School and community influences on adolescent alcohol and drug use

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Abstract

Social environmental risk factors present in schools and communities have not been thoroughly investigated. This study cross-sectionally examined the social environments of schools and communities, and their influence on adolescent alcohol and drug use. Survey responses of eighth grade students (\(N = 2309\)), a random half of their parents (\(n = 943\)), community leaders (\(n = 118\)), school principals (\(n = 30\)), school counselors (\(n = 30\)) and chemical health providers (\(n = 14\)) were pooled to create indices of social environmental norms, role models, social support and opportunities for non-use of alcohol. Each index was examined for its association with prevalences from 30 schools of alcohol use onset, last-month alcohol use, heavy alcohol use and last-year marijuana use in univariate and stepwise regression analyses. Increases in the levels of norms, role models and opportunities for non-use predicted decreases in alcohol use prevalences. The explanatory power of the examined constructs in multivariate analyses was acceptably high (\(R^2: 38-53\%\)). These findings further support the notion that community-wide efforts need to be launched to affect changes in the normative, role model and opportunity structures of adolescents' social environments in order to curb adolescent alcohol and drug use.

Introduction

Recent results of the Monitoring the Future Study indicate that alcohol and drug use is widespread among young adolescents (Johnston et al., 1994). Forty-seven percent of eighth graders used alcohol in the past year, more than a quarter (25.5\%) reported alcohol use in the last month and 16.7\% reported marijuana use in the last year.

Risk factors for adolescent alcohol and drug use from the intra- and inter-individual domains have previously been investigated (Jessor and Jessor, 1977; Bohman, 1978; Cadoret and Gath, 1978; Robins, 1978; Smyth and Fogg, 1978; Kandel, 1982; Norem-Hebeisen and Hedin, 1983; Johnson et al., 1984; Baumrind, 1985; Robins and Pryzbeck, 1985; Thompson and Wilsnick, 1987; Rosenstock et al., 1988; Shedler and Block, 1990; Dielman et al., 1991; Hawkins et al., 1992). The influence of the wider social environment such as schools and communities on adolescent behaviors, however, has more often been assumed rather than been empirically established (Kornhauser, 1978). Therefore, it has been argued that social environments such as schools and communities need to be empirically examined with respect to their contribution to adolescent problem behavior including adolescent alcohol and drug use (Jessor, 1993; Zaslow and Takanishi, 1993).

Research on how the social environments of schools or communities contribute to the etiology of adolescent alcohol and drug use is limited. Murray et al. (1984) found that smoking prevalence increased for boys who attended non-coeducational schools, were not exposed to health education, had no women teachers or whose headteacher smoked.
An increase in smoking prevalence among girls was observed after they attended schools that did not offer health education and where wearing of the school uniform was optional. Pentz et al. (1989) found that punitive consequences for teenage smoking had no effects, whereas schools with policies emphasizing prevention and de-emphasizing cessation reported lower amounts of smoking. Community characteristics have also been linked to adolescent alcohol and drug use. Community standards such as legal norms may impact adolescent alcohol and drug use (Fitzpatrick and Gerard, 1993). Evidence is available suggesting that extreme economic deprivation in conjunction with childhood behavior problems (Bursik and Webb, 1982) and neighborhood disorganization might exacerbate adolescent alcohol and drug use (Wilson and Herrnstein, 1985).

Social Cognitive Theory (Bandura, 1977, 1986) extended by theoretical conceptualizations of health promotion (Perry and Jessor, 1985) suggests that key factors in the school and community environment influencing adolescent alcohol and drug use are norms, social support, role models, as well as opportunities and barriers in those settings (Perry and Jessor, 1985; Perry and Kelder, 1992). There is some empirical evidence for the associations of these constructs with adolescent alcohol and drug use (Kandel, 1985; Dielman et al., 1991).

Hansen et al. (1997) found in a longitudinal study that normative social influences were the strongest predictors of later adolescent substance use when compared to numerous intra- and inter-individual risk factors. In addition, modeling of alcohol and drug use (Bandura, 1977) by parents, siblings or peers has repeatedly been found to be a crucial determinant of adolescent alcohol and drug use (Rooney, 1982; Kandel, 1985; Barnes and Welte, 1986; Ary et al., 1993). In addition, higher levels of support from parents, teachers and peers for adolescent pro-social behavior have been found to be related to less adolescent alcohol and drug use (Jessor and Jessor, 1977; Wills and Vaughan, 1989; Eggert et al., 1990; Greiser and Bortz, 1990). The social environment of schools and communities can provide opportunities and barriers for adolescents to use alcohol and drugs by regulating legal, economic and physical conditions (Wagenaar and Perry, 1994). Lowering the drinking age, lower taxes placed on alcohol at purchase and allowing patrons to purchase distilled spirits by the drink are all associated with higher rates of adolescent alcohol consumption (Hawkins et al., 1992). Perceived ease of access of alcohol has also consistently been found to be related to adolescent alcohol use and drunk driving. When alcohol is more available, the prevalence of drinking, the amount of alcohol consumed and the heavy use of alcohol all increase (Gorsuch and Butler, 1976).

This study explored four facets of the school and community social environment, and their single and compound effects on adolescent alcohol and other drug use. Specifically, the constructs of norms, role models, social support and opportunities to alcohol and drug use were examined within schools and communities for their associations with adolescent alcohol and drug use. This study was conducted in the 30 schools and adjoining communities participating in Project Northland, a large community-wide intervention study to delay the onset of underage drinking in northeastern Minnesota communities (Perry et al., 1993). It was hypothesized that higher levels of school/community norms, role-modeling, social support and opportunities for non-use of alcohol would be associated with less adolescent alcohol and drug use.

Methodology

This study constitutes a cross-sectional observational study of adolescent alcohol and drug use by eighth graders and its association with four social environmental indices. This study is an outgrowth of Project Northland, a 9 year efficacy trial (1990–1999) with the goals to delay onset and reduce the prevalence of alcohol use among adolescents (Perry et al., 1993, 1997; Williams et al., 1995b).

Measures and Respondents

Project Northland is ongoing in 24 schools districts and adjoining communities in northeastern Minne-
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Sota counties that have reported significant problems with alcohol and drug use (NIAAA, 1991). Project Northland targets the Class of 1998 and began when students were in sixth grade (1991-1992). The intervention region is comprised of rural communities ranging in size from 200 to 18,000 residents. Most of the population in this area is of European heritage, although approximately 5% of the Project Northland study cohort is of American Indian descent (Perry et al., 1993, 1997; Williams et al., 1995b). School districts and adjoining communities were randomly assigned to an intervention or delayed program condition as described in detail elsewhere (Perry et al., 1993, 1997; Williams et al., 1995b). The present study was undertaken in all 24 school districts, with the 30 schools attended by eighth grade students.

To test our study hypotheses, data from several surveys were pooled to form four indices of the social environment of these 30 schools and their adjoining communities. Responses to six different surveys were used in this study. These are the responses of:

2. A random half of their parents (n = 943).
3. Community leaders (n = 118).
4. School principals (n = 30).
5. School counselors (n = 30).
6. Chemical health service providers (n = 14).

**Student survey and respondents**

Data from all eighth grade students participating in Project Northland were eligible to be included for data analysis (N = 2323). This sample consisted of slightly more male (N = 1203, 51.8%) than female students and the overwhelming majority of students were of European descent (N = 2203, 94.9%). The majority of non-Caucasian students were American Indian (N = 98; 4.2%). The majority of students lived with both biological parents (N = 1564, 67.6%).

The student survey was classroom-administered in spring, 1994, and addressed intermediate and targeted outcome measures for Project Northland including students' knowledge about alcohol, attitudes and normative expectations about drinking and drunk driving, student perceptions of their social environment such as parental expectations and family rules regarding teenage alcohol use, ease of access to alcohol, peer pressure, and environmental factors such as norms, support and role models within the school. In addition, self-reported alcohol and other drug use intentions and behaviors were assessed. Students reported their lifetime, last-year, last-month and last-week use as well as frequencies of problematic, heavy use (e.g. five or more drinks in a row, drinking until falling down or sickness) (Johnston et al., 1994). A psychometric study evaluated the reliability and validity of these measures and is reported elsewhere (Williams et al., 1995a). The survey was administered by trained staff and took about 40 min to complete. Students absent on the day of the survey were scheduled to take the survey on a make-up day. Therefore, virtually all eighth graders in a participating school were surveyed.

**Parent survey and respondents**

A random sample of 50% of parents of students participating in the student evaluation of Project Northland at baseline in 1991 was drawn (Perry et al., 1993). These parents were recontacted in spring, 1994, and a total of 943 parents completed an interview (88.1% of the baseline sample). The overwhelming majority of the respondents were students' mothers (n = 896, 91.4%).

Parents were surveyed over the telephone about family rules and attitudes regarding adolescent alcohol and drug use, their perception of adolescent access to alcohol and other drugs, their perception of community norms around underage drinking and enforcement, family problems caused by alcohol and drug use, and supervision of their children after school and at parties. In addition, parents were surveyed about their perception of social support they expected to receive from their communities if their child had a problem with alcohol or drug use. Interviews took about 30 min to complete. The interviews were conducted by trained telephone interviewers from the University of Minnesota's Division of Epidemiology.
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Community leader survey and respondents
Selected leaders (mayors, police chiefs, newspaper editors, school officials, business leaders) in communities immediately adjacent to each of the recruited school districts were identified \( n = 118 \) and interviewed. All school districts were associated with at least one community for study. Key informants from 24 communities that could be matched as feeding into a particular school were identified in this manner.

Community leaders were interviewed face-to-face in fall, 1991, about their perceptions of community norms, law enforcement regarding adolescent alcohol use, and the level of community readiness to use several policy measures to curb adolescent alcohol and drug use. Interviews took about 1 h to complete and were undertaken by a trained survey staff member from the University of Minnesota (Sosale et al., in preparation). Although these interviews were conducted in 1991, assessed perceptions of community-level factors were assumed to be still relevant in 1994.

School principal/counselor survey and respondents
School principals \( (N = 30) \) and school counselors \( (N = 30) \) were interviewed from all schools participating in Project Northland when students were in eighth grade. The principal survey addressed means of informing students about school policies around alcohol and drug use, indicators used in the schools to identify students with potential alcohol and drug use problems, the number of alcohol and drug use policy violations in the last 2 years, and policy enforcement practices in the schools. Principals were also asked about parental involvement in school activities in addition to standard sociodemographic items. Counselors were surveyed along similar lines as were the principals. Additionally, they were surveyed about the provision of social support in their school via enumeration of support groups and alcohol and drug use prevention groups. Counselors were also surveyed with respect to the community resources utilized by their school for alcohol and drug use related problems and the satisfaction with these resources. Both surveys were administered over the telephone by the first author in spring, 1994, after piloting the surveys in face-to-face and telephone formats. Surveys with principals lasted an average of 15 min. Surveys with counselors lasted about 25 min.

Service provider survey and respondents
Each school counselor identified the most frequently used referral source for students with alcohol or other drug use problems. These outside resources included county social services as well as counseling agencies and treatment centers in the region. Overall, 14 different providers were identified by the 30 schools in the region as their primary referral source. The highest number of citations for a referral source by different schools was five. If a site was named by more than one counselor as a referral site, the representative of that referral site was interviewed concerning all the schools/communities which had named the agency as their primary referral site.

All surveys were administered over the telephone by the first author in spring, 1994, after piloting the surveys in face-to-face and telephone formats. The survey centered on informal and formal support systems as well as opportunities to use alcohol and other drugs for adolescents in their respective schools and communities. The level of communication between the surveyed organization or agency and other institutions and service providers in the region was also assessed. Surveys took about 15 min to complete.

Dependent variables
In this study four different levels of alcohol and drug use were assessed. These measures were adopted from The Monitoring the Future Study, and have previously been shown to yield valid and reliable population data (Johnston et al., 1994). School prevalences for four measures were computed: past-year alcohol use, past-month alcohol use, heavy drinking (five or more drinks in a row in the last 2 weeks) and past-year marijuana use. Prevalences were adjusted for race and gender. Subsequently, these adjusted prevalences served as
our dependent variables. Generally, adjustments did not substantially alter school prevalence estimates.

The average adjusted school prevalences were 66.9% (±9.8%) for last-year alcohol use, 29.9% (±8.8%) for last-month alcohol use, 13.3% (±7.0%) for heavy alcohol use and 9.8% (±8.0%) for last-year marijuana use. Alcohol use prevalences were normally distributed over the 30 schools. One school’s value for reported marijuana use (44.5%) was removed from the analyses, because this value was more than 4 SD removed from the mean and considered an outlier (Neter et al., 1989). After removal of this outlier the distribution of school prevalences for last-year marijuana became normally distributed and, thus, could be analyzed using regression methodology.

Independent variables

Four indicators representing the four specified social environmental factors were developed: (1) school/community norms for adolescent alcohol and drug non-use; (2) school/community role models for adolescent alcohol and drug non-use; (3) school/community social support for adolescent alcohol and drug non-use; and (4) school/community opportunities for adolescent alcohol and drug non-use.

Individual item or scale scores from the previously described six surveys were considered for inclusion in the four indices. We used psychometric procedures based on techniques for individual-based scale development to develop our indices. We ensured medium to high inter-item correlations, medium to high item-total correlations, in addition to ensuring sufficient response variance of the individual index items (Streiner and Norman, 1989; DeVellis, 1991). Index construction presented a challenge as a maximum of only 30 data points (schools/communities) per index item were available to develop a reliable indicator. This number of data points can be considered small for the development of reliable measures (DeVellis, 1991). Index construction presented a challenge as a maximum of only 30 data points (schools/communities) per index item were available to develop a reliable indicator. This number of data points can be considered small for the development of reliable measures (DeVellis, 1991).

First, all survey items that were seen as representative of the four constructs of interest were identified. Survey items were selected for an index based on their apparent fit with the construct measured by the index. Since we attempted to characterize the school/community environment, school/community means for each of these items were computed as our potential index entries. As the number of respondents per potential index item differed (e.g. thousands of student responses, but only one counselor response per school), item means were computed as index entries. If item or scale scores were used in one index it precluded their use in another index. All index items were scored so that an increase in the item score indicated more protection (less risk) from alcohol and drug use. The z-standardized item scores were computed. In a next step, an inter-item correlation matrix was calculated per index. Items that were negatively correlated with a large number of other proposed index items (40% or higher) were excluded from the index. In a second step, a Chronbach α coefficient was calculated for the remaining items.

Index scores were computed by summing all z-standardized index items per school/community. An index score was only computed if at least 80% of the index items were present for that school/community (DeVellis, 1991). If more than 20% of the items were missing, the index score for that school/community was set to missing and, thus, that school/community was dropped from analysis (additional psychometric information on the development of our indices is available upon request). If 20% or less of the items were missing, missing items were pro-rated when computing index scores.

Index scores correlated with each other in a medium to high range ($r = 0.27$ to $r = 0.67$). These correlations are listed in Table I. Chronbach α coefficients for the four indices ranged from 0.66 (social support index) to 0.80 (role model index).

Norm index

Norms can be defined as what is or is not expected of adolescents as appropriate behavior (Schwarzer, 1992). Normative expectations with respect to alcohol and drug use can be held by school or community officials, parents, peers or the adolescents themselves. These expectations can be conflicting, in that school officials might expect
Table I. Pearson correlation matrix for norm, role model, social support and opportunity/barrier index scores (cells list Pearson correlation coefficient, Prob > |R|, number of observations)

<table>
<thead>
<tr>
<th></th>
<th>Norms</th>
<th>Role model</th>
<th>Social support</th>
<th>Opportunity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Norms</td>
<td>1.000</td>
<td>0.000</td>
<td>0.515</td>
<td>0.001</td>
</tr>
<tr>
<td></td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td></td>
</tr>
<tr>
<td></td>
<td>26</td>
<td>30</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>Role model</td>
<td>0.515</td>
<td>1.000</td>
<td>0.417</td>
<td>0.668</td>
</tr>
<tr>
<td></td>
<td>0.007</td>
<td>0.000</td>
<td>0.048</td>
<td>0.552</td>
</tr>
<tr>
<td></td>
<td>30</td>
<td>30</td>
<td>23</td>
<td>25</td>
</tr>
<tr>
<td>Social support</td>
<td>0.265</td>
<td>0.181</td>
<td>1.000</td>
<td>0.001</td>
</tr>
<tr>
<td></td>
<td>0.181</td>
<td>0.048</td>
<td>0.000</td>
<td></td>
</tr>
<tr>
<td></td>
<td>27</td>
<td>23</td>
<td>27</td>
<td></td>
</tr>
<tr>
<td>Opportunity</td>
<td>0.668</td>
<td>0.001</td>
<td>0.323</td>
<td>1.000</td>
</tr>
<tr>
<td></td>
<td>0.001</td>
<td>0.004</td>
<td>0.115</td>
<td>0.000</td>
</tr>
<tr>
<td></td>
<td>28</td>
<td>25</td>
<td>28</td>
<td>30</td>
</tr>
</tbody>
</table>

The number of observations differ between the indices due to missing values.

non-use, whereas peers might expect experimental use from the adolescent. Norms are influenced by policies, rules and their enforcement. Enforcement can be formal (suspension from school for use) or informal (peers shun adolescent who refuses to experiment with alcohol or drugs). Items selected for this index reflect these aspects of norms. Examples include items assessing perceived parental norms or perceived norm enforcement for adolescent driving while under the influence. A complete item list for this index is available upon request. Standardized item scores were summed to compute an overall index score per school/community. The eight index items were comprised of items and scales taken from the student, parent, principal and leader surveys.

**Role model index**

All surveys were scrutinized with respect to items deemed potential indicators of the presence or absence of role models for alcohol and other drug non-use in school/community environments. Role models influence adolescents by modeling expected behaviors and the consequences of those behaviors (Bandura, 1977). Peers or adults can act as role models; role models can be actual or on media (Bandura, 1977). Items for this index reflect these aspects. Furthermore, we included items on actually occurring use of tobacco and illicit drugs (prevalence), as well as perceived use of alcohol and other drugs. Examples of items in this index include best friend’s use of alcohol and tobacco or presence of health enhancing role models in schools. A complete item list for this index is available upon request. We did not compute a role model index score for four schools/communities because more than 20% (two or more items) of the index items for these observations were missing. The nine items retained in the index were comprised of items from the student, parent, principal and counselor surveys.

**Social support index**

Social support refers to the degree of caring or support available (or perceived to be available) to an adolescent by his family, peers, school personnel or other adults in the community (Jessor and Jessor, 1977). The extent and quality of the counseling, social service and referral system available to the adolescent in a community were considered indicators for school/community social support. Example items assessed parental perceptions of community support or perceived social support available in the school. A complete item list for this index is available upon request. We did not compute an overall index score for three schools/
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communities, as more than 20% (two or more items) of their index items were missing. The student, parent, principal, counselor and provider surveys all contributed items to this index.

Opportunity index

Schools and communities provide various opportunities and barriers for alcohol use and the consumption of other drugs by adolescents. For example, the extensiveness of options for alcohol-free activities in the community or school might be considered an opportunity to non-use. On the other hand, easy access for adolescents to alcohol and drugs can be considered an opportunity to use. Examples of items include perceived parental supervision or quality of opportunities in the community as assessed by community leaders. We did not compute index scores for two schools/communities because more than 20% (two or more items) of their items were missing. Items contributing to this index were pooled from the student, parent, principal, counselor, provider and leader surveys.

Data analysis

We examined four dependent variables: eighth grade school prevalences of last-year, last-month and heavy alcohol use in addition to marijuana use in the last year. The class size of eighth graders differed substantially among schools. Thus, prevalences (means) were computed using vastly different numbers of students per school and widely differing standard errors associated with the prevalence estimate were obtained for the different schools. Standard errors of the prevalence estimates between large and small schools differed by factors of 5 or more. Thus, weighted regression analysis was chosen to adjust for variance differences between schools (Neter et al., 1989). Similar analytic approaches have previously been described when community prevalences of various health behaviors were compared (Diehr et al., 1993). Scores for the independent variables (indices) were weighted by the inverse of the standard error associated with the dependent variable (school prevalence) in the regression model. Thus, more reliable observations (smaller standard errors) were weighted more heavily than less reliable observations when fitting the regression model.

Four community-level covariates were considered to derive adjusted prevalence estimates: (1) 1990 community population, (2) percent of Caucasians in community, (3) average family income and (4) annual average unemployment. Since we considered four covariates for 30 data points (schools), we aimed for variable reduction by testing the importance of the covariates in a stepwise regression procedure for all dependent variables. It was decided to consider covariates in the final regression models if they were significant at least at the $P < 0.25$ level in at least two regression models. None of the considered covariates satisfied this criterion.

We first tested the univariate associations of each index score with the dependent variables using weighted regression analysis. In a next step, we tested the independent associations of each index score that had in the first step been found to be significantly related with the dependent variables. A stepwise weighted regression procedure with a specified entry and removal criterion of $P < 0.15$ was employed. All statistical analyses were conducted with the help of SAS Version 6.09 software (SAS Institute, 1990). Model fit statistics ($F$ values), parameter estimates and their associated probabilities for the independent variables were obtained for all regression models. We calculated adjusted $R^2$ estimates to adjust for the small number of observations per regression parameters.

Results

Univariate weighted regression analyses

The norm index was significantly related to all three alcohol use related variables, but failed to predict last-year marijuana use. Alcohol use onset was significantly negatively associated with the norm index ($F = 7.47$, 29 d.f., $P < 0.011$) as was last-month alcohol use ($F = 10.38$, 29 d.f., $P < 0.003$) and heavy alcohol use ($F = 15.28$, 29 d.f., $P < 0.001$). The proportion of the variance of the dependent
variable explained by the norm index ranged from 18% for alcohol use onset, to 24% for last-month alcohol use and 33% for heavy alcohol use.

Next, we tested the associations of the role model index with all four dependent variables. Again, significant associations were found for the alcohol use related variables only. The role model index was statistically negatively associated with alcohol use onset ($F = 11.14, 25$ d.f., $P < 0.003$), last month alcohol use ($F = 12.12, 25$ d.f., $P < 0.002$) and heavy alcohol use ($F = 4.87, 25$ d.f., $P < 0.037$). Last-year marijuana use was not associated with role model index scores. We found that the shared variance between the dependent and independent variables ranged from 29% for alcohol use onset to 31% for last-month alcohol use and 13% for heavy alcohol use.

We did not find any, even marginally significant linear associations of the outcome variables with the social support index scores. When predicting the outcome variables from the opportunity index scores we again found significant associations with all alcohol use related outcomes. Opportunity index scores were negatively associated with alcohol use onset ($F = 10.52, 27$ d.f., $P < 0.003$), last-month alcohol use ($F = 9.08, 27$ d.f., $P < 0.006$) and heavy use ($F = 10.21, 27$ d.f., $P < 0.004$). Marijuana use was not associated with this index score. We observed an adjusted $R^2$ of 26% for alcohol use onset, 23% for last-month alcohol use and 25% for heavy alcohol use.

**Stepwise weighted regression analyses**

Summary statistics for stepwise regression analyses can be found in Table II. Last-year marijuana use onset was not associated with any of the index scores and is, therefore, not listed in Table II. In our multivariate regression models shared variance between the dependent and the independent variables ranged from 46% for alcohol use onset, 53% for last-month alcohol use to 38% for heavy alcohol use.

**Discussion**

This study linked risk factors from the larger social environment of schools and communities to adolescent alcohol and drug use prevalence among eighth grade students in 30 schools. Indices of school/community-level norms, role models, social support, and opportunities for adolescent alcohol and drug non-use were created by pooling responses from surveys conducted with students, a random half of their parents, community leaders, chemical health service providers, and school principals and counselors. All four of these measures of the social environment demonstrated satisfactory internal consistency. We found that our measures of school/community-level norms, role models, and opportunities for alcohol and drug use were all significantly associated with alcohol-related prevalences. However, last-year marijuana use prevalence was not predicted by any index scores. In addition, the social support index only approached a significant association with last-month alcohol use and heavy alcohol use. Indices were further examined for their independent contribution in explaining school prevalence in multivariate regression analyses. We found that both the norm and role model indices were independently associated with last-year alcohol use and last-month alcohol use school prevalence. Heavy alcohol use prevalence was independently associated with the norm index only. We were able to account for 38–53% of the variance in the prevalences of alcohol use onset, last-month alcohol use and heavy alcohol use in these multivariate analyses.

Overall, the observed prevalences of alcohol use onset, last-month alcohol use, heavy alcohol use and last-year marijuana use are congruent with data from a recent nationally representative sample of eighth graders (Johnston et al., 1994). However, the observed dispersion of all our prevalence rates among the schools is noteworthy. School prevalences of alcohol use onset by eighth grade, for example, ranged from 47.1% in one school to 88.1% in another, heavy alcohol use rates ranged from 1 to 29%. This observed range of prevalences is even more remarkable in light of the fact that students in this study all resided in sociodemographically homogeneous communities in rural northeastern Minnesota and suggests that characterizing communities superficially or simplistically
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Table II. Results of weighted stepwise regression analyses predicting school/community prevalences of alcohol use onset, last-month alcohol use, and heavy alcohol use from norms, role model and opportunity index scores

<table>
<thead>
<tr>
<th></th>
<th>Parameter estimate</th>
<th>SE</th>
<th>F</th>
<th>Prob &gt; F</th>
<th>Model fit statistics</th>
<th>Partial R²</th>
<th>Model R²</th>
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</thead>
<tbody>
<tr>
<td>Alcohol use onset</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>norms</td>
<td>-0.0897</td>
<td>0.0376</td>
<td>5.68</td>
<td>0.0262</td>
<td>( F = 9.46, 24 , \text{d.f.}, )</td>
<td>0.3386</td>
<td>0.3386</td>
</tr>
<tr>
<td>role model</td>
<td>-0.0743</td>
<td>0.0330</td>
<td>5.07</td>
<td>0.0347</td>
<td>( P &lt; 0.0011 )</td>
<td>0.1238</td>
<td>0.4625</td>
</tr>
<tr>
<td>Last-month alcohol use</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>norms</td>
<td>-0.0951</td>
<td>0.0353</td>
<td>7.24</td>
<td>0.0134</td>
<td>( F = 12.18, 24 , \text{d.f.}, )</td>
<td>0.3832</td>
<td>0.3832</td>
</tr>
<tr>
<td>role model</td>
<td>-0.0796</td>
<td>0.0310</td>
<td>6.60</td>
<td>0.0175</td>
<td>( P &lt; 0.0003 )</td>
<td>0.1423</td>
<td>0.5255</td>
</tr>
<tr>
<td>Heavy alcohol use</td>
<td></td>
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</tr>
<tr>
<td>norms</td>
<td>-0.1249</td>
<td>0.0331</td>
<td>14.23</td>
<td>0.0010</td>
<td>( F = 14.23, 24 , \text{d.f.}, )</td>
<td>0.3822</td>
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<td></td>
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<td></td>
<td>( P &lt; 0.0010 )</td>
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</tr>
</tbody>
</table>

may obscure important differences among communities. As different social environments produce different health behaviors (Diehr et al., 1993) in addition to differing risk factor profiles and health outcomes (Rose, 1992), these different prevalences of alcohol and drug use among schools also suggest that school and community environments systematically influence adolescent alcohol and other drug use.

Several studies have attempted to gain insight into the context–behavior link for adolescent problem behaviors and the social environment in which this behavior occurs (Jessor and Jessor, 1977; Dielmann et al., 1991; Walter et al., 1993). These investigators were able to account for between 20 and 50% of the variance of their measures of alcohol and drug use. Three of our four measures of the social environment explained a significant portion of the variance of alcohol use onset, last-month alcohol use and heavy use. When all of these indices were tested in stepwise regression analyses for their independent contribution to adolescent alcohol and drug use prevalence, we were able to explain a significant amount of the variance of the dependent variables (38–53%).

This study is characterized by several unique features in exploring the link between adolescent alcohol and drug use and the social environment. First, in other studies assessment of the social environment has often been based on responses from one or two groups of respondents only (e.g. Moos, 1979; Simcha-Fagan and Schwartz, 1986). In contrast, this study assessed the social environment by linking responses from six groups of respondents (students, their parents, community leaders, social service providers, school principals and school counselors). The ability to examine adolescent alcohol and drug use in 30 schools/communities and to link this use to perceptions of the social environment by various groups of respondents can be considered novel.

A number of study limitations should also be noted. Foremost, this study cannot establish causality between its predictor and outcome variables, as variables were examined cross-sectionally. Second, as this study was to a large degree based on secondary data analyses, we were forced to create post hoc measures of the constructs of norms, role models, social support and opportunities. Third, we only had 30 data points available for developing reliable indices and examining univariate and multivariate associations between the dependent and independent variables. Thus, the likelihood of detecting statistically significant associations and the ability to adjust our data for covariates was reduced. Fourth, our failure to detect statistically significant relationships of the social support index with the outcome measures might have been caused by measurement error, as this index was considerably less internally consistent than our other indices. Therefore, social support should not be rejected as a possible protective factor for alcohol and drug use; clearly, based on prior research, more research concerning this
construct is warranted (Jessor and Jessor, 1977; Wills and Vaughan, 1989; Eggert et al., 1990; Greiser and Bortz, 1990). Fifth, we were not able to separate the differential effects that the two social environments of schools and communities might have had on our measures of adolescent alcohol and drug use. Thus, the distinct influence of schools and communities remains clouded.

Our findings support the notion that the influence of the wider social environment may be as important as intra- and inter-individual factors and should be seriously considered for preventive interventions. Prevention strategies of adolescent alcohol use should optimize their efforts by complementing successful classroom strategies with strategies to influence the larger social environment such as schools, communities and mass media in order to present consistent normative messages and appropriate role models for adolescent non-use of alcohol. More specifically, prevention campaigns should attempt to alter the social environment so that the prevailing school/community-wide norms, role models, opportunities and barriers are all perceived by adolescents as being inconsistent with alcohol use (Perry, 1986). Parents could be engaged through school programs that foster parent–child communication concerning rules and consequences around teen alcohol use (Perry et al., 1988; Toomey, 1994). In addition, adults perceived by adolescents as potential role models such as teachers, school administrators, coaches or business leaders could be targeted by prevention campaigns so that they, in turn, will communicate their disapproval of teen alcohol use. Adolescents could also be reached indirectly via local billboards, print and TV advertisements, or various posters depicting nationally or locally well-known and respected adults communicating disapproval of teen alcohol use. In addition to reducing the number of role models modeling use, attempts at increasing the number of positive individuals exhibiting health-enhancing behaviors should be undertaken as well (Perry and Jessor, 1985). This could, for example, be achieved by encouraging and reinforcing student participation in peer-led organizations that discourage alcohol and other use or the promotion of alcohol-free events and activities preferably led or organized by peers (Komro, 1994).

Such prevention campaigns are highly complex and difficult to implement in pluralistic, democratic societies. Approaching these changes in increments and over time, e.g. by building from classroom to family to peer to community-wide changes, may therefore be necessary to shift the social environment of adolescents toward a healthier lifestyle.

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