Social Norms in the Development of Adolescent Substance Use: A Longitudinal Analysis of the International Youth Development Study

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Abstract Identifying specific aspects of peer social norms that influence adolescent substance use may assist international prevention efforts. This study examines two aggregated measures of social norms in the school setting and their predictive association with substance (alcohol, tobacco and marijuana) use 2 years later in a large cross-national population-based cohort of adolescents. The primary hypothesis is that in Grade 7 both “injunctive” school norms (where students associate substance use with “coolness”) and “descriptive” norms (where student substance use is common) will predict Grade 9 substance use. Data come from the International Youth Development Study, including 2,248 students (51.2 % female) in the US and Australia attending 121 schools in Grade 7.

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Independent variables included injunctive norms (aggregating measures of school-wide coolness ratings of each substance use) and descriptive norms (aggregating the prevalence of school substance use) in Grade 7. Dependent variables included binge drinking and current use of alcohol, tobacco and marijuana in Grade 9. Associations between each type of school-wide social norm and substance use behaviors in Grade 9 were tested using multi-level logistic regression, adjusting for covariates. In unadjusted models, both injunctive and descriptive norms each significantly predicted subsequent substance use. In fully adjusted models, injunctive norms were no longer significantly associated with Grade 9 use, but descriptive norms remained significantly associated with tobacco and marijuana use in the expected direction. The findings identify descriptive social norms in the school context as a particularly important area to address in adolescent substance use prevention efforts.

Keywords Substance use · Smoking · Alcohol · Marijuana · Social norms · School

Introduction

Preventing and delaying the use of substances such as alcohol, tobacco and marijuana is an important challenge internationally (Johnston et al. 2012; White et al. 2012). The current article examines data from the International Youth Development Study (IYDS), a longitudinal study designed to compare youth development in the United States (US) and Australia. Prior IYDS comparisons have noted lower rates of alcohol and tobacco use in the US (McMorris et al. 2007; Toumbourou et al. 2009) and lower rates of marijuana use for adolescents in Australia relative

to the US (McMorris et al. 2007). Though similar as highly developed English speaking countries, the US and Australia have different policies and social attitudes regarding substance use (Hemphill et al. 2011): US policies can be characterized as zero tolerance and abstinence focused (The White House 2011), whereas Australian policies focus on harm reduction or harm minimization (including abstinence) to reduce the health, social, and economic consequences of substance use for the individual and the community (Caulkins and Reuter 1997; Ministerial Council on Drug Strategy 1998). The present article seeks to examine to what extent social influences, specifically peer social norms, are longitudinal cross-national predictors of substance use in the IYDS, in order to inform prevention efforts in both locations seeking to curtail these behaviors and their associated harms.

Social Influences on Health Behaviors

Social influence on substance use behaviors can take many forms. Research has demonstrated that social factors such as modeling of a behavior by parents, siblings, peers or friends (Ennett et al. 2010); perceived norms of behavior (Eisenberg and Forster 2008); and school policies restricting use or enforcing negative consequences (Evans-Whipp et al. 2004) are associated with youth substance use (Tyas and Pederson 1998). In the culture at large, media representations of substance use (Morgenstern et al. 2013) and policies such as the legal drinking age and cigarette taxation also play an important role in the availability, meaning and use of substances (Bader et al. 2011).

Social factors may be particularly germane to adolescent health behaviors, including substance use, due to the developmental characteristics of this unique stage of life (Christie and Viner 2005; Neinstein 2002). Young adolescents (roughly ages 11–14) begin the process of differentiating themselves from their parents and orienting towards their peers. Socially, young adolescents turn increased attention to peer social cues in order to establish peer acceptance (Gifford-Smith et al. 2005).

A number of social science and health behavior theories posit that social forces act on individuals to shape health behaviors. Social ecological models describe multiple levels of influence including interpersonal interactions, institutional or organizational qualities and broader socio-cultural factors that all act on the individual (Bronfenbrenner 1979; McLeroy et al. 1988), and Ennett et al. (2010) have applied these models to youth smoking, finding evidence of influence at the family, peer, school and neighborhood contextual levels. Similarly, other theories suggest that important “others” are influential through their modeling of specific behaviors or sharing values

regarding behaviors or their expected outcomes (Azjen 1980; Bandura 1986; Flay and Petraitis 1994; Rose 1992).

The foci of the present study are two peer social norm constructs from the body of theory on social influence. The Theory of Normative Social Behavior includes two types of social norms: “descriptive” norms refer to perceptions of what others do, and “injunctive” norms refer to perceptions of others’ expectations and values of the behavior (Rimal and Real 2005; Rimal 2008). Likewise a core construct in Bandura’s Social Cognitive Theory suggests that behavior is motivated partly by the anticipated consequences, or outcome expectations, of the behavior (1986). In short, we expect that a higher prevalence of young people engaging in a specific behavior (i.e., descriptive norms) may send a subtle message that such behavior is accepted and indeed, expected, which may encourage adoption of that behavior throughout a social setting. We further expect that greater benefits associated with a behavior (i.e., injunctive norms or outcome expectations) will result in adoption of that behavior.

Existing evidence supports these theorized relationships in the area of youth substance use. Measures of descriptive norms include estimated prevalence or intensity of a behavior and frequency of noticing others doing a behavior or the visibility of the behavior, and consistently show that these perceived norms are associated with alcohol (Neighbors et al. 2007; Roski et al. 1997), tobacco (Eisenberg and Forster 2008) and drug use (Neighbors et al. 2008; Roski et al. 1997; Walker et al. 2011) among adolescents and young adults. However, this work is subject to an important caveat: Research has established that individuals’ estimates or perceptions of their friends’ or peers’ behavior is biased towards their own behavior, creating a “false consensus” effect (Henry et al. 2011; Kilmer et al. 2006; Wolfson 2000).

Recognizing this limitation, a smaller body of literature utilizes data provided by others regarding their own behavior to generate social norms for a setting and tests the association of these norms with substance use behavior. Some find significant relationships (Ennett et al. 2010; Keyes et al. 2011, 2012; Molyneux et al. 2002). For example, even in the context of other social influences, Ennett et al. (2010) found an independent contribution of the school-wide modeling of smoking (i.e., smoking behavior reported by all other students in the school network) to adolescents’ smoking behavior. On the other hand, robust adjustment for covariates has fully attenuated these associations in other research (Ellickson et al. 2003; Patton et al. 1998). Ellickson et al. (2003), for example, found that school-level prevalence of smoking was strongly associated with smoking frequency 1 year later, but the relationship no longer remained after accounting for individuals’ own prior smoking behavior.

Research on injunctive social norms for adolescent substance use also typically uses measures of perceived norms, subject to the same limitations described above. Select studies, however, have examined aggregated measures of perceived approval of substance use (Keyes et al. 2011, 2012; Kumar et al. 2002). For example, Kumar et al. (2002), using the large Monitoring the Future study, found that school-level disapproval of substance use was associated with a lower probability of students' own substance use, after controlling for their own level of substance use approval and other covariates. Although this work provides critical evidence of the importance of injunctive norms to adolescent substance use, "approval" may not be the most salient concept for this age group, as the word alludes to judgments of safe, appropriate or adult-sanctioned behavior, and young adolescents are at a stage when questioning authority, rebelling and forging one's own identity are basic developmental tasks. "Coolness," in contrast, is a construct reflecting youth culture; it is generally viewed as a desirable characteristic and associated with popularity (especially among boys) (Closson 2008; Meisinger et al. 2007), and it peaks in importance during early adolescence (LaFontana and Cillessen 2010). Although direct comparisons of the importance of coolness and approval (or other value expectancies) are not available, the youth focus of "coolness" may be a more relevant behavior motivator in this age group.

Research regarding coolness as an expectancy of substance use is relatively sparse. In general, findings suggest that youth do not perceive substance use as cool (Gilreath et al. 2012; Loomis et al. 2012; Spijkerman et al. 2004). However, adolescents that do see use as cool are more likely to smoke and drink alcohol than those who do not (Epstein et al. 2000; Gilreath et al. 2012; Spijkerman et al. 2004). These studies examine the perception of coolness at the individual level. Additionally, select studies have used an aggregated coolness or social status measure and found associations with adolescent substance use behavior (Boardman et al. 2008; Bricker et al. 2007; Gilreath et al. 2012). For example, Gilreath et al. (2012) aggregated individual responses regarding the coolness of smoking in 39 schools, and reported relationships with smoking behavior; results were attenuated after adjusting for the individual's own perception of the coolness of smoking.

These descriptive and injunctive norms—assessed as perceptions or aggregated measures—are theoretically related to each other as well as to substance use behaviors. For example, the school-wide prevalence of use likely predicts an individual's *perception* of the prevalence of use, which then contributes to the individual's own substance use (in addition to use coloring perception, as described above). Similarly, the collective attitude about the coolness of substance behaviors likely depends on the

group size (i.e., prevalence) and social status of others modeling each behavior (for example, smoking at the school's tobacco free boundary). Because social influence is a product of the behaviors others model (descriptive norms), the value the group assigns to these behaviors (injunctive norms) and the individual's perceptions, a comprehensive analysis would consider multiple aspects of social norms in conjunction with their own behaviors and value expectancies.

Shortcomings of Existing Research

The research described above establishes the relevance of peer social norms as an important influence for adolescent substance use, but this body of work has several important shortcomings and gaps still remain. With few exceptions (e.g., Patton et al. 1998; Keyes et al. 2011, 2012), research using data provided by others to establish social norms (i.e., not relying on perceptions of others' behaviors or attitudes) uses cross-sectional designs. Second, studies using aggregated data to create school-wide social norms variables have focused mostly on tobacco use. Although tobacco, alcohol and marijuana similarly cluster with a variety of anti-social and health risk behaviors (Jessor and Jessor 1977) and may be seen as a means of achieving peer connection; the social norms, expectations and public policies surrounding them differ. Marijuana use, for example, may remain relatively hidden compared to cigarette smoking due to its status as an illegal substance. Understanding the shared or unique roles of social influences in the development of each type of substance use will be important in improving the targeting of prevention efforts. Third, most studies using school-level variables include fewer than 40 schools. As power to detect effects in multilevel analysis is constrained by the number of second-level units (e.g., schools rather than students), null findings in some studies may be due to this limitation.

The present study builds on existing research by examining two aggregated measures of social norms in the school setting and their association with alcohol, tobacco and marijuana use two years later in a large population-based cohort of adolescents in the US and Australia. The focus of this work is on the school as a context for social norms, and this was selected for several reasons. Schools are a primary social setting for young people, in that they spend a large number of waking hours there. The school level also represents an important balance point of feasibility and reach for intervention work (Bond et al. 2004; Fletcher et al. 2008). Specifically, the school social environment can be modified through policies, programs, teacher trainings, educational offerings and other mechanisms much more easily than larger community, state or national settings. Changes at the school institutional level are able

to reach a far greater number of young people than interventions on the family, friend group or individuals alone.

Hypotheses

Given the mixed findings from previous research and a strong theoretical basis suggesting the important role of peer social norms at the organizational/institutional level (i.e., the school), we hypothesize that attending a school with greater injunctive social norms (coolness) and descriptive norms (prevalent substance use) in Grade 7 will each independently be associated with students' Grade 9 substance use in an adequately powered sample of schools and students. We hypothesize that these associations will be attenuated but remain significant after adjustment for the student's own perception of the coolness of substance use, their use of each substance in Grade 7, and other covariates (i.e., gender, family economic status, type of school, state, and number of participating students in the school).

Methods

Study Design and Data Collection

This study is a secondary analysis of data collected as part of the International Youth Development Study (IYDS), an ongoing longitudinal study of adolescent health in Victoria, Australia, and Washington State, United States. The IYDS was designed to measure school influences and used a two-stage cluster sampling design to maximize the number of schools selected. In the first stage, public and private schools with a Grade 5, 7 and 9, within each state and grade level, were randomly selected using probability proportionate to grade-level size. The second stage used random selection of one class within each school. Classes in Washington yielded 3,856 eligible students, of whom 2,885 (74.8 %) consented to and participated ($n = 153$ schools). In Victoria, 3,926 students were eligible to participate, of whom 2,884 (73.5 %) consented and participated ($n = 152$ schools). Non-participation was due primarily to unreturned consent forms (11 % in Washington, 5 % in Victoria) and parent refusal (14 % in Washington, 21 % in Victoria). Study protocols were equivalent across locations and time points.

An analysis of differences between the IYDS sample and the school-age population in each state suggests that the sample is largely representative of the adolescent populations in both locations, with only minor differences (McMorris et al. 2007). Annual surveys of participants were initiated in 2002. Retention rates on the project have been greater than 98 % for survey waves included in this report.

The present analysis uses data from participants in Grade 7 to predict substance use behavior two years later in Grade 9. Grade 7 students from Victoria ($N = 984$) and Washington ($N = 956$) were surveyed in 2002 and then resurveyed in 2004 in Grade 9; an additional 894 students in Victoria entered the study in 2002 (in Grade 5), and provided data used in this analysis in 2004 (Grade 7) and 2006 (Grade 9; this group was followed for an additional wave due to the availability of funding). These cohorts were selected from the full IYDS because the developmental period from Grade 7 represents the age at which many young people begin using substances due to peer influences (Leung et al. 2011). The school sample was restricted to those that had at least ten students participating, in order to ensure that aggregated school-level variables were not based on a very small number of respondents, which would greatly confound the independent social use norms variable and the dependent substance use variables at the individual level. The sample therefore included 2,248 participants [1,326 in Victoria (59.0 %), 922 in Washington (41.0 %)] who were in Grade 7 at 121 schools and provided follow-up data in Grade 9. The sample was evenly divided by gender (51.2 % female) with a mean age in Grade 7 of 13.0 years (11.8–16.6). A majority were white (90.6 % of the Victorian sample, 65.3 % of the Washington sample).

The survey underwent procedures to ensure comparability in both states, and sampling and survey administration protocols were identical in both states (McMorris et al. 2007). Study staff visited selected classrooms for group administration during required 50–60 min classes. When students were absent on the day of survey administration, these surveys were conducted later by trained school personnel or over the telephone with study staff.

Ethics approval was obtained from the University of Washington (Washington State), the University of Melbourne and the Royal Children's Hospital (Victoria), and from appropriate school districts and administrators in each location. Written parental consent was obtained, and students provided assent to participate in the study on the day of the survey. Additional details of the IYDS are available elsewhere (Hemphill et al. 2011; McMorris et al. 2007).

Measures

The IYDS survey is a self-report instrument adapted from the Communities That Care Youth Survey, showing good reliability and validity in large samples of adolescents in the US and Australia (Bond et al. 2000; Glaser et al. 2005; Hemphill et al. 2011), and items specific to substance use behavior were adapted from the Monitoring the Future survey (Bachman et al. 2001). Measures used in the present analyses are outlined below.

Substance Use Behaviors

Current use of alcohol, tobacco and marijuana/cannabis were assessed in Grades 7 and 9 with separate items asking about frequency of use in the past 30 days, using standard items from large surveillance tools. Several response options were offered, and responses were dichotomized to contrast any use with non-use due to highly skewed distributions. Current use of each substance was used as a separate dependent variable in analysis. Binge drinking (five or more drinks in a row) over the past 2 weeks was also used as a dependent variable (Grade 9).

Perceived Coolness

Perceived coolness of substance use was assessed in Grade 7 with three items selected from the Rewards for Antisocial Involvement scale of the Communities That Care Youth Survey (Arthur et al. 2002; Glaser et al. 2005), “What are the chances you would be seen as cool if you [smoked cigarettes/began drinking alcoholic beverages regularly, that is, at least once or twice a month/used marijuana]”. “Cool” was not defined, and was left to the interpretation of the participant. Response options were on a five-point scale ranging from “no or very little chance” to “very good chance.” Previous research has demonstrated acceptable reliability and construct validity of this scale in diverse samples of middle and high school students (Arthur et al. 2002; Glaser et al. 2005).

School-Level Social Norms

School-level norms were created by aggregating data from Grade 7 participants at each school. Descriptive norms were the school-wide prevalence of past 30-day tobacco, alcohol and marijuana use (separately). Injunctive social norms were calculated as the mean level of perceived coolness of tobacco, alcohol and marijuana use (separately) for all participants at each school.

Covariates

Although not part of the research questions or hypotheses, five covariates were included to avoid confounding by background characteristics (related to economic status, public policy, and other cultural factors) that may be associated with both the social norms and substance use behaviors of interest in this analysis. Covariates included participants’ self-reported gender and parent-reported family socioeconomic status [derived from reports of highest maternal and paternal education level and family income (Evans-Whipp et al. 2007)], and study variables of type of school (public, private), state, and the number of students contributing data in the school.

Data Analysis

Correlations and *t* tests were used, as appropriate, to test differences in social norms across covariates to determine the need for adjustment in analytic models. Multilevel logistic regression analysis (PROC GENMOD) was conducted to examine associations between each type of school-wide social norm and four substance use behaviors in Grade 9 (current alcohol, tobacco and marijuana/cannabis use and binge drinking). Model testing occurred in three stages reflecting increasing multivariate adjustment to test the social norm hypotheses. For each behavior, Model 1 used the Grade 7 descriptive norm and injunctive norm as independent variables (separately) and use of the same substance in Grade 9 as the dependent variable (e.g., injunctive norm for smoking and Grade 9 smoking behavior). Model 2 added all five covariates to the previous models. Model 3 included both social norms variables simultaneously, all five covariates, and the participant’s own Grade 7 use of the same substance and own perceived coolness of use of that substance. Inclusion of control variables reduced confounding from other sources and the potential bias introduced by generating school-level variables that include the behavior being modeled. In order to test whether the role of social norms was the same in the US and Australia, interaction terms of each social norm variable by country were tested in Model 1; none were statistically significant. SAS version 9.3 was used for all analyses.

The substance use norms variables were measured on a percent scale, and a single unit (i.e., 1 % difference) is not highly meaningful. We therefore calculated odds ratios as a comparison of students at schools with a high prevalence of each substance use (75th percentile) to students at schools with a low prevalence (25th percentile) in order to facilitate interpretation of these associations in a more practical way.

Results

In Grade 7, approximately one-quarter of students reported drinking alcohol, 11 % reported smoking cigarettes, and 8 % reported marijuana use in the 30 days preceding the survey (Table 1). Generally, students gave low endorsement to the coolness of substance use; mean levels were approximately two for each type of substance, corresponding to a response of “little chance” of being seen as cool. By Grade 9, substance use rates had increased as expected (Table 1). At the individual level, Grade 7 substance use and perceptions of coolness of each substance had statistically significant ($p < .001$) but low correlations: $r_{\text{alcohol}} = .24$, $r_{\text{tobacco}} = .15$, $r_{\text{marijuana}} = .12$.

As shown in Table 2, substance use and perceived coolness were significantly associated with covariates in

Table 1 Current substance use behaviors and perceptions of coolness, N = 2,248 students attending 121 schools in Grade 7

	%	N
Grade 7 substance use behaviors (past 30 days)		
Alcohol use	27.2	603
Tobacco use	10.6	234
Marijuana use	7.9	176
Grade 9 substance use behaviors		
Alcohol use (past 30 days)	48.7	1,091
Binge drinking (past 2 weeks)	25.0	557
Tobacco use (past 30 days)	14.7	328
Marijuana use (past 30 days)	10.1	226
	Mean	SD
Grade 7 coolness attitudes ^a		
Cool to drink alcohol	2.06	1.30
Cool to smoke	2.07	1.32
Cool to smoke marijuana	1.77	1.22

^a Range = 1–5; higher values indicate greater perceived likelihood of being seen as cool

bivariate tests. In particular, substance use and perceived coolness of each substance (except use of marijuana) were significantly higher in Victoria than in Washington. Several differences were noted by school type and family SES.

At the school level in Grade 7, there was considerable variability in social norms of substance use. The prevalence of tobacco use ranged from 0 to 35.7 % of students across 121 schools, current alcohol use ranged from 0 to 62.5 % and marijuana use ranged from 0 to 26.7 %. Schools also had different climates with regards to expectations of the coolness of substance use: aggregated school-level scores ranged from 1.0 to 3.9 (of a possible 1–5). School-level

correlations between the injunctive norms and descriptive norms for each substance were low to moderate: $r_{\text{alcohol}} = .60$, $p < .001$; $r_{\text{tobacco}} = .52$, $p < .001$, $r_{\text{marijuana}} = .13$, $p = .152$). These associations indicate that adjusting regression analyses to account for both injunctive and descriptive norms is important to avoid confounding (especially for models of alcohol and tobacco use).

Associations between social norms of the Grade 7 school and substance use behaviors in Grade 9 are shown in Tables 3 (alcohol use) and 4 (tobacco and marijuana use). In unadjusted models (Model 1), descriptive norms (i.e., prevalence) were statistically significantly associated with subsequent use of each type of substance. For example, students attending Grade 7 at a high alcohol use school had almost twice the odds of binge drinking in Grade 9 as students attending a low alcohol use school (OR = 1.97, CI = 1.68, 2.31). In unadjusted models of the injunctive norm (i.e., coolness) of alcohol use predicting later substance use, each unit of coolness (1–5) was associated with similarly elevated odds of alcohol and tobacco use. Upon adjusting for gender, family SES, state, school type and number of students providing data (Model 2), associations between social norms and later substance use were attenuated, but remained significant for the school-wide descriptive norm. The injunctive norm remained significantly associated with Grade 9 substance use only for tobacco. When both social norms and individual Grade 7 substance use and perceived coolness of use were added to the models (Model 3), the descriptive norm remained significantly associated with tobacco and marijuana use. Other associations between social norms and substance use were nonsignificant, but approached this threshold for the alcohol use descriptive norm and the two alcohol behaviors ($p < .10$).

Table 2 Bivariate associations between substance use variables and covariates (Grade 7)

	Alcohol use	Tobacco use	Marijuana use	Alcohol coolness ^a	Tobacco coolness ^a	Marijuana coolness ^a
Gender	$t = 1.75$, $p = .080$	$t = -2.01$, $p = .045^b$	$t = -1.46$, $p = .144^b$	$t = 1.33$, $p = .183$	$t = -.34$, $p = .731$	$t = 1.59$, $p = .112$
Male	28.9 %	9.2 %	7.1 %	2.1	2.1	1.8
Female	25.6 %	11.9 %	8.7 %	2.0	2.1	1.7
Family SES	$r = -.07$, $p < .001$	$r = -.03$, $p = .176$	$r = -.01$, $p = .817$	$r = -.05$, $p = .034$	$r = -.06$, $p = .004$	$r = -.03$, $p = .144$
State	$t = 11.0$, $p < .001^b$	$t = 2.09$, $p = .037^b$	$t = -2.05$, $p = .041^b$	$t = 14.0$, $p < .001^b$	$t = 13.4$, $p < .001^b$	$t = 4.2$, $p < .001^b$
Victoria	35.1 %	11.7 %	6.9 %	2.4	2.4	1.9
Washington	15.6 %	9.0 %	9.4 %	1.6	1.7	1.6
School type	$t = -3.77$, $p < .001^b$	$t = 1.72$, $p = .086^b$	$t = 1.96$, $p = .050^b$	$t = 1.94$, $p = .052^b$	$t = -.64$, $p = .524$	$t = -2.02$, $p = .044$
Public	25.2 %	11.2 %	8.5 %	1.8	2.1	2.0
Private	34.1 %	8.6 %	6.0 %	1.7	2.1	2.2
N/school	$r = .01$, $p = .526$	$r = -.04$, $p = .050$	$r = -.06$, $p = .009$	$r = .02$, $p = .443$	$r = .00$, $p = .906$	$r = .02$, $p = .460$

Bold values indicate statistical significance ($p < .05$)

^a Range = 1–5; higher values indicate greater perceived likelihood of being seen as cool

^b Satterthwaite test for unequal variances

Table 3 Odds of alcohol use in Grade 9 by school social norms in Grade 7: multilevel analysis

	Binge alcohol use (Grade 9)			Current alcohol use (Grade 9)		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
School-level norms (Grade 7)						
Alcohol use prevalence ^a	1.97 (1.68, 2.31)	1.66 (1.35, 2.03)	1.27 (1.00, 1.61)	2.14 (1.83, 2.50)	1.53 (1.29, 1.81)	1.20 (0.97, 1.50)
Coolness of alcohol use ^b	1.73 (1.32, 2.27)	1.31 (0.99, 1.73)	0.98 (0.72, 1.34)	1.88 (1.39, 2.54)	1.20 (0.90, 1.60)	0.99 (0.71, 1.38)
Individual-level (Grade 7)						
Alcohol use	–	–	3.53 (2.84, 4.38)	–	–	3.91 (3.09, 4.95)
Perceived coolness of alcohol use	–	–	1.11 (1.01, 1.22)	–	–	1.06 (0.98, 1.16)
Covariates						
Sex (male = 1, female = 2)	–		1.21 (0.99, 1.48)	–		1.16 (0.96, 1.40)
Family SES (1–3)	–		0.57 (0.42, 0.76)	–		0.70 (0.54, .90)
School type (public = 1, private = 2)	–		1.02 (0.75, 1.39)	–		1.16 (0.88, 1.55)
State (Victoria = 1, Wash = 2)	–		0.79 (0.52, 1.19)	–		0.49 (0.35, 0.71)
Number of students	–		1.00 (0.98, 1.02)	–		1.01 (0.99, 1.03)

Bold values indicate statistical significance ($p < .05$)

Model 1: each norm entered separately as single independent variable

Model 2: each norm entered separately, adjusted for gender, family SES, state, school type and number of participants/school

Model 3: norms entered simultaneously, adjusted for Model 2 covariates, Grade 7 substance use coolness score (individual) and Grade 7 substance use (individual)

^a ORs compare schools at 75th percentile to schools at 25th percentile

^b ORs compare each level of substance use coolness (1–5) to the next lower level (i.e., one unit of coolness)

At the individual level, participants' own Grade 7 substance use predicted use in Grade 9. Likewise, greater individual perceptions of substance use coolness were associated with higher odds of binge drinking and tobacco and marijuana use in fully adjusted models.

Among the covariates, family SES was significantly inversely associated with binge drinking, alcohol and tobacco use in Model 3. Odds of current alcohol and tobacco use in Washington were approximately half the odds in Victoria, and for marijuana use were approximately twice the odds in Washington than in Victoria. Although some bivariate associations were observed, school type was not associated with later substance use in adjusted models.

Discussion

The present study examined the role of descriptive and injunctive social norms in predicting the use of tobacco,

alcohol and marijuana/cannabis 2 years later in a large sample of young adolescents. Combining two types of norms, as well as participants' own substance use behaviors and perceptions of coolness, permitted a robust look at the complex construct of social influence. The findings only partly supported the hypotheses in that the injunctive social norm was not predictive after multivariate adjustment. However, the descriptive social norm in Grade 7, specifically the prevalence of use, was significantly predictive of marijuana and tobacco use and was close to significance for alcohol use measures 2 years later, even after accounting for participants' own prior use of the same substance and perceptions about the coolness of use. These findings are in keeping with social ecological models and other theoretical frameworks regarding the influence of social norms and institutional characteristics, as well as with existing research showing associations between school-wide social norms and tobacco use (Ennett et al. 2010; Gilreath et al. 2012; Molyneux et al. 2002), and with

Table 4 Odds of tobacco and marijuana use in Grade 9 by school social norms in Grade 7: multilevel analysis

	Current tobacco use (Grade 9)			Current marijuana use (Grade 9)		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
School-level norms (Grade 7)						
Tobacco/marijuana use prevalence ^a	1.85 (1.51, 2.28)	1.65 (1.34, 2.03)	1.46 (1.17, 1.83)	1.38 (1.21, 1.59)	1.23 (1.08, 1.40)	1.18 (1.03, 1.34)
Coolness of tobacco/marijuana ^b	2.01 (1.57, 2.59)	1.42 (1.10, 1.83)	0.77 (0.58, 1.03)	.84 (0.60, 1.17)	1.36 (0.91, 2.03)	0.94 (0.60, 1.47)
Individual-level (Grade 7)						
Tobacco/marijuana use	–	–	3.92 (2.93, 5.24)	–	–	2.97 (2.10, 4.21)
Perceived coolness of tobacco/marijuana use	–	–	1.25 (1.13, 1.38)	–	–	1.28 (1.14, 1.44)
Covariates						
Sex (Male = 1, female = 2)	–		1.54 (1.14, 2.07)			0.85 (0.62, 1.16)
Family SES (1–3)	–		0.58 (0.42, 0.80)			0.71 (0.46, 1.11)
School type (public = 1, private = 2)	–		0.86 (0.57, 1.31)			0.92 (0.52, 1.60)
State (Victoria = 1, Wash = 2)	–		0.52 (0.35, 0.77)			2.20 (1.43, 3.38)
Number of students	–		1.01 (0.98, 1.04)			1.01 (0.99, 1.04)

Bold values indicate statistical significance ($p < .05$)

Model 1: each norm entered separately as single independent variable

Model 2: each norm entered separately, adjusted for gender, family SES, state, school type and number of participants/school

Model 3: norms entered simultaneously, adjusted for Model 2 covariates, Grade 7 substance use coolness score (individual) and Grade 7 substance use (individual)

^a ORs compare schools at 75th percentile to schools at 25th percentile

^b ORs compare each level of coolness (1–5) to the next lower level (i.e., one unit of coolness)

work demonstrating that one's positive expectancy of a behavior contributes to engaging in that behavior (Epstein et al. 2000; Gilreath et al. 2012; Spijkerman et al. 2004).

This work extends the field in three important ways. First, by using two different peer-derived measures of norms and comparable individual-level measures, we are able to parse out the role of two different school-wide characteristics versus participants' own behaviors and attitudes. Distinguishing between types of social norms and their unique roles is important for prevention messaging. The findings suggest that programs may be more effective if they focus on reducing the number of students in the school setting who are engaging in a behavior, rather than on the meaning or coolness of that behavior for the student body. Second, three different substances are examined here which, while they may have similar etiology, are different behaviors subject to different regulation, media representations and social norms. Understanding their differences is crucial to the development of school-based interventions.

For example, this research suggests that tobacco and marijuana use may be more amenable to school-based programs than alcohol-use behaviors, in that they are more clearly associated with school-wide social norms. Third, this study uses data from a large cross-national study including students at 121 different schools, making it among the largest of this type of investigation. Previous work with 40 or fewer schools may not have had adequate second-level power to detect statistical significance at that level after accounting for individual covariates such as prior substance use (Gilreath et al. 2012).

Despite a similar level of zero order relationship, the school-wide descriptive norms of substance use were more consistently associated with later use than the school-wide injunctive norm in adjusted models. The moderate correlations between these norms for alcohol and tobacco may have contributed to some collinearity between these variables, resulting in inflated variance and nonsignificant findings for coolness norms. However, for alcohol use,

injunctive norms were not associated with Grade 9 use in Model 2, which adjusted only for covariates such as state and family SES, indicating some degree of confounding by these demographic and study variables. In addition, the two social norms variables had only a low correlation for marijuana, and the injunctive norm was not associated with later use in any marijuana model. Taken together, these results suggest that the school-wide descriptive norm may be a more important feature of the social environment than injunctive norms regarding the coolness of substance use. In the language of health behavior models, this may suggest that behavioral modeling is more salient for young people's substance use than value expectancies (Azjen 1980; Bandura 1986), or that what people do (descriptive norms) is more important than what people think others should do [injunctive norms (Rimal and Real 2005; Rimal 2008)]. At the individual level, however, the significant association between participants' perceptions of coolness and later substance use (for most outcomes) suggests that the value expectancy of coolness is important at this age, but may not come from the collective value at the school level. Rather, it may come from individual perceptions influenced by a group of close friends, older siblings, media portrayals or other social or cultural forces that could not be investigated in the present study.

The significant associations between select covariates and substance use point to the importance of other factors in the social environment that may be important to consider in future research. In particular, higher family SES was found to be protective against tobacco and alcohol use. The association between economic status and tobacco use is evident in adults in the US and Australia (Australian Bureau of Statistics 2006; Centers for Disease Control and Prevention 2012), suggesting that parents' modeling of substance use behaviors might be an underlying mechanism of this study's findings. Although peer influence increases in importance during adolescence, family factors remain relevant (Viner et al. 2012). Family SES may also dictate neighborhood of residence, which has also been linked to substance use behaviors (Karriker-Jaffe 2013). Future research should include detailed measures of family norms for comparison to school-level norms of tobacco, alcohol and marijuana use. Additionally, differences in substance use behaviors and norms across the two countries suggest the relevance of macro-level factors (Hemphill et al. 2011). Prior IYDS studies have suggested the higher rates of alcohol and tobacco use in Australia relative to the US are related to the lower legal drinking age (18 in Victoria versus 21 in the US) (Evans-Whipp et al. 2013; Toumbourou et al. 2014), and more tolerant community (Hemphill et al. 2011) and family norms (McMorris et al. 2011).

Several features of the study design and variables may affect the current findings. In particular, substance use

behaviors were dichotomized for analysis, thereby limiting the full range of variance in these behaviors. Extreme substance use, such as daily use of tobacco, alcohol and marijuana, is rare among young adolescents in the IYDS dataset; only 1–3 % of participants reported very frequent use, precluding analysis of these small groups. It is possible that treating frequent users the same as any users may have masked differences between them, including the extent to which social norms influenced their substance use. Whether this would artificially inflate or decrease the observed associations is unknown. Given the small number of frequent users in this large dataset, however, any bias is expected to be negligible.

Other limitations of the study design should be considered in the interpretation of these findings. First, data were collected from one or two classrooms of students per school, yielding relatively small numbers of students per school (mean = 21.8, range = 10–46). Aggregated school-wide variables would ideally be derived from a larger number of individuals in order to increase reliability of these assessments. In addition, the IYDS design included school-level clustering when participants were recruited, but most had moved to a different school by Grade 9, with only partial overlap in the student body and presumably different social norms. School-wide norms in Grade 9 could therefore not be included in analytic models; doing so would allow for a more specific test of the longitudinal influence of norms in Grade 7. Second, the present study did not include social network data enabling participants to be linked to their friends (and data provided by those friends) or to examine assessments of family members. Prior research has indicated that school is but one important social context for young people (Ennett et al. 2010; Tyas and Pederson 1998), and future studies that incorporate measures from others may test a broader range of social normative influences on substance use. Third, although a multi-level model was used to properly account for the clustering of students within schools, third-level clustering of schools within countries could not be fully addressed due to the small number of countries included in this study ($n = 2$). Differences in the policy, media and cultural context in the US and Australia may result in non-independence of data within each state. Adjusting for state in analytic models as well as behavioral norms and participants' own substance use addresses this concern. Fourth, as a secondary analysis of existing data, this study was unable to explore relevant constructs not included in the survey, such as perceptions of the prevalence of substance use or other value expectancies for substance use in this age group. Fifth, because the IYDS was initiated in 2002, it is important to confirm findings in more recent data. Finally, because the study design is observational rather than

experimental, the causal influence of social norms can only be speculated.

This study also has several strengths that advance work in this area. As described above, using data provided by others in the social setting to generate school-level variables has greater validity than relying on participants' perceptions of others' behaviors and attitudes. Second, including two different aspects of social norms while controlling for subjects' report of use and their own value expectancies permits a more nuanced understanding of social norms as an influence on adolescent substance use distinct from personal use and values, which is only rarely available in other research on this topic. The longitudinal sample and large number of schools are additional strengths of the study design, which contribute to our understanding of etiology and the statistical validity of this work. Finally, use of population-based samples from two different countries—and the finding that associations between social norms and substance use did not vary by country—demonstrate the relevance of these constructs cross-nationally.

Conclusions

The social milieu of the school provides an important context for young adolescents at a time when initiation of substance use is common. School-wide norms, particularly the prevalence of substance use behaviors, are associated with later use of tobacco, alcohol and marijuana. In contrast, the school-wide injunctive norm of the coolness of substance use did not maintain a significant association with substance use behaviors after accounting for other variables. This study highlights the need to address descriptive social norms in the school setting, not just individual use, as part of prevention efforts for adolescent substance use in the US and Australia. This supports social norming approaches to prevention that attempt to adjust student perceptions of school norms which often exaggerate the actual levels of use in schools (Hansen and Graham 1991). Policy approaches that prohibit the use of substances in or near schools or at school-related functions may be important strategies not only for reducing current use among students, but also for creating a social environment that discourages the uptake of substance use among younger students.

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