 1991 to 33.2% for the cohort that was in 8th grade in 2012. Even with a reduction in the base rate, the 8th grade to 12th grade onset rate of alcohol use has not changed; the increase averaging 25.0% from 8th to 12th grades across all cohorts. Thus, despite these reductions in prevalence at younger ages we are still seeing the same grade-to-grade increase in prevalence among students. Additionally, the onset of marijuana between 8th and 12th grades has averaged 14.0% across all

cohorts. Unlike cigarettes and alcohol, the trend in prevalence of past 30-day marijuana use has not changed. The 12th grade marijuana use prevalence for the cohort who were 8th graders in 1991 (21.2%) and 8th graders in 2012 (22.5%) suggest there has been no progress at preventing marijuana use at the national level. Preventing alcohol, cigarette, and marijuana use remain national priorities.

Psychosocial Correlates and Predictors of Drug Use

Analysis of adolescent drug use onset typically rely heavily on individual-level data. A great deal is known about individual-level predictors. Accumulated evidence identifies several key individual-level psychosocial variables that are related to the onset of alcohol, cigarette, and marijuana use, including intentions to use, perceptions about injunctive and descriptive normative beliefs about peer use, expectancies or beliefs about the consequences of use, and perceived availability of drugs [2].

These variables reflect a family of theories that have been used to explain behavior, including the theory of reasoned action [3], the theory of planned behavior [4], and an integrated theory that combines elements of multiple theories [5]. In all versions of these theories, intention is the only variable postulated to influence behavior directly. Other variables, such as normative beliefs and expectancies are theorized to be distal to behavior and instead influence a person's intentionality. Nonetheless, there are numerous studies that evaluate the direct influence of these other variables on behavior and show patterns of strong relations.

A recent meta-analysis of alcohol studies [6] examined variables associated with the theory of planned behavior. Intentions were strongly associated with alcohol use. Normative beliefs were highly correlated with intentions. Direct links between normative beliefs and behavior are not part of the theory and this link was not tested. In a test of the theory of reasoned action, Stoddard and Pierce [7] found that intentions were highly predictive of alcohol and marijuana use, while injunctive peer norms (and to a lesser extent, descriptive normative beliefs) were highly predictive of intentions. Similarly, Elek et al. [8] examined the role of intentions, normative beliefs, and attitudes on predicting alcohol, cigarette, and marijuana use. Intentions were most strongly correlated with drug use; however, attitudes, and peer and parent norms were also important. Malmberg et al. [9] studied the onset of marijuana use in the context of the theory of planned behavior by means of a longitudinal design. They found pretest-to-posttest lagged correlations between social approval, intentions, and marijuana use, with strong relations between intentions and use.

Studies not specifically designed to test these theories but that included relevant variables have found similar results. Olds and colleagues [10] completed analyses of 7th through 12th grade students and found that normative beliefs and intentions were highly correlated. Both were strongly correlated with alcohol, cigarette, and marijuana use. Crano et al. [11] examined students' responses to questions about ever having used marijuana and intentions to use marijuana in the next 12 months. They found that reporting friends who used marijuana was among the strongest of variables that differentiated non-marijuana users from vulnerable current non-users and users. McNeal and Hansen [12] examined 12 predictors of onset and found that intentions, normative beliefs, beliefs about consequences, and lifestyle incongruence were all predictors of alcohol, cigarette, and marijuana use initiation.

Several studies have specifically examined normative beliefs, finding that it significantly predicted the use of multiple drugs [13, 14]. There were strong correlations between perceived

peer use and substance use initiation between 7th and 9th grades [15]. Normative beliefs are correlated with cigarette smoking [16]. Salvy et al. [17] found that normative beliefs were strong predictors when students were younger (6th grade); however, as students grew older, the influence of normative beliefs weakened as time spent with drinking and marijuana using peers increased in importance.

Studies Examining the Role of Normative Beliefs About Peer Use

The National Survey on Drug Use and Health (NSDUH) collected data from 2004 to 2012, from 163,837 teens. Findings revealed that non-use peer norms were associated with less marijuana use [18]. Numerous other studies have reported similar findings [19,20,21,22,23].

In addition to the variables posited by the theory of planned behavior/theory of reasoned action, additional research has examined such topics as perceived ease of access as predictors of behavior [24,25,26]. Adolescents' perception that alcohol or other substances are easily obtained is correlated with increased prevalence.

Environmental Correlates and Predictors of Drug Use

Discussing school- and community-level predictors requires a different theoretical approach that moves from a person-centered perspective to an environmental or sociological one. In Kurt Lewin's classic equation $B = f(P, E)$, behavior is a function of the person and the environment [27]. That is, behavior is a function of people interacting with their environments. Most research in this area relies on Bronfenbrenner's ecological systems theory [27,28,29]. As he notes, "the ecology of human development. . involves mutual accommodation between an active, growing human being and the changing properties of the immediate settings in which the developing person lives, as this process is affected by relations between these settings" [30]. Both psychosocial and environmental components are important to consider, but it is the interaction that becomes crucial to understand [28].

Intentions and beliefs are inherently psychological in how they are conceived by theoreticians and mainly reflect an individual's cognitions. On the other hand, normative beliefs and perceived ease of accessibility imply something beyond cognition. They imply a connection to a social realm. Thus, while normative beliefs may reflect how a person perceives what their peers think and how their peers act, there is an external social reality associated with such thinking. Similarly, when adolescents perceive alcohol, cigarettes, or marijuana to be either readily available or hard to get, there is an external reality that influences such perceptions. For example, neighborhood alcohol outlet density, for which perceived ease of access may be a surrogate, has been found to be correlated with prevalence of use [24, 26, 31]. In the same way that individual differences influence the onset of drug use, differences in environments are also expected to be related to drug use [32]. Factors measured at the school and community levels may be just as influential as an individual's beliefs, intentions, and attitudes. Ultimately, of course, we expect there to be a definable interplay between the two.

There are two challenges that face researchers who attempt to investigate the influence of environmental variables on drug use. The first challenge has to do with gaining sufficient sample size to model aspects of the environment. When the setting of interest is the neighborhood or the school, the number of cases needed is considerable. The second challenge has to do with measurement. Schools and neighborhoods as environmental units are inanimate and do not

complete surveys. There are two approaches to resolving this measurement issue; aggregate individual's responses or use external, typically archival, measures. It is not uncommon to find both in the research literature. For example, several researchers have aggregated student, parent, teacher, and administrator surveys at the school level to create a school-level index [33,34,35,36,37,38]. On the other hand, there is research that has used external measures such as poverty or socioeconomic status [39,40,41], documentation about adult substance use (Bendtsen et al., 2013), or a school's alcohol and drug policies [42].

Despite these challenges, prior research has successfully examined variability in drug use based on some measure of the environment. For example, research has demonstrated that prevalence of alcohol use aggregated at the school level is predictive of subsequent involvement in alcohol [33, 35, 43]. Normative beliefs and expectations aggregated at the school level have also been found to be correlated with alcohol use [38]. Additionally, positive school climate and student-rated school bonding have been found to be correlated with lower use [35, 36, 44].

Variables such as neighborhood and school poverty and socioeconomic status [33, 39, 40, 45, 46], crime, alcohol and cigarette outlet density [47], and supportive and positive communities [34] have yielded less consistent findings [41, 48]. Generally, measures from archival sources such as these are less predictive than those based on aggregated surveys.

The Current Study

The goal of the current study is to complete analyses on school-level variables collected statewide in Georgia middle and high schools. The Georgia student surveys administered over a five-year period (2011 to 2015) include assessments of drinking alcohol, binge drinking, smoking cigarettes, and using marijuana. During the first four years of administration (20,112,014), surveys also assessed psychosocial measures (ease of access, beliefs about consequences, bonding to school, and peer and parent normative beliefs). Prior research and theory, reviewed above, has demonstrated the influence of these psychosocial measures on adolescent drug use. We explore the relative strength of psychosocial and behavioral variables aggregated at the school level on subsequent year's alcohol, cigarette, and marijuana use. Additionally, we explore differences between middle and high school behavioral and psychosocial predictors of prevalence. We hypothesize that (1) environmental variables derived by aggregating school-level data will predict drug use and (2) the strength of these variables influence will vary over time based on the age of the population. This study examines the longitudinal impact of school-level predictors of drug use prevalence using a large number of middle and high school cohorts and is thus a unique contribution to the literature.

METHOD

Research Design

This project was designed as a multi-year, multi-grade analysis of secondary data. The Georgia Department of Education routinely collects data from middle and high school students as part of the Georgia Student Health Survey. Beginning in 2008, 6th, 7th, 8th, 10th, and 12th grade students were surveyed. The survey was expanded to include 9th and 11th grade students beginning in 2011. We selected data from the 2011 through 2015 school years for analysis. Numbers of students available for analysis during each of the waves of data are presented Table 1.

Table 1. Student Surveys Available for Analysis at Each Grade for Each Year

Grade	2011	2012	2013	2014	2015	Total
6	69,744	100,577	85,808	94,382	100,695	451,206
7	8,233	95,063	84,408	94,719	101,259	383,682
8	67,881	98,186	82,187	93,288	99,679	441,221
9	47,852	89,376	77,287	91,211	97,806	403,532
10	44,840	79,452	68,051	78,820	86,992	358,155
11	37,560	71,371	61,019	71,162	76,508	317,620
12	39,354	62,817	55,149	63,483	66,706	287,509
Total	315,464	596,842	513,909	587,073	629,645	2,642,933

Because student data were de-identified, this precluded any longitudinal analysis at the student level. However, county, school system, school, and grade within school were identified. We anticipated that small numbers of students within schools and within grades would bias prevalence estimates. In order to avoid this bias, all analyses were limited to schools that provided more than 10 student surveys for a given year or a given grade. Table 2 presents the number of schools contributing surveys at each grade that were available for analysis at each year.

Table 2. School-level Survey Data Available for Analysis at Each Grade for Each Year

Grade	2011	2012	2013	2014	2015	Total
6	405	483	507	528	553	2,476
7	63	456	490	512	534	2,055
8	398	473	491	510	531	2,403
9	262	366	386	400	416	1,830
10	281	364	387	398	417	1,847
11	265	365	386	398	411	1,825
12	280	367	382	396	407	1,832
Total	1,954	2,874	3,029	3,142	3,269	14,268

Measures

The Georgia Student Health Survey included student self-reports about past 30-day alcohol consumption, binge drinking, cigarette smoking, and marijuana use. Each student's responses were dichotomized (yes/no) and were averaged within grade across that student's school, creating prevalence rates of behavior for each grade and year.

Surveys also assessed the following psychosocial variables: (1) perceived ease of access to a variety of substances (Access; e.g., "How easy would it be to get marijuana?"), (2) perceived adult approval or disapproval of substance use (Adult Norms; e.g., "How wrong do your parents feel it would be for you to have one or two drinks of alcohol nearly every day?"), (3) beliefs about the consequences of substance use (Beliefs; e.g., "How much do you think people risk harming themselves, physically and in other ways, if they have five or more drinks of an alcoholic beverage once or twice a week?"), (4) attachment to and liking of school (Bonding to School; e.g., "I feel like I fit in at my school."), (5) perceived peer approval or disapproval of substance use (Peer Norms; e.g., "How wrong do your friends feel it would be for you to smoke tobacco?"). Numbers of items contributing to each scale and each scale's internal consistency are presented in Table 3.

Table 3 Reliability: Cronbach Alpha Coefficients for Psychosocial Scales

Scale	Items	2011	2012	2013	2014	Average
Access	11	0.95	0.95	0.95	0.96	0.95
Adult Norms	4	0.93	0.93	0.93	0.94	0.93
Beliefs	11	0.98	0.97	0.97	0.97	0.97
Bonding to School	9	0.81	0.80	0.80	0.82	0.81
Peer Norms	12	0.92	0.92	0.92	0.93	0.92

Analysis Methodology

Our plan focused on using school-level data in regression analyses with just-prior year prevalence of behavior (Prior Use) and psychosocial measures as predictors of subsequent year behavior. For example, 6th grade use and 6th grade psychosocial variables were used to predict 7th grade use for each substance. Because students typically change schools between 8th and 9th grades and there was no information about feeder patterns that would allow us to track students, 8th -to-9th grade analyses were not completed. Thus, we completed two sets of regression middle school analyses (6th -to-7th and 7th -to-8th) and three sets of high school analyses (9th -to-10th, 10th -to-11th, and 11th -to-12th). We completed analyses using 1,049 schools to assess 6th -to-7th grade outcomes, 1,069 schools for 7th -to-8th grade, 1,332 schools for 9th -to-10th grade, 1,358 schools for 10th -to-11th grade, and 1,356 schools for 11th -to-12th grade analyses.

RESULTS

Prevalence

After merging data at the school level, we first calculated self-reported prevalence for each behavior (see Table 4). As would be expected from what has generally been reported about substance use, there were consistent grade-to-grade increases in prevalence of all four substance use behaviors. Compared to Monitoring the Future [1] and Youth Risk Behavior Surveillance System [49] data, self-reported 12th grade rates were slightly reduced from what was expected. There was notable school-to-school variability in the percent of students who reported engaging in these behaviors. For every grade and each behavior, there were schools in which there was no reported use. However, there were also schools in which greater than average substance use was prevalent. Table 4 also presents the 95th percentile of observed prevalence.

Table 4. Average Past 30-day Prevalence of Behaviors (Upper 95th Percentile)

Grade	Alcohol		Binge Drinking		Cigarettes		Marijuana	
6th	2.6%	(7.3%)	1.6%	(5.5%)	1.2%	(3.8%)	0.8%	(3.0%)
7th	3.6%	(9.4%)	2.0%	(7.1%)	1.8%	(5.9%)	1.9%	(6.0%)
8th	6.5%	(14.3%)	4.8%	(12.6%)	3.5%	(8.9%)	4.0%	(10.0%)
9th	10.3%	(19.8%)	7.9%	(17.0%)	5.9%	(13.9%)	6.8%	(13.8%)
10th	13.6%	(25.0%)	10.6%	(20.4%)	7.4%	(16.2%)	8.7%	(17.2%)
11th	16.5%	(29.4%)	13.2%	(25.0%)	9.1%	(18.7%)	10.1%	(19.5%)
12th	20.3%	(34.5%)	16.3%	(29.4%)	11.6%	(22.2%)	11.1%	(20.2%)

Regression

All regression analyses performed as planned failed due to multicollinearity among psychosocial variables. For example, averaged across all grades, Access was correlated with Bonding to School (r = .35), and Peer Norms were correlated with both Bonding to School (r = .48) and Beliefs (r = .41).

Subsequent regression analyses were completed with only psychosocial variables that individually had correlation coefficients with behavior greater than an absolute value of 0.30, which was set for convenience. For all four behavioral variables, predictors included prior grade school prevalence of that behavior (Prior Use) and Peer Norms. For drinking alcohol, binge drinking, and smoking cigarettes, Access was also included. For marijuana prevalence analyses, Prior Use, Peer Norms, Adult Norms, and Beliefs were included.

All 20 analyses yielded significant findings. Variance accounted for in middle school analyses were somewhat smaller than for high school analyses. Adjusted R Squares averaged across the four behaviors were 0.24 and 0.20 for 6th -to-7th and 7th -to-8th grade outcomes, respectively, and were 0.30, 0.34, and 0.37 for 9th -to-10th, 10th to11th, and 11th -to-12th grade outcomes, respectively.

Table 5 presents standardized beta weights associated with each regression analysis. Prior Use is a consistent predictor of all four behaviors at all waves and, except for predicting 7th grade cigarette smoking and marijuana use, is consistently the strongest predictor of subsequent use. The role of Prior Use generally became a stronger predictor of school-wide prevalence of use as students grew older. Except for 7th grade binge drinking, Peer Norms had a role equal to or exceeding the role of Prior Use for middle school drinking alcohol, smoking cigarettes, and using marijuana. The importance of Peer Norms became statistically less important in high school, whereas, ease of Access became a significant predictor of prevalence of use.

Table 5. Strength of Relations Between Predictors and One-year Lagged Behaviors (Significant Standardized Beta Weights)

Drinking Alcohol	**7th Grade**	**8th Grade**	**10th Grade**	**11th Grade**	**12th Grade**
Prior Use (Drinking)	0.255	0.245	0.302	0.353	0.376
Access	----	----	-0.126	-0.205	-0.233
Peer Norms	-0.252	-0.241	-0.146	-0.116	-0.111
Binge Drinking	7th Grade	8th Grade	10th Grade	11th Grade	12th Grade
Prior Use (Binging)	0.380	0.193	0.392	0.440	0.393
Access	----	----	-0.182	-0.196	-0.276
Peer Norms	-0.137	-0.203	-0.073	-0.095	-0.091
Smoking Cigarettes	7th Grade	8th Grade	10th Grade	11th Grade	12th Grade
Prior Use (Smoking)	0.267	0.263	0.447	0.390	0.407
Access	----	----	-0.075	-0.160	-0.154
Peer Norms	-0.289	-0.194	-0.153	-0.182	-0.180
Using Marijuana	7th Grade	8th Grade	10th Grade	11th Grade	12th Grade
Prior Use (Marijuana)	0.163	0.263	0.373	0.350	0.369
Peer Norms	-0.246	-0.458	-0.196	-0.185	-0.160
Adult Norms	-0.226	----	----	----	----
Beliefs	----	----	----	----	----

Discussion

We note that from 6th through 12th grades, there is a gradual increase in all behaviors (see Table 4). Analyzing these changes in drug use prevalence at the school level enables an assessment of social-ecological factors. When aggregated, variables become markers of a school's social ecology and signify the dynamic, interdependent relationships between students and their environment. These variables may also be predictors of drug use at the individual level; however, in this case it is not just individual student's cognitions but the social milieu that is represented. Analyzing longitudinal school-level data at multiple grades to assess predictive relations strengthens our understanding of how a school's drug use prevalence develops. Thus, in these analyses, it is the school's culture that is considered to be predictive of behavior.

Our overall hypothesis that aggregated environmental variables would predict drug use was confirmed. School-level variables were strong predictors of prevalence in the subsequent school year for 30-day alcohol consumption, binge drinking, cigarette smoking, and marijuana use. Further, we observed age-dependent differences in the strengths of relations. In middle schools, it is primarily school-wide prevalence of use and perceived norms about use that are the strongest sources of influence that predict subsequent use. When students reach high school, perceived access (at least for the prevalence of drinking, binging, and smoking) becomes a part of the social fabric of the school and predicts subsequent use.

Other than positing a relation between environment and behavior, social-ecological theories are generally not specific about which environmental variables are predictive of behavior. In this study, school-level prevalence and perceived norms among students were strong predictors of subsequent drug use. Two variables (Prior Use and Peer Norms) provided an independent contribution in each of the predictive formulas. It is noteworthy that these variables were not redundant. One might suppose, for example, that school-level perceived norms would simply reflect actual prevalence. This was not the case; each variable contributed independently to the regression equations.

While self-reported prevalence, perceived prevalence, and perceived ease of access to drugs were powerful predictors of subsequent drug use, it is not yet clear how the cultures these variables represent develop within schools. It is possible, for example, that such school cultures are multi-generational and that older students pass on the culture to younger students through stories, jokes, narratives, gossip, and rumors. Or perhaps, social networks play a role; students who have high centrality may control what is valued and deemed important at the school. Some schools foster the development of larger deviant subcultures than others. Teachers, coaches, and parents may also play a role. There are clearly cultural differences among schools that influence drug use which further research needs to explore.

In all versions of the theories that have been used to explain behavior, intention is the only variable postulated to influence behavior directly. Nevertheless, there are numerous studies that evaluate the direct influence of these other variables on behavior and show patterns of strong relations. Results of the current study support inclusion of these other variables. Findings suggest that environmental variables do predict drug use behaviors directly and that theories which account for these relationships may be more suitable for investigating prevalence.

Intentions and beliefs are inherently psychological in how they are conceived by theoreticians and mainly reflect an individual's cognitions. On the other hand, normative beliefs and perceived ease of accessibility imply something beyond cognition. They imply a connection to a social realm. Results of the current study demonstrate that variables connected to the social realm are stronger predictors of prevalence. Findings suggest that intervention efforts that target

social rather than psychological variables have a greater potential to be effective at influencing prevalence.

There are clear implications of these findings for prevention efforts. Results support the notion that programs need to be comprehensive, developmentally appropriate, and implemented school wide. Many interventions address correcting erroneous normative beliefs as a person-centered construct. Addressing normative beliefs as an environmental construct and expanding interventions such as social norm campaigns to ensure that there is a school-wide effect will strengthen preventive outcomes. Further, especially in older grades, policies and interventions need to reduce actual access as well as perceptions that alcohol and other drugs are easily obtained.

Many school-based prevention programs are built on individual-level psychosocial models. The goal of these interventions is to address person-centered constructs and programs are often characterized by strategies to alter skills or motivations of individuals within a class. The results of this study suggest that interventions should also address building school environments that are generally protective by integrating and infusing the concepts targeted by the intervention throughout the school. More importantly, strategies for developing conventional norms among students should be applied school wide. Specifically targeting the development of a positive school culture is likely to enhance prevention effectiveness. There is also a need to sustain positive culture year-to-year so that schools that would otherwise be high-risk can break the cycle of increasing annual prevalence.

There are important implications of our findings for research generally. Large, publicly available, longitudinal datasets present opportunities for testing a variety of theories, including those that address social-ecological factors that may influence drug use. Aggregating at the school level provides a proxy measure of contextual factors and researchers could use such datasets specifically to test school-level phenomena [50].

As noted in Tables 1 and 2, analyses included over 2.5 million student surveys from over 14,000 grades within schools. This sizable dataset provided an excellent resource for analyzing the relation between psychosocial and social-ecological relations with substance use onset. Moreover, as documented in Table 3, there was a high degree of reliability of all psychosocial measures when assessed at the student level.

This study benefitted from having multiple years of data from a large sample of schools. Although simply using longitudinal data does not allow us to infer causality, these findings are more persuasive than cross-sectional data would be. Because our analyses focused on school-level effects, student retention was abandoned as a requirement. However, if there was an accretion or dilution of students from year-to-year, one might logically conclude that observed statistical relations would actually be reduced. The strong predictive relations observed suggests that either the composition of schools was relatively stable or that school culture, whatever the specific makeup of students, transcends such a circumstance.

There are several limitations to this study. The survey that elicited the data we used was developed at the behest of the Georgia Department of Education for their own purposes. The dataset did not include the wide array of variables that are typically targeted as mediators by drug prevention programs. Typical topics targeted and assessed include the development of personal skills such as making good decisions and setting and achieving goals, social skills including refusing peer pressure, and activities to improve intentions, motivation, and attitudes [51]. There are doubtless numerous other person-centered and environmental targets of intervention that could also be explored. These analyses are limited in that individuals could not be tracked longitudinally. When measured at the school level across multiple years, there is no guarantee that the same

students would have been assessed at each wave of testing. Had the data included any means of linking students' surveys grade-over-grade, hierarchical linear modeling could have been applied to tease out individual- versus school-level effects. However, given the relative abundance of prior individual level analyses and findings that mirror those presented here at the school level, we can assume that both individual- and school-level effects predict subsequent use.

Finally, as noted, beliefs about consequences and bonding to school were dropped from regression analyses because of multicollinearity. Nevertheless, a school's level of attachment among students (Bonding to School) may be an important predictor of drug use. It may moderate other variables in the chain of influence, or its level may be augmented or suppressed because of the school's culture as manifested by students' normative beliefs or perceived ease of access to drugs. Similarly, beliefs about consequences may either precede, co-occur, or result from students' normative beliefs. Alternatively, all of these variables may be generalized indicators of school culture. Future research ought to explore these possibilities.

Summary

A school's culture transcends the characteristics of the individuals within the school. During later grades in middle school, actual and perceived prevalence form positive feedback loops that influence a school's subsequent prevalence. In both middle and high schools, low prevalence and no- or low-use social norms are protective. Conversely, students at schools with increased early onset and social norms that foster drug use are at increased risk. In high school, perceived ease of access plays an additional predictive role. Findings suggest that preventive interventions should target these strongest predictors of drug use and be expanded to include school-wide components.

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Ethics declarations

Disclosure of Potential Conflicts of Interest
None.

Research involving human participants

This paper involves secondary data analysis of data collected and archived by the Georgia State (US) Department of Education via the Georgia Student Health Survey.

Informed Consent

Data were collected by the Georgia Department of Education. The surveys were administered anonymously. The Georgia Department of Education requires all schools to notify parents/guardians about the Georgia Student Health Survey and give them the option to opt out if so desired. Georgia Student Health Survey questions were made available for review by parents/guardians upon request. The Georgia Department of Education approves "passive" parental consent for the Georgia Student Health Survey which allows parents to "opt out" of survey participation by returning a signed consent form to the school. Local school districts may use "active" parental consent if they choose to do so.

We had access to only de-identified student-level data although schools were identified. The IRB chair agreed this research was exempt based on 45 CFR § 46.104 exemption 4 which addresses research involving the collection or study of existing data of sources that are publicly available and the information is recorded so that subjects cannot be identified.

Ethical responsibility
We have abided by the following ethical standards. The analyses in the paper are entirely original and have been completed honestly and without fabrication or falsification. There has been no plagiarism with the exception of quoted materials for which credit has been given.

Additional information

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