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### Does Individual Risk Moderate the Effect of Contextual-Level Protective Factors? A Latent Class Analysis of Substance Use

Michael J. Cleveland<sup>a</sup>; Linda M. Collins<sup>b</sup>; Stephanie T. Lanza<sup>a</sup>; Mark T. Greenberg<sup>c</sup>; Mark E. Feinberg<sup>d</sup>

<sup>a</sup> The Methodology Center, The Pennsylvania State University, University Park, Pennsylvania, USA <sup>b</sup>

The Methodology Center and the Department of Human Development and Family Studies, The

Pennsylvania State University, University Park, Pennsylvania, USA <sup>c</sup> The Prevention Research Center

and the Department of Human Development and Family Studies, The Pennsylvania State University,

University Park, Pennsylvania, USA <sup>d</sup> The Prevention Research Center, The Pennsylvania State

University, University Park, Pennsylvania, USA

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## **Does Individual Risk Moderate the Effect of Contextual-Level Protective Factors? A Latent Class Analysis of Substance Use**

MICHAEL J. CLEVELAND

*The Methodology Center, The Pennsylvania State University, University Park,  
Pennsylvania, USA*

LINDA M. COLLINS

*The Methodology Center and the Department of Human Development and Family Studies,  
The Pennsylvania State University, University Park, Pennsylvania, USA*

STEPHANIE T. LANZA

*The Methodology Center, The Pennsylvania State University, University Park,  
Pennsylvania, USA*

MARK T. GREENBERG

*The Prevention Research Center and the Department of Human Development and Family  
Studies, The Pennsylvania State University, University Park, Pennsylvania, USA*

MARK E. FEINBERG

*The Prevention Research Center, The Pennsylvania State University, University Park,  
Pennsylvania, USA*

*The current study investigated how individual risk factors interact with social contextual-level protective factors to predict problematic substance use among a sample of 12th-grade students ( $n = 8,879$ , 53% female). Results suggested six latent classes of substance use: (1) Non-Users; (2) Alcohol Experimenters; (3) Alcohol, Tobacco, and Other Drug (ATOD) Experimenters; (4) Current Smokers;*

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Address correspondence to Michael J. Cleveland, The Methodology Center, Calder II, Suite 400, The Pennsylvania State University, University Park, PA 16802, USA. E-mail: mcleveland@psu.edu

(5) *Binge Drinkers*; and (6) *Heavy Users*. Binary logistic regression models provided evidence that individual risk, family, school, and community protective factors were associated with membership in the substance use latent classes. However, the significance of interaction terms suggested that these protective influences differed according to the level of individual risk. Adolescents with high levels of individual risk benefited less from a positive family or neighborhood context than adolescents with low levels of individual risk. These findings suggest that the individual risk factors may undermine the protective effect of parental supervision, discipline, and other family factors, as well as protective aspects of cohesive neighborhoods, among these adolescents. Multi-component and adaptive intervention efforts that account for different levels of ATOD use involvement, as well as distinct profiles of risk and protection, are likely to be most effective in preventing problematic substance use.

**KEYWORDS** ATOD, prevention, protective factors, risk factors, youth development

Despite sustained prevention efforts, alcohol, tobacco, and other drug (ATOD) use continues to be a focus of adolescent study in the United States. For example, nearly half of high school seniors have tried the most commonly used illicit substance, marijuana (Johnston, O'Malley, Bachman, & Schulenberg, 2008). Similar or even higher rates are reported for alcohol and tobacco use. Nearly half of high school seniors reported that they have tried cigarettes and three quarters reported alcohol use. Furthermore, rates of substance use-related problems among college students are alarmingly high. One recent report revealed that 22.8% of college students reported frequent binge-drinking (5 or more drinks on any one occasion in the past two weeks), and 22.9% met the DSM-IV criteria for alcohol and/or drug abuse (The National Center on Addiction and Substance Abuse [CASA], 2007). These rates underscore the important need to distinguish between moderate and problematic ATOD use, particularly among older adolescents.

The development of effective interventions to ameliorate these harmful effects depends on a clear understanding of factors that are associated with adolescent ATOD use. There is general consensus that the etiology of ATOD use is multifactorial and involves interactions among genetic, psychological, and social determinants (Galea, Nandi, & Vlahov, 2004). Consistent with a model of adolescent risk behavior that centers on the role of social bonds—the social development model (Catalano, Kosterman, Hawkins,

Newcomb, & Abbott, 1996)—we focused our study on individual risk and three contextual domains: the family, school, and neighborhood.

## SOCIAL CONTEXT AND ADOLESCENT ATOD USE

A large body of research has shown that family process factors have a significant impact on a range of adolescent outcomes, including ATOD use (Dishion & Patterson, 2006). For example, adolescents raised by parents who use effective parenting practices such as consistent discipline techniques and monitor their children's activities are less likely to engage in risk behavior (Li, Stanton, & Feigelman, 2000). Research also suggests that other family processes such as provision of warmth and support by parents is associated with less adolescent ATOD use (Barnes, Reifman, Farrell, & Dintcheff, 2000).

Schools provide another context for adolescents to form social bonds. In fact, schools often represent the most salient source of connectedness to non-familial adults for many youth. Thus it is not surprising that adolescents with high-quality relationships with teachers fare better compared to students who report less bonding with teachers (McNeely & Falci, 2004). Extensive research within both the health and education literatures has also demonstrated that student connection to school—having a sense of belonging or attachment—is associated with positive youth outcomes (Libbey, 2004). In fact, research based on the social development model (SDM) has shown that interventions designed to enhance school bonding led to increased positive behaviors and reduced problem behaviors (Catalano, Haggerty, Oesterle, Fleming, & Hawkins, 2004).

Adolescent risk behavior has also been linked to a number of community-level factors (Leventhal & Brooks-Gunn, 2000). Many commonly studied community process factors derive from social disorganization theory and involve measures of cohesion among neighbors, sense of belonging, and opportunities to participate in community organizations (Sampson, 2001). Other community-level attributes such as norms favorable to substance use, availability of drugs, and enforcement of substance use laws have been also identified as important risk factors for adolescent ATOD use (Van Horn, Hawkins, Arthur, & Catalano, 2007).

## THE SOCIAL DEVELOPMENT MODEL

The SDM provides a useful framework for understanding how contextual factors influence adolescent behavior. Three criminological theories—social control, social learning, and differential association—are incorporated by the SDM into a general theory of adolescent behavior (Catalano & Hawkins, 1996). The SDM proposes that interactions with socializing agents such as

parents, peers, and community institutions result in learning patterns of behavior. Those behaviors that are rewarded or reinforced are maintained, whereas those that are ignored or punished are extinguished. A central concept in the SDM is the creation of social bonds between the adolescent and the socializing agents. The social bond involves attachment to others in the socializing unit, which ultimately leads to commitments and beliefs within the adolescent that are consistent with the values of the socializing agent (Catalano et al., 1996). Once established, the social bond inhibits behavior that is inconsistent with these values and beliefs.

Empirical tests have provided evidence that constructs of the SDM (e.g., opportunities for involvement, reinforcement, and bonding) play an important role in mediating family, peer, and neighborhood effects on the development of antisocial behavior (Brown et al., 2005; Lonczak et al., 2001). Extensive research has also shown the existence of personality risk factors that place youth at substantial risk for exhibiting problem behaviors (Wills & Dishion, 2004). These include traits such as rebelliousness, sensation-seeking behaviors, and poor emotion control. Importantly, research with the SDM has provided evidence that such individual factors are indirectly associated with a range of adolescent outcomes such as antisocial behavior, school problems, and substance use (Brown et al., 2005; Catalano, Oxford, Harachi, Abbott, & Haggerty, 1999). These studies suggest that social and cognitive skills indirectly influence adolescent problem behaviors by increasing the likelihood of forming prosocial bonds and diminishing the development of antisocial bonds.

### INTERACTIONS AMONG INDIVIDUAL AND SOCIAL CONTEXTS

To date, no studies guided by the SDM have explored how moderation among individual and contextual factors may influence adolescent outcomes. This gap is noteworthy because some research suggests that youth who lack social and cognitive skills exhibit problem behaviors, regardless of the quality of their family context (King & Chassin, 2004; Wootton, Frick, Shelton, & Silverthorn, 1997). Fewer studies have examined interactions between individual characteristics and school or neighborhood contexts. With some exceptions (e.g., Foshee et al., 2007; Lynam, Caspi, Moffitt, Wikstrom, & Novak, 2000) studies suggest that the protective aspects of social contexts diminish at high levels of individual risk. This has been termed a “protective but reactive” interaction (Luthar, Cichetti, & Becker, 2000) and suggests that there may be a subset of children for whom contextual protective factors have little influence on problem behavior (King & Chassin, 2004). Nearly all of the research that examined moderating influences has been conducted with children or early adolescents. Much less is known about how individual characteristics of older adolescents may condition the influence of social contexts.

## THE CURRENT STUDY

Given the diversity of adolescents' ATOD experiences, person-centered approaches have been advocated as necessary to more fully capture the complex links between risk factors and adolescent ATOD use outcomes (Ludden & Eccles, 2007). We used latent class analysis (LCA) to identify sub-groups of adolescents based on their level of experience with three substances: alcohol, cigarettes, and marijuana. LCA has been successfully applied in many domains, including ATOD use (e.g., Lanza, Collins, Lemmon, & Schafer, 2007). Because research demonstrates that correlates of problem use are different than those of moderate use (van den Bree & Pickworth, 2005), we also added individual, family, school, and neighborhood predictors to our LCA model. We expected to find that adolescents with high levels of individual risk would be more likely to display problematic ATOD use. We also hypothesized that individual risk would moderate the influence of contextual protection on ATOD involvement in a "protective but reactive" manner. That is, family, school, and community protection were hypothesized to diminish at high levels of individual risk.

## METHOD

### Sample

The data for this study were drawn from the 2005 Pennsylvania Youth Survey (PAYS), a biennial surveillance survey conducted with a representative sample of PA public school students in grades 6, 8, 10, and 12. Local parental permission procedures were followed in all schools; in some schools students completed the survey using a Web-based survey administration. The full dataset contained data on 180 school districts and 93,884 students. As school officials were given the option to exclude the family items from the student surveys, 77 (42.78%) of the 180 school districts did so and are excluded from these analyses. Thus the current study used the sample of 8,879 12th-grade students (53% female, 9.99% non-White) who completed the full survey.

### Measures

PAYS utilizes the Communities That Care Youth Survey (CTC-YS), a broad assessment of risk and protective factors as well as problem behaviors (Arthur, Hawkins, Pollard, Catalano, & Baglioni, 2002). Previous research demonstrated that aggregate indices of the 31 scales in the CTC-YS provided meaningful and useful measures of adolescent risk and protective factors (Feinberg, Ridenour, & Greenberg, 2007). This study used the four indices

in the CTC-YS that tapped into individual risk, and family, school, and community protective domains.

The *Individual Risk* aggregate index included sensation seeking (3 items, e.g., “done something dangerous because someone dared you to do it,”  $\alpha=0.82$ ), rebelliousness (3 items, e.g., “I ignore rules that get in my way,”  $\alpha=0.75$ ), and belief in immoral order (4 items, e.g., “I think sometimes it’s okay to cheat at school,”  $\alpha=0.64$ ). *Family protection* was measured by family attachment (4 items, e.g., “Do you feel very closer to your mother?”  $\alpha=0.76$ ), family opportunities for prosocial involvement (3 items, e.g., “My parents give me lots of chances to do fun things with them,”  $\alpha=0.80$ ), family rewards for prosocial involvement (4 items, e.g., “Do you enjoy spending time with your father?”  $\alpha=0.79$ ), family supervision (4 items, e.g., “If you skipped school, would you be caught by your parents?”  $\alpha=0.77$ ), and family discipline (3 items, “The rules in my family are clear,”  $\alpha=0.69$ ).

The *School Protection* domain included school commitment (6 items, “How interesting are most of your courses to you?”  $\alpha=0.81$ ), school opportunities for prosocial involvement (5 items, “I have lots of chances to be part of class discussions or activities,”  $\alpha=0.65$ ), and school rewards for prosocial involvement (4 items, “My teachers praise me when I work hard at school,”  $\alpha=0.69$ ). *Community Protection* was measured by neighborhood attachment (3 items, e.g., “I like my neighborhood,”  $\alpha=0.83$ ), community prosocial involvement (3 items, e.g., “There are people in my neighborhood who encourage me to do my best,”  $\alpha=0.88$ ), laws and norms favorable to drug use and firearms (6 items, e.g., “How wrong would most adults (over 21) in your neighborhood think it was for kids your age to drink alcohol?”  $\alpha=0.72$ ), perceived availability of drugs and firearms (5 items, e.g., “If you wanted to get some cigarettes, how easy would it be for you to get some?”  $\alpha=0.80$ ), and community disorganization (5 items, e.g., “How much does [lots of graffiti] describe your neighborhood?”  $\alpha=0.82$ ).

*Alcohol use* was measured with two items. The first asked, “On how many occasions (if any) have you had beer, wine, or hard liquor in your *lifetime*?” with seven response categories that ranged from 0 to 40+ occasions. Recent binge drinking was assessed by asking, “Think back over the last two weeks. How many times have you had five or more alcoholic drinks in a row?” Six responses were available, ranging from none to 10 or more times. Two items assessed *cigarette use*: “Have you ever smoked cigarettes?” (5-point Likert scale, never to regularly now) and “How frequently have you smoked cigarettes *during the past 30 days*?” (7-point Likert scale, not at all to two packs or more per day). *Marijuana use* was assessed by asking “On how many occasions (if any) have you used marijuana [in your *lifetime*/ *during the past 30 days*]?” Each item had seven response categories that ranged between 0 to 40+ occasions.

## Analysis Plan

LCA is a statistical model that posits an underlying categorical latent variable that divides a population into mutually exclusive and exhaustive latent classes (Goodman, 1974). In the current study, the ATOD measures were used as indicators of latent classes of adolescent ATOD use. The LCA model can be expressed as a function of two sets of parameters. First, the latent class membership probabilities represent the proportion of the population in each ATOD latent class. Second, the conditional item-response probabilities represent the distribution of responses to each measured item, within each latent class. More details and an empirical example that applies LCA to adolescent alcohol use appear in Lanza et al. (2007).

An important extension of LCA allows exogenous predictors to be added to the basic model via binary or multinomial logistic regression. LCA with covariates estimates another set of parameters that represent the influence of the covariates on the log-odds that an individual belongs to a particular ATOD use latent class relative to the reference class. The current study explored whether individual risk, family protection, school protection, and community protection were predictive of ATOD use class membership. These four variables were standardized and entered first as main effects, followed by interaction terms of individual risk with each other domain. Finally, gender was included as a grouping variable in order to explore differences in ATOD use class membership and the effects of the predictors. All analyses were conducted using PROC LCA (Lanza, Lemmon, Schafer, & Collins, 2008).

## RESULTS

### Latent Classes of ATOD Use

In order to specify the latent class models, five categorical indicators were created after examining the distributions of the substance use measures. As seen in Table 1, alcohol experimentation was reported by more than 80% of both male and female students, although most did not report recent binge drinking. However, males were more likely to report recent binge drinking episodes ( $\chi^2 [2] = 34.86, p < .001$ ) and recent marijuana use ( $\chi^2 [2] = 59.82, p < .001$ ) compared to female students. Similar rates of cigarette use were found for both genders.

A series of latent class models were compared to determine the optimal model in terms of balancing model fit and parsimony. Using a variety of indicators including the likelihood-ratio  $G^2$  statistic, Akaike's Information Criterion (AIC, Akaike, 1974), the Bayesian Information Criterion (BIC, Schwartz, 1978), and interpretability of results, it was determined that the six-latent class model provided a more optimal solution compared to two-, three-, four-, five-, or seven-class models. Table 2 presents the prevalence

**TABLE 1** Descriptive Statistics of Substance Use Measures by Gender

ATOD Use Behavior	Response	Females ( <i>n</i> = 4730)		Males ( <i>n</i> = 4108)	
		Freq	Percent	Freq	Percent
<i>Ever Used Alcohol</i>					
	No	754	16.02	774	18.94
	Yes	3953	83.98	3312	81.06
<i>Ever Used Cigarettes</i>					
	No	2370	50.34	2110	51.56
	Yes	2338	49.66	1982	48.44
<i>2-Week Binge Drinking</i>					
	None	3418	72.62	2726	66.81
	1 time	595	12.64	496	12.16
	2 + times	694	14.74	858	21.03
<i>30-Day Cigarette Use</i>					
	None	3518	74.69	3076	75.17
	<1/day	437	9.28	408	9.97
	1 + /day	455	16.03	608	14.86
<i>Marijuana Use</i>					
	Never	2911	61.82	2338	57.14
	Ever Used	1014	21.53	876	21.41
	Recent Use	784	16.64	878	21.46

Note. Freq = frequency.

**TABLE 2** Probability of Responses to Items Measuring ATOD use Behaviors Given Latent Class Membership

ATOD Use Behavior	ATOD use latent class (prevalence)					
	Non-Users (17%)	Alc Exps (38%)	ATOD Exps (10%)	Current Smokers (8%)	Binge Drinkers (9%)	Heavy Users (18%)
<i>Ever Used Alcohol</i>						
No	<b>1.000</b>	0.007	0.007	0.007	0.000	0.007
Yes	0.000	<b>0.993</b>	<b>0.993</b>	0.993	<b>1.000</b>	<b>0.993</b>
<i>Ever Used Cigarettes</i>						
No	<b>0.947</b>	<b>0.771</b>	0.007	0.007	<b>0.614</b>	0.007
Yes	0.053	0.229	<b>0.993</b>	<b>0.993</b>	0.386	<b>0.993</b>
<i>2-Week Binge Drinking</i>						
None	<b>0.994</b>	<b>0.958</b>	<b>0.752</b>	0.601	0.000	0.255
1 time	0.003	0.042	0.119	0.169	<b>0.472</b>	0.215
2 or more times	0.003	0.000	0.129	0.230	<b>0.528</b>	<b>0.530</b>
<i>30-Day Cigarette Use</i>						
None	<b>0.997</b>	<b>1.000</b>	<b>0.819</b>	0.000	<b>1.000</b>	0.175
<1/day	0.000	0.000	0.000	<b>0.593</b>	0.000	0.256
1 + /day	0.003	0.000	0.181	<b>0.407</b>	0.000	<b>0.569</b>
<i>Marijuana Use</i>						
Never	<b>0.986</b>	<b>0.865</b>	0.097	0.551	0.503	0.005
Ever Used	0.011	0.087	<b>0.858</b>	0.403	0.250	0.231
Recent Use	0.003	0.048	0.045	0.047	0.247	<b>0.764</b>

Note. Alc Exps = Alcohol Experimenters latent class; ATOD Exps = ATOD Experimenters latent class. Responses that characterize each latent class are in bold type.

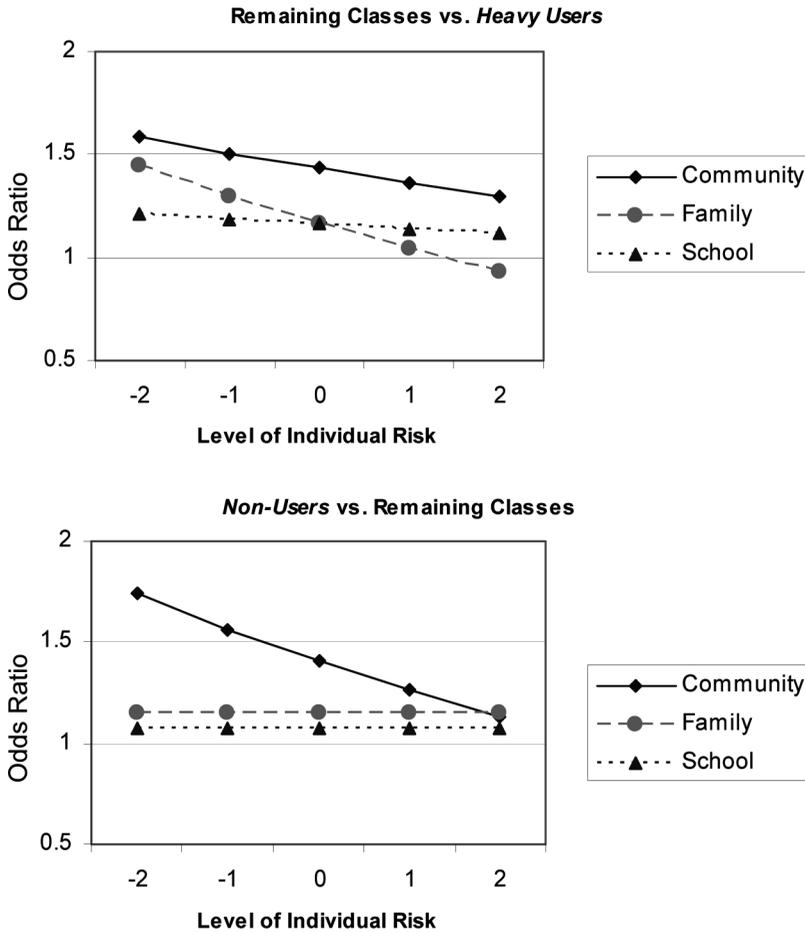
estimates for the six latent classes and the probability that members of each latent class endorsed each response category of the five substance use items. According to the model, 17% of adolescents are in the *Non-Users* latent class. Members of this class were not likely to report use of any substance. *Alcohol Experimenters* was the most common ATOD use latent class (38%). This class was characterized by a high probability of ever using alcohol but very low probability of binge drinking or reporting any cigarette or marijuana use. In contrast, 10% of the students are in the *ATOD Experimenters* latent class, characterized by experimentation with, but no recent use, of each of the substances. *Current Smokers* and *Binge Drinkers* each comprised nearly 10% of the sample. Notably, a significant proportion of adolescents (18%) belonged to the *Heavy Users* latent class, characterized by recent use of all three substances.

### Predicting ATOD Use Latent Class Membership

Next, the main effects and interaction terms were included as predictors of ATOD latent class membership in two binary logistic regression models, each of which estimated odds ratios (OR) corresponding to a one-unit increase in the predictor. For ease of interpretation, all results are presented so that an  $OR > 1.0$  corresponds to increased protection (i.e., greater odds of being in the less risky class or classes). The first model estimated the odds of belonging to the *Heavy Users* relative to any of the remaining five latent classes, corresponding to a one-unit increase in family protection. All four main effects were in the expected direction (all  $ps < .001$ ); however, family protection significantly interacted with individual risk ( $OR = 0.89, p = .005$ ).

The presence of an interaction implies that the effect of family protection itself varies across different levels of individual risk. Therefore as an aid in interpreting the interaction, we plotted the effects of family protection, along with the effects of school, and community protection, across different levels of individual risk. This plot is displayed in the top panel of Figure 1. As the figure shows, the effect of family protection varied across the level of individual risk. At low levels of individual risk, family protection was related to higher likelihood of being in one of the five other latent classes, compared to the *Heavy Users* latent class. However, the effects of family protection dissipated at higher levels of individual risk. School and Community factors did not significantly vary across level of individual risk and were associated with protection even as individual risk reached 2 *SD* above the mean.

The second binary logistic model estimated the odds of belonging to the *Non-Users* latent class relative to any of the remaining five latent classes. For this model the main effects for individual, family, and community domains were in the expected direction ( $ps < .001$ ) whereas the main effect of school protection was not significant ( $p = .062$ ). Only



**FIGURE 1** Effects of family, school, and community protective factors on ratio of odds of belonging to all other latent classes compared to the *Heavy Users* latent class (top panel), and ratio of odds of belonging to the *Non-Users* latent class compared to all other latent classes (bottom panel), across level of individual risk.

community protection and individual risk significantly interacted ( $OR = 0.90$ ,  $p = .025$ ). The bottom panel of Figure 1 shows the increase in the odds of membership in the *Non-Users* latent class relative to membership in any of the other five latent classes corresponding to a one-unit increase in the protective factors. The effects of family protection were small but significant, and constant across all levels of individual risk. The protective effect of community factors interacted with individual risk, with the strongest effect among students with low individual risk. Among those with lowest individual risk ( $-2$  *SD*), a 1 *SD* increase in community protection corresponded to a nearly two-fold increase in the odds of being a non-user, relative to being an ATOD user.

## Gender Differences

We next examined gender differences in the prevalence of ATOD use class membership and the effects of the covariates. To test these differences, a model where the proportion of the individuals in each latent class was allowed to vary across the two groups was compared to a model with these proportions constrained to be equal across gender. The omnibus test was significant ( $\Delta G^2 [5] = 128.41, p < .001$ ); however, substantial differences were seen in just three of the latent classes. Females were more likely than males to belong to the *ATOD Experimenters* (16% vs. 10%;  $\Delta G^2 [1] = 12.19, p < .001$ ) and *Alcohol Experimenters* (37% vs. 31%,  $\Delta G^2 [1] = 31.21, p < .001$ ) latent classes. Males were more likely to belong to the *Binge Drinkers* latent class (16% vs. 7%,  $\Delta G^2 [1] = 57.92, p < .001$ ). There was some evidence that in the model comparing *Heavy Users* to all other latent classes, the interaction between family protection and individual risk was stronger among females (OR = 0.80) than in males (OR = 0.92).

## DISCUSSION

The current study employed a person-centered approach to examine latent classes of ATOD use among 12th-grade students in Pennsylvania. Results suggested six different ATOD use latent classes. Thus our results supported the value of distinguishing between moderate and problematic ATOD use, particularly for older adolescents (Ludden & Eccles, 2007; van den Bree & Pickworth, 2005). Consistent with epidemiologic data, most (80%) of the adolescents were likely to belong to one of the five substance-using latent classes, and more than a quarter were likely to belong to one of the more problematic classes of use such as *Heavy Users* (18%) or *Binge Drinkers* (9%). Nonetheless, a sizable proportion (17%) of the students was likely to be non-users. Few substantive gender differences were found.

### Risk and Protective Factors for ATOD Use

Consistent with our expectations, an aggregate measure of individual risk (sensation seeking, rebelliousness, and belief in an immoral order) was significantly related to ATOD class membership. The results also provided evidence that family, school, and community-level protective factors were associated with membership in the latent classes. However, the significance of interaction terms suggested that these protective influences differed according to the particular combination of individual risk and contextual protection. Adolescents with high levels of individual risk factors benefited less from a positive family or neighborhood context than those with low levels of individual risk. These findings suggest that extreme levels of individual risk factors may undermine the protective effect of parental supervision,

discipline and other family factors, as well as protective aspects of cohesive neighborhoods, among these high-risk adolescents. We found mixed evidence regarding the effect of school-level protection.

The current results are consistent with the pattern of buffering referred to as “protective but reactive” (Luthar et al., 2000). This type of interaction occurs when the buffering factor provides advantages that dissipate in the presence of high levels of the risk factor. In this study, the beneficial influence of both family and community contexts dissipated at high levels of individual risk. Such findings suggest that for a certain group of adolescents, the individual risk factors may be so strong that they partly overwhelm the benefit of residing in a protective context (Foshee et al., 2007; King & Chassin, 2004; Wills & Dishion, 2004; Wootton et al., 1997). Future work that continues to clarify the nature of this interaction is warranted. For example, our results suggest that individual factors influence the development of adolescent risk-behaviors through their influence on the formation of social bonds (Brown et al., 2005; Lonczak et al., 2001). For children with these risk characteristics, variation in opportunities for forming prosocial bonds across contexts may be less salient because they are less likely to take advantage of the opportunities offered. It may be that these adolescents have a certain personality style that renders them less responsive to positive socialization processes and thus less likely to form strong bonds even to supportive parents (King & Chassin, 2004; Wootton et al., 1997).

We did not find evidence that protective influences due to school factors differed across levels of individual risk. Other researchers have noted that students’ connectedness to teachers had little influence on adolescent health-risk behaviors once the behavior was initiated (McNeely & Falci, 2004). In contrast, we found that school-level factors were associated with models predicting heavy users but were not associated with membership in a non-user latent class. Future research that disaggregates school bonding and examines this construct in younger teens is needed to clarify how different aspects of school-level factors influence the initiation, continuation, or desistence of ATOD use.

### Implications for Prevention

It is noteworthy that the main effects in the three social contexts were associated with positive outcomes. This finding underscores the important role that bonding to parents, schools, and communities play in preventing adolescent ATOD use. It also has important implications for ATOD use prevention specialists and other practitioners and points to the need to consider multi-component strategies in preventing adolescent problem behaviors (Dishion, Kavanagh, Schneiger, Nelson, & Kaufman, 2002). The SDM offers a valuable model in which each of the constructs in the model may be a potential intervention target; however, because of the multiple direct and

indirect paths, it may be necessary to develop multiple interventions to interrupt the causal processes in the development of ATOD use (Catalano et al., 1996).

We found that individual risk moderated the influence of contextual factors on adolescent ATOD use. These results suggest that an effective prevention approach may involve targeting youth with high levels of individual risk who also experience elevated family or community risk. Consequently, adaptive intervention strategies that tailor the particular dosage or type of treatment across individuals in order to match the strategy with the individual's risk may be most effective in preventing adolescent ATOD use (Collins, Murphy, & Bierman, 2004). For example, the Adolescent Transitions Program (ATP) uses a screening procedure to identify high risk students and families and then delivers a multilevel family intervention within a public middle school environment (Dishion & Kavanagh, 2003). The ATP has been shown to reduce initiation of ATOD use among both at-risk and typically developing students even though the parent intervention component was relatively brief (an average of 5 hours over 2 years).

## CONCLUSION

In drawing conclusions, it is important to bear in mind some limitations of the current study. Foremost among these is the cross-sectional nature of the data, which limits our ability to draw causal conclusions regarding the relations among risk and protective factors and problematic ATOD use. Second, our study focused on adolescent reports of three domains of social context. We did not include measures of other important contexts for adolescent problem behaviors such as the peer group (Elliott, Huizinga, & Ageton, 1985) or objective measures of structural characteristics of schools or neighborhoods (Van Horn et al., 2007). In addition, the role of factors such as schools may be stronger in earlier grades than is shown here just prior to high school graduation. These remain important domains for future research. Finally, our sample consisted largely of White adolescents who resided in nonurban areas of one state. Follow-up studies that examine these relations among other populations of adolescents in other contexts are needed to establish how protective influences of social contexts influence ATOD use.

Our results are consistent with a comprehensive approach toward ATOD use prevention. Using a person-centered approach, we found that older adolescents vary widely in their experiences with alcohol, cigarette, and marijuana use. The findings suggested that factors across individual, family, school, and community domains were associated with membership in these ATOD use classes. However, the results also suggest that the match between intervention and individual may be important in order to maximize intervention effects. Multi-component and adaptive intervention systems that

account for different levels of ATOD use involvement, as well as distinct profiles of risk and protection, are likely to be most effective in preventing problematic use at this important development stage.

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