Associations Between Adolescents' Perceptions of Alcohol Norms and Alcohol Behaviors: Incorporating Within-School Variability

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Abstract

Background—Social norm interventions have been implemented in schools to address concerns of alcohol use among high school students; however, research in this area has not incorporated measures of variability that may better reflect the complexity of social influences.

Purpose—To examine the association between perceived alcohol norms, the student and school-level variability of those norms, and alcohol use behaviors among high school students.

Methods—A sample of 25,824 students from 58 high schools completed an online self-report survey. Hierarchical linear regression models were fit to examine the relationships between student- and school-level alcohol norm predictors, within school variability, and current alcohol use and binge drinking.

Results—Individual- and school-level norms were predictive of both current alcohol use and binge drinking. Whereas measures of norm diversity at the school-level were not predictive of alcohol use behaviors, individual norm proximity was predictive of both current alcohol use and binge drinking.

Discussion—The study findings were both consistent with prior research and support assertions that variability measures should be incorporated into social norms research approaches.

Translation to Health Education Practice—The findings support the incorporation of student-level variability measures, which could assist in identifying students who are susceptible to peer influence.

Keywords

Adolescent health; Measurement; Substance Use; Schools

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Background

Alcohol consumption is a common behavior during adolescence, with 66% of high school students reporting ever consuming alcohol; 35% reporting current alcohol use (i.e., using alcohol in the past 30 days); and 21% reporting current binge or heavy episodic drinking (i.e., consuming large amounts of alcohol in a single setting in the past 30 days).[1] Adolescent alcohol use has been linked with immediate risk for injury, such as motor vehicle accidents.[2,3] In addition, adolescent alcohol use may be related to other social and behavioral challenges including relationship problems with parents, peers, and significant others as well as academic concerns.[4] Adolescent alcohol use also increases the risk of addiction[5,6] and influences the volume of alcohol intake over the life course which has been linked with many chronic diseases including cancers, cardiovascular disease, and digestive diseases (e.g., liver cirrhosis)[7]. For these reasons many public health interventions and programs have been implemented in schools to reduce adolescent alcohol use and mitigate its consequences.[8,9]

While there are many variables associated with adolescent alcohol use,[10] peer group composition and the perceptions of social norms have been among the strongest and most consistent predictors of current alcohol use and engaging in binge drinking.[11–14] According to social norm theory, targeting social normative beliefs is especially important as these beliefs often reflect inaccurate perceptions or self-confirming assumptions about others' alcohol use.[15–17] Adolescents perceive two types of norms about alcohol use: a descriptive norm and an injunctive norm. Descriptive norms relate to perceptions concerning the prevalence of use; studies have found that adolescents overestimate the amount of alcohol consumed by their peers (see Borsari and Carey[18] for a review of the literature). Injunctive norms deal with attitudes about how people in general should behave; similar to descriptive norms studies have found that adolescents overestimate approval of drinking.[19] The association between perceived alcohol use norms and alcohol use is hypothesized to be driven by individuals' propensity to conform to group norms,[19,20] which creates social environments amenable to peer pressure.[21] Unfortunately, high school settings and the developmental stage of adolescence produce the perfect convergence of need for social acceptance, positive expectancies to engage in alcohol use, and alcohol availability.[12,15] Therefore, dampening the influence of perceptions concerning the prevalence (i.e., descriptive norm) and permissiveness (i.e., injunctive norm) of alcohol use in peers and the larger school environment can allow students to form more healthy and realistic perceptions regarding alcohol, which in turn may decrease current alcohol use and the likelihood of engaging in binge drinking.[22]

Consistent with social norm theory, interventionists have hypothesized that the power of social influence could be manipulated and used as leverage to decrease negative behaviors and promote more positive outcomes in group settings. Interventions aimed at altering adolescents' descriptive norms about alcohol use norms have been shown to reduce alcohol behaviors. Common interventions include social marketing campaigns attempting to show norms of quantity and frequency of drinking related behaviors and consequences.[23] Other norms campaigns involve providing personal feedback to students about how their behaviors compare to those of their peers.[24] Programs using this approach have increased in popularity

due to their cost effectiveness and ease of implementation.[8, 25,26] However, recent work has identified empirical and theoretical issues concerning the complexity of how norms operate in school settings,[15] such as how proximal the holder of different perceptions is to the student (i.e., proximal context)[27] and students' ability to identify with those that hold different perceptions.[28] The current paper aimed to address some of these gaps in our understanding of these complex processes by exploring the role of variability in norms as a possible missing dimension in the theory of how social norms are assessed, operate, and are maximally effective.

Variability of Norm Proximity

Social norm interventions follow the assumption that social norms, while held by individual students, function in aggregate and are therefore representative of the greater climate and culture of that specific setting.[29] However, school alcohol use norms, might more accurately be seen as operating in a nuanced and individualistic manner depending on the proximal context of each student.[30] While environmental and social contextual factors such as setting type and peer group composition have been considered in prior research on social norm interventions,[31,32] perhaps a more appropriate way to account for proximal context is to operationalize the overall difference between an individual student's perceptions from the majority within their school. Thus, in addition to school-wide aggregate norms influencing individual student alcohol use, the extent to which personally held perceptions differ from the majority could increase or decrease the probability of engaging in high-risk behaviors. For example, in a school with norms that favor alcohol use, a student's personal views and perceptions that differ strongly from that norm could in fact serve as a protective factor.

Variability as Norm Diversity

To better understand the distribution of adolescents' social norms within schools, intergroup contact[33] and diversity literature[34,35] provide a framework for modeling and predicting the influence of group variability. Specifically, intergroup contact theory suggests that the more homogenous an environment, the more likely individuals are to interact with those who hold similar attitudes and beliefs.[36,37] Therefore, the distribution of the norm across the setting could influence the opportunity an individual student has to learn and ascribe to, as well as affiliate with, peers who hold different norms. For example, if the norm within the school is supportive of alcohol use, and most students in the population hold that norm, then students that attend that school are more likely to encounter a classmate who supports alcohol use than one who does not. Conversely, if the school's alcohol supportive norm is held by only half the population and the rest hold very different perceptions, then a student would have a greater chance of interacting with students that provide diverse viewpoints and possibly alternatives to the mainstream alcohol use behaviors.

Purpose

The current study explored two aims concerning the sensitivity of an individual student's behavior to the larger school's perceived norms.

1.   To understand the influence of individual norm proximity on alcohol use behaviors. We hypothesized that the more similar an individual student's

perceived alcohol use norms are to school-wide average alcohol use norms, the more likely that student are to engage in alcohol use.

2. To understand the influence of school-level diversity in norms on alcohol use behaviors. We hypothesized that the greater the variability of perceived alcohol use norms across the student population, the less likely students are to be influenced by the average perceived norms of their school.

These hypotheses were explored by assessing high school students' perceptions of both descriptive norms (i.e., how problematic is student alcohol use) and injunctive norms (i.e., how risky having a drink every day is) on two alcohol use behaviors: current alcohol use and engaging in binge drinking. Whereas current alcohol use and engaging in binge drinking have both been shown to be influenced by social norms, research suggests there may be different patterns of susceptibility.[14,21,38] Taken together, this exploratory line of research on variability in high school adolescents' perceived alcohol use norms may inform school-based prevention programs aiming to shift unhealthy perceived norms or better capitalize on variability in such norms.

Methods

Participants

Data come from a state-wide project focused on measuring and improving school climate within high schools called the Maryland Safe and Supportive Schools Initiative (MDS3). The data were collected from students in 58 high schools from 12 school districts across the state of Maryland. Participating schools included a diverse population with a minority rate of 46.8% (SD 25.1%) and a mean student enrollment of 1,262.90 (SD 462.91). A total of 25,824 students in an average of 25.6 9th–12th grade classrooms completed a web-based survey in the spring of 2013. Student and school demographic characteristics are presented in Table 1.

Procedure

The Maryland State Department of Education approached school districts in order of perceived need to ascertain their interests in participating in the voluntary project. After expressing interest in the project, district-wide meetings with principals were held to obtain commitment for participation. The web-based, anonymous survey was administered using a waiver of active parental consent and youth assent process and was completely voluntary. Parents were informed about the survey and larger project through a letter sent home with students. Students completed the survey in language arts classrooms; approximately 25 classrooms per school, balancing across grade level, were selected to complete the survey. School staff administered the survey following a written script. De-identified data were approved for analysis for this study by the researchers' Institutional Review Board.

Measures

Youth self-report data come from the MDS3 School Climate Survey, which was developed by the Johns Hopkins Center for the Prevention of Youth Violence in conjunction with project partners and drew upon several previously published scales and behavioral

indicators, which are described below. For additional details on the survey content and administration, see Bradshaw et al.[39]

Alcohol use behaviors—Consistent with the Center for Disease Control and Prevention's Youth Risk Behavioral Survey, students self-reported *current alcohol use* in the past 30 days ("How many days did you have at least one drink of alcohol") as well as engaging in *binge drinking* in the past 30 days ("How many days did you have 5 or more drinks in a row (within a couple of hours)")") were examined.[1,14] Based on the distribution of the data, a decision was made to dichotomize *current alcohol use* and *binge drinking* as yes/no. These items and the approach to dichotomization are widely used in research on alcohol use in adolescents and have been shown to be valid indicators of youth alcohol behaviors.[40,41]

Perceived alcohol use norms—Two types of alcohol use norms were assessed: students' perceptions that alcohol use was a *problem* at their school (i.e., descriptive norm) as well as the perception that alcohol use was *risky* (i.e., injunctive norm). Specifically, students' perception that alcohol use was a problem was asked with the following question, "How much of a problem is students' alcohol use (such as beer, wine, or liquor)?"[41] Students responded on a 4-point scale from *not a problem* to *large problem*. Students' perception that alcohol use was risky was assessed via the following question, "How much do you think people risk harming themselves (physically or otherwise) if they drink one or two drinks of an alcoholic beverage (beer, wine, liquor) nearly every day?"[43] Students responded on a 4-point scale from *no risk* to *great risk*. Perceived alcohol use norms were used to create both a student-level and school-level norm variable for both the *problem* and *risky* norms. The school-level norm was created by mean-aggregating student data across an entire school's population.

Covariates—All models included student perceptions of the difficulty of obtaining alcohol,[43] as well as self-reported gender, race (White, Black, Hispanic, Asian, Other), and grade-level (9–12). School-level covariates included school size, percent of students receiving free and reduced-priced meals (FARMS), percent of students suspended, and a measure of the ethnic heterogeneity of the school population.[34,35]

Analysis Plan

Measures of variability—Student- and school-level variables were created to model variability in students' perceived alcohol use norms. *Variability of norm proximity* was assessed using a school match discrepancy score which was created by subtracting the specified school's aggregated mean of perceived alcohol use norms (i.e., problem or risky) from the individual student's reported score.[30] Positive scores represent a student with a perceived norm that exceeds their peers (i.e., more problematic or more risky), while a negative score represents a perceived norm below the majority of their peers (i.e., less problematic and less risky). *Variability in norm diversity* was measured using a generalized variance approach that takes into account the number of attribute groups possible (i.e., level of student-reported norm perception) and the representation of that group across the entire school population to generate an index score.[34,35] Simply, this school-level variability score

represents the probability that two randomly chosen students in a specific school will have different perceived alcohol use norms, with scores ranging from 0 (representing complete homogeneity within that school) to 1 (representing complete heterogeneity).

Discrepancy directionality—To further examine discrepancy findings, two dummy variables were created to capture the distinct possibilities for each alcohol use norm perception. One discrepancy group consisted of students whose perceptions were 1 *SD* or more above the mean, indicating that perceptions were higher than their average classmates. The other discrepancy group consisted of students whose perceptions were 1 *SD* or more below the mean, indicating that their perceptions were lower than their school peers. These cutoffs were recommended in the literature as indicating the portion of a sample that is different from the mean.[30, 44] The dummy variables created were compared to a reference group of students who were within 1 *SD* around the mean (i.e., did not differ substantially from the schoolmates in alcohol use norm perceptions). Chi-square tests were performed to further examine the likelihood of reporting both current alcohol use and engaging in binge drinking for distinct discrepancy groups of students above and below their school's mean alcohol perception norms compared to students who were part of the reference group.

Model testing—A multilevel modeling approach was implemented to account for the nested structure of the data, represented by students within classrooms within schools. To answer the two research questions, two separate three-level hierarchical linear models for each outcome were used to examine the associations between student and school demographic characteristics, student and school-level perceived alcohol use norms, and reports of *current alcohol use* and engaging in *binge drinking*. The first model focused on the main effects of both individual student and school-wide perceived alcohol use norms. The second model focused on the inclusion of variability measures (*norm proximity and norm diversity*) of perceived alcohol use norms at both levels. Individual student's perceived alcohol use norms and school match discrepancy scores were highly correlated ($r = .98$, $p < .001$; $r = .99$, $p < .001$) for both problem and risky alcohol use norms, respectively. Due to the high correlation between these variables, both derived from student-level alcohol use norms, each model only included either the student's perceived alcohol use norm (i.e., student problem norm, student risky norm) or the school match discrepancy score (i.e., problem discrepancy score, risky discrepancy score). Therefore, for Aim 1 (Model 1), which was concerned with the main effects of perceived alcohol use norms on student alcohol use and engaging in binge drinking, the student's perceived alcohol use norms were included. Subsequently, because Aim 2 (Model 2) was focused on incorporating norm variability, the school match discrepancy scores were included in the analysis.

All models controlled for student and school-level characteristics. Specifically at the student-level, *gender, race/ethnicity, grade, alcohol access,* and perceived alcohol use norms – including *individual student perceived norm* and *school match discrepancy score* for the problem and risky norms – were modeled. No variables were incorporated at the classroom-level, but an error term for the intercept was included to account for clustering of students due to survey administration in the classroom setting. At the school-level, *percentage of students receiving free and reduced-priced lunch (FARMS), percentage of students*

suspended, *total enrollment*, *school racial diversity*, and the school-level perceived alcohol use norm variables of *mean* and *variability* (generalized variance) were all included. Student-level continuous variables and all school-level variables were grand-mean centered. All analysis were conducted using HLM version 6.08.

Results

Descriptive Analyses

Student and school demographic characteristics can be found in Table 1. Means, standard deviations, and correlations between study variables can be found in Table 2. Of particular note, 33.2% of students reported at least one day of drinking in the past 30 days, whereas 18.7% of students reported at least one day of binge drinking in the past 30 days. There were also significant correlations between the alcohol use norm perceptions and the alcohol use norm discrepancy scores.

Multilevel Analyses

Demographic associations with alcohol use behaviors—Many student-level characteristics were significantly associated with both *current alcohol use* and *binge drinking*. For example, students that were upperclassmen ($OR_{current} = 1.56$, $p = .001$; $OR_{binge} = 1.96$, $p = .001$) and "Other" racial group membership ($OR_{current} = 1.14$, $p = .015$; $OR_{binge} = 1.16$, $p = .032$) had higher odds of reporting both *current alcohol use* and *binge drinking*. Further, Black ($OR_{current} = 0.80$, $p = .001$; $OR_{binge} = 0.63$, $p = .001$) and Asian ($OR_{current} = 0.57$, $p = .001$; $OR_{binge} = 0.58$, $p = .001$) students as well as those that felt that alcohol was difficult to obtain at their school ($OR_{current} = 0.68$, $p = .001$; $OR_{binge} = 0.69$, $p = .001$) had lower odds of reporting both *current alcohol use* and *binge drinking*. With regard to school-level predictors, total enrollment ($OR_{current} = 1.00$, $p = .001$; $OR_{binge} = 1.00$, $p = .012$) and percentage of students suspended ($OR_{current} = 1.00$, $p = .050$; $OR_{binge} = 1.01$, $p = .001$) were marginally associated with increased odds of reporting both *current alcohol use* and *binge drinking*. In addition, a higher rate of FARMS ($OR_{current} = 0.99$, $p = .001$; $OR_{binge} = 0.99$, $p = .001$) was marginally associated with reduced odds of reporting drinking behavior for both models. See detailed results in Table 3 for *current alcohol use* and Table 4 for *binge drinking*.

Aim 1: Alcohol use norm perceptions associations with current alcohol use (Table 3)

Main effects predicting current alcohol use: Students who perceived alcohol as more of a problem at their school ($OR = 1.21$, $p < .001$) had higher odds of reporting current alcohol use (see Table 3, Model 1). As student risk perception increased, the odds of reporting *current alcohol use* lowered ($OR = 0.71$, $p < .001$). At the school-level, average perceptions of alcohol as a problem at their school were associated with increased odds of reporting *current alcohol use* ($OR = 1.53$, $p = .001$).

Student and school variability predicting current alcohol use: Results indicated that students who were more discrepant from their schools' mean perception of whether alcohol was a problem ($OR = 1.20$, $p < .001$) had increased odds of reporting *current alcohol use*

(See Table 3, Model 2). Additionally, the extent to which students were discrepant from their school's mean perception of risk significantly decreased odds of students reporting *current alcohol use* (OR= 0.71, *p* < .001) in the sample. School-level variability as measured by the generalized variance approach did not report any significant odds ratios for *current alcohol use*.

Aim 2: School and student variability and associations with binge drinking (Table 4)

Main effects predicting binge drinking: Students who perceived alcohol as more of a problem at their school had increased odds of reporting *binge drinking* (OR = 1.27, *p* < .001) (see Table 4, Model 1). Those students with greater perceptions of increased risk had reduced odds of reporting *binge drinking* (OR = 0.67, *p* < .001). At the school-level, average perceptions of alcohol as a problem at their school were associated with higher odds of reporting *binge drinking* (OR = 2.07, *p* < .001).

Student and school variability predicting binge drinking: Results indicated that students who were more discrepant from their schools' mean perception of whether alcohol was a problem (OR = 1.27, *p* < .001) had increased odds of reporting *binge drinking* (See Table 4 Model 2). Additionally, students who were more discrepant from their schools mean perception of risk had significantly decreased odds of students reporting *binge drinking* (OR = 0.67, *p* < .001). School-level variability as measured by the generalized variance approach was not significantly associated with *binge drinking*. However, with the inclusion of school-level variability, increased average perceptions of risk were associated with decreased binge drinking (OR=.55, *p* .05)

Post hoc analysis: discrepancy directionality—Significant associations between alcohol use norm discrepancy and alcohol use outcomes were found in all cases except one (i.e., problem norm for binge drinking), indicating that direction of discrepancy is related to alcohol use behaviors as expected (See Table 5). Specifically, having problem norms 1SD above the mean was associated with increased current alcohol use and binge drinking, with problem norms 1SD below the mean associated with decreased current alcohol use. Having risky norms 1SD above the mean was associated with decreased current alcohol use and binge drinking, with risky norms 1SD below the mean associated with increased current alcohol use and binge drinking.

Discussion

Findings revealed that alcohol use behaviors are prevalent within this adolescent high school sample, with a third of students reporting current alcohol use and almost a fifth of students reporting engaging in binge drinking. These findings are consistent with data from national longitudinal studies of adolescent substance use.[1,11, 14] We also found that mean levels of perceived alcohol use norms, both descriptive and injunctive, were associated with alcohol use behaviors, which is consistent with prior literature (e.g., Brooks-Russell et al.[11,12]). Additionally, although previous studies have explored the influence of social norm perceptions on alcohol use behaviors,[13,14] research assessing variability of perceptions at

both the student- and school-level has been nonexistent. The current study addressed this gap by incorporating two measures of perceived alcohol use norm variability into multilevel models predicting the current alcohol use and binge drinking behaviors of high school students. Results supported the inclusion of individual norm proximity; however, no significant associations emerged for the school-level diversity score. These data provide evidence that the addition of individual-level variability in models predicting alcohol use behaviors adds a dimension of clarity to understanding the complex operation of social norms within school settings and how health education efforts can be augmented and targeted to increase efficacy.

Individual norm proximity was significantly associated with both current alcohol use and binge drinking outcomes. The theory underlying the social norms approach accurately predicted that students with norm perceptions more discrepant towards risk would have a higher probability of differing in their alcohol use behaviors.[17,45] These discrepancies between students' norms of perceiving a higher prevalence of negative alcohol use and less riskiness in consuming alcohol regularly compared to their peers resulted in a higher likelihood of engaging in alcohol use. In contrast, those who comparatively believed alcohol was less of a problem at their school and viewed consuming alcohol regularly as more risky were less likely to engage in alcohol usage. These findings highlight the role of proximity as an important factor associated with social norm influence. Not only were the school-wide aggregate norms predictive of individual student alcohol use behaviors, but the extent to which personally held perceptions differed from these norms played a role in engaging in high-risk behaviors. Certain students could have personally held beliefs and attitudes concerning alcohol usage that could make them more predisposed to social norms and therefore good candidates for social norms interventions.[15]

Our results did not support the hypotheses that school-level variability (i.e., norm diversity) was a significant factor associated with individual student alcohol use behaviors. The hypotheses about these associations were based on previous findings within the intergroup contact and school diversity literatures that suggest that the more homogenous the school environment, the more likely students are to share similar attitudes and perceptions in a variety of categories including peer victimization and safety,[35] friendship choices,[46] and racial climate perceptions.[47] To our knowledge, this is the first study to apply this theoretical framework to modeling alcohol use norm variability at the school or setting level.

There are two possible explanations to why norm diversity associations were not found. First, more proximal sources of social norms (e.g., close friends, teammates, etc.) could exert more of an influence on the perceptions of high school students than the larger school climate exerts, and these sources can act as a buffer from these widely held beliefs – which depending on the proximal influences can result in more positive or negative outcomes.[48] The results suggested that student level variability, as measured by discrepancy from the majority, was associated with increased or decreased odds of engaging in alcohol use behaviors depending upon the individual student's relative position towards the school mean. A second explanation concerns the construction and use of generalized variance index. This approach was designed and exclusively applied to measure diversity based upon discrete categories and not scale responses. The index score was constructed using Likert-

scaled responses that might lack the specificity to meaningfully differentiate students from one another without the use of multiple items or a reliable scale.[34] Future alcohol research that uses the generalize variance index should first devise more discrete groupings that approximate students' norm perceptions by either leveraging categorical variables within the setting or using person-centered approaches (e.g., latent-class analysis) to create these groups from a collection of alcohol use norm perceptions already assessed in the population of interest.

Despite not finding significant effects for norm diversity, the results highlight a convergence of environmental and social factors that are associated with both current alcohol use and binge drinking that have not been examined fully within the alcohol norm literature.[14,21,38] The pattern of findings were very similar for the two alcohol use behaviors, suggesting that alcohol norm interventions that attend to alcohol discrepancy in their target populations could possibly reduce both behaviors. This finding is different from prior research that suggested that the decisions to engage in more casual alcohol use are more susceptible to setting norms than those who engage in binge drinking, who may be more influenced by actual alcohol use behaviors.[18,48,49]

Our results are, however, limited in that the study design was cross-section; therefore, we are unable to assess causality or understand patterns of relationships. Future studies should examine the influence of variability longitudinally, as individual's propensity to conform to group norms suggests that both individual and school norms change over time.[18,29] The sample was limited to a volunteer sample of Maryland schools, which limits the generalizability of results to other high school populations from different states in different contexts. Additionally, the relatively small number of schools may have limited our ability to find effects at the school-level, as data were only collected from 58 high schools.[50] Despite these limitations, this study integrated disparate research literatures and methodologies to explore the potential role of variability in social norms in school settings.

Translation to Health Education Practice

Social norm interventions have been historically popular due to their cost efficiency and ease of implementation.[26] Traditionally social norm interventions are implemented using a "blanket" approach characterized by school-wide rollouts without much thought as to which specific populations need to be influenced. Although this intervention design and implementation process aligns with current funding and time constraints of school personnel implementing health promotion programming, it may not maximize the potential impact of the preventive intervention. Specifically focusing on students in groups that were known to engage in high-risk alcohol behaviors (e.g., fraternities, sororities, athletic teams, etc.) in alcohol social norm interventions has shown positive results.[16,51] Our findings suggest the possibility of moving beyond group membership, towards the assessment of individual norm proximity, as a method to determine appropriate subgroups upon which to focus social norm interventions. Many schools are beginning to incorporate assessments of climate and social-emotional wellbeing, which often include questions about involvement in risk behaviors including alcohol use. Such an approach may also provide greater insight regarding both the distributions of norms across the school as well as variability in norms within schools.

School personnel may find this information both helpful in justifying the adoption of social norms interventions (i.e., existence of skewed norms) as well as inform intervention design and evaluation. Incorporating discrepancy measures into social norms assessment and intervention development, implementation, and evaluation offers the possibility to improve allocation of resources and more accurate targeting of vulnerable populations that might have an individual propensity or sensitivity to alcohol norms that is not tied to group membership.

Acknowledgments

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Table 1

Student and School Demographic Characteristics

Student characteristics (N = 26,875)	N (%)
Gender Male	
	13,619 (50.7)
Female	13,253 (49.3)
Race/ethnicity	
Black/African American	8,342 (31.1)
White/Caucasian	13,601 (50.6)
Hispanic	1,349 (5.0)
Asian/Pacific Islander	1,247 (4.6)
Other race	2,329 (8.7)
Grade	
Lower (9th/10th)	14,376 (53.8)
Upper (11th/12th)	12,366 (46.2)
Alcohol use	
Current alcohol use	8,642 (33.2)
Binge drinking	5,191 (19.9)

School characteristics (N = 58 schools)	M (SD)
School enrollment	1,262.90 (462.91)
% FARMS	37.45 (17.82)
% Suspension	17.18 (12.04)
Racial diversity	0.56 (0.15)
Alcohol norm perceptions	
Alcohol access	1.93 (0.12)
Problem	2.56 (0.23)
Risky	2.66 (0.11)
Problem – Variability	0.76 (0.02)
Risky – Variability	0.77 (0.02)

Table 2

Student-level means and correlations of key variables

Variable	Mean (SD)	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.
1. Gender		—												
2. Black/African American		-.01*	—											
3. Hispanic		.00	-.15***	—										
4. Asian		.00	-.15***	-.05***	—									
5. Other race		.02*	-.21***	-.07***	-.07***	—								
6. Upper grade		.01	.00	.01	-.02**	-.01	—							
7. Alcohol access	1.93 (0.93)	-.09***	.08***	.02**	.05***	-.01	-.11***	—						
8. Problem norm	2.57 (1.14)	.09***	-.14***	.01	.01	.01	.06***	-.34***	—					
9. Risky norm	2.67 (1.03)	.11***	.00	-.01	.05***	-.02*	-.01	-.06***	.09***	—				
10. Problem – Discrepancy	0.00 (1.12)	.09***	-.08***	.01	.01	.02**	.06***	-.32***	.98***	.10***	—			
11. Risk – Discrepancy	0.00 (1.02)	.11***	-.01	-.01	.04***	-.02**	-.01	-.06***	.10***	.99***	.10***	—		
12. Current alcohol use	0.33 (0.47)	.00	-.08***	.00	-.05***	.03***	.12***	-.19***	.15***	-.15***	.13***	-.14***	—	
13. Binge drinking	0.20 (0.40)	-.05***	-.11***	.00	-.04***	.03***	.14***	-.16***	.15***	-.15***	.13***	-.14***	.68***	—

Note: the demographic rows also list values under the Mean (SD) position as follows — 2. Black/African American -.01*, 3. Hispanic .00, 4. Asian .00, 5. Other race .02*, 6. Upper grade -.02**.

Pearson correlation coefficients were calculated for continuous variables and point biserial correlation was used for continuous-dichotomous associations

*
p .05,

**
p .01,

***
p .001

Table 3

Results for 3-Level HLM Examining the Association between Current Alcohol Use and Student Characteristics

	Model 1 (Main Effect)		Model 2 (Variability)	
	OR	CI	OR	CI
Student-level variables	1.01		1.00	
Female	1.01	(0.939,1.076)	1.00	(0.938,1.076)
Black[a]	0.80***	(0.731,0.873)	0.80***	(0.730,0.871)
Hispanic[a]	0.93	(0.809,1.076)	0.93	(0.808,1.075)
Asian[a]	0.57***	(0.482,0.678)	0.57***	(0.481,0.677)
Other[a]	1.14*	(1.028,1.275)	1.14*	(1.026,1.275)
Upper grade[b]	1.56***	(1.468,1.664)	1.56***	(1.469,1.665)
Alcohol access norm	0.68***	(0.658,0.703)	0.68***	(0.658,0.703)
Problem norm	1.21***	(1.164,1.252)		
Risky norm	0.71***	(0.684,0.731)		
Problem – Discrepancy[c]			1.20***	(1.164,1.252)
Risky – Discrepancy[c]			0.71***	(0.684,0.731)
School-level variables				
FARMS	0.99***	(0.989,0.996)	0.99***	(0.989,0.996)
% Suspension	1.00*	(1.000,1.007)	1.00	(1.000,1.007)
Total enrollment	1.00***	(1.000,1.000)	1.00**	(1.000,1.000)
Racial diversity	1.14	(0.810,1.593)	1.21	(0.870,1.695)
Problem – Mean	1.53**	(1.199,1.960)	1.88***	(1.441,2.446)
Risky – Mean	0.91	(0.556,1.499)	0.63	(0.376,1.043)
Problem – Variability			0.21	(0.012,3.681)
Risky – Variability			2.69	(0.100,71.849)
Random Effects	SD	VC	χ^2 (df)	SD	VC	χ^2 (df)
Level 1 and 2	.31	.09	1854.01***(1403)	.31	.09	1853.92***(1403)

| | **Model 1 (Main Effect)** | | | **Model 2 (Variability)** | | |
	OR	**CI**	**OR**	**CI**
Level 3	.12	.02	115.56 *** (51)	.12	.01	113.37 *** (49)

OR = Odds Ratio. CI = 95% Confidence Interval. SD = Standard Deviation. VC = Variance Component. d.f. = Degrees of Freedom.

[a] White is the reference group.

[b] Lower Grades (10th and 9th) are the reference group.

[c] Variable was created by subtracting student score from their school mean.

*
p .05,

**
p .01,

***
p .001

Table 4

Results for 3-Level HLM Examining the Association between Binge Drinking and Student Characteristics

	Model 1 (Main Effect)		Model 2 (Variability)	
	OR	CI	OR	CI
Student-level variables				
Female	0.77***	(0.716,0.825)	0.77***	(0.716,0.824)
Black[a]	0.63***	(0.565,0.708)	0.63***	(0.565,0.706)
Hispanic[a]	0.85	(0.713,1.012)	0.85	(0.712,1.011)
Asian[a]	0.58***	(0.476,0.709)	0.58***	(0.475,0.708)
Other[a]	1.16*	(1.013,1.327)	1.16*	(1.012,1.327)
Upper grade[b]	1.96***	(1.830,2.107)	1.96***	(1.830,2.108)
Alcohol access norm	0.69***	(0.659,0.714)	0.69***	(0.659,0.714)
Problem norm	1.27***	(1.215,1.322)		
Risky norm	0.67***	(0.647,0.699)		
Problem – Discrepancy[c]			1.27***	(1.215,1.322)
Risky – Discrepancy[c]			0.67***	(0.647,0.699)
School-level variables				
FARMS	0.99***	(0.988,0.996)	0.99***	(0.988,0.995)
% Suspension	1.01**	(1.003,1.011)	1.01**	(1.003,1.011)
Total enrollment	1.00*	(1.000,1.000)	1.00*	(1.000,1.000)
Racial diversity	1.08	(0.681,1.724)	1.21	(0.700,1.804)
Problem – Mean	2.07***	(1.581,2.719)	2.64***	(1.989,3.512)
Risky – Mean	0.80	(0.489,1.314)	0.55*	(0.303,0.984)
Problem – Variability			0.36	(0.017,7.756)
Risky – Variability			2.87	(0.061,134.713)
Random Effects	SD	VC χ^2 (df)	SD	VC χ^2 (df)
Level 1 and 2	.37	.14 1850.80*** (1403)	.37	.14 1850.58*** (1403)

	Model 1 (Main Effect)			Model 2 (Variability)		
	OR	**CI**		**OR**	**CI**	
Level 3	.14	.02	106.68 *** (51)	.14	.02	106.00 *** (49)

OR = Odds Ratio. CI = 95% Confidence Interval. SD = Standard Deviation. VC = Variance Component. d.f. = Degrees of Freedom.

[a] White is the reference group.

[b] Lower Grades (10th and 9th) are the reference group.

[c] Variable was created by subtracting student score from their school mean.

*
 p .05,

**
 p .01,

***
 p .001

Table 5

Results for Chi-Square Tests Examining the Discrepancy Directionality

Outcome	Student Alcohol Norms	Alcohol Use (Mean norm alcohol use) χ^2	
Current Alcohol Use			
		Above	Below
	Problem norm (30.4%)	43.9%	26.7%
		363.19***	26.63***
	Risky norm (34.4%)	24.4%	42.4%
		212.20***	101.16***
Binge Drinking			
		Above	Below
	Problem norm (16.4%)	30.3%	15.6%
		527.55***	1.87
	Risky norm (19.4%)	14%	31.4%
		92.11***	270.94***