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The Role of Risk and Protective Factors in Substance Use across Adolescence

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Abstract

Purpose—To compare the relative influence of risk and protective factors across several domains on adolescent substance use in a large sample of youth.

Methods—Cross-sectional survey data were collected from 6th, 8th, 10th, and 12th grade students in Pennsylvania (N = 91,778). Generalized linear mixed models were estimated for each grade level to examine associations among indices of 3 risk (individual, peer, and family) and 3 protective (family, school, and community) factors and (a) lifetime substance use and (b) recent substance use.

Results—The risk factors were stronger predictors of substance use outcomes compared to the protective factors, regardless of grade level or substance use type. In particular, the individual and peer risk factors were strongly related to lifetime and recent use of cigarettes, alcohol, and marijuana. Among the protective factors, the strongest associations with substance use were found in the community domain. Several age-related differences in the associations were also found, suggesting that family and community factors were more salient among younger grades whereas peer and school factors were stronger among older adolescents.

Conclusions—These findings provide support for the Social Development Model (SDM), which proposes that adolescent substance use is associated with factors across multiple spheres of influence. Age-related differences in these associations suggest that effective interventions to reduce adolescent substance use may need to emphasize different domains of risk and protective factors at different stages of adolescent development.

Keywords

Adolescence; age differences; risk factors; protective factors; substance use

Recent epidemiologic surveys indicate that substance use by U.S. youth remains a matter of concern. For example, the 2006 Monitoring the Future results showed that among 12th graders, most (72.7%) had tried alcohol at least once in their lives and almost half (42.3%) reported lifetime use of marijuana. Among the 8th grade students, lifetime prevalence of alcohol exceeded 40% and nearly 16% reported trying marijuana at least once. Lifetime use of cigarettes was reported by nearly half (47.1%) of 12th graders and almost one-fourth (24.6%)

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of 8th grade students [1,2]. Moreover, even though the lifetime and annual prevalence rates have declined in the last decade, there is some evidence that the rate of decline is slowing, or has ended. Of particular concern is the fact that the greatest declines have occurred among the older students, reflecting important cohort differences [1,2]. Thus, it is important to further disseminate and sustain preventive interventions that target factors associated with adolescent alcohol, tobacco, and other drug (ATOD) use. However, the development of successful interventions relies upon a clear understanding of the developmental precursors of such health-risk behaviors.

A vast literature has shown that numerous factors across several domains are related to a range of adolescent problem behaviors. Several individual and personality factors such as sensation seeking, poor impulse control, and conscientiousness are linked to adolescent outcomes [3,4]. Several factors related to a youth's engagement with school predict adolescent outcomes, including academic failure, commitment to school, and disengagement from school [5]. Affiliation with antisocial peers also is strongly linked to adolescent problem behaviors [6,7]. Within the family, parental substance use, family conflict, and poor family management practices are important risk factors [8]. Among community-level attributes, community norms favorable to drug use, as well as community disorganization and poverty, have been identified as precursors to adolescent problem behavior [9]. Thus it is apparent that the etiology of substance use is multifactorial and likely involves complex interplay among genetic, psychological, and social determinants [10,11].

Including all of these factors in a single study would present a formidable task; therefore, many scholars recommend that theoretically-driven models be used to direct the study of adolescent problem behaviors [12]. The current study utilized the Social Development Model (SDM), which incorporates both risk and protective factors into a general theory of adolescent antisocial behavior [13]. The SDM proposes that children learn patterns of behavior from socializing agents in four contexts: parents, peers, schools, and community. Two general pathways are included in the SDM. The prosocial path consists of commitment and attachment to prosocial activities and people, leading to internalization of society's rules and norms and inhibition of deviant behavior. In contrast, involvement and commitments to those engaged in antisocial behaviors increase the likelihood of adolescent antisocial behavior. The SDM proposes that development of attachments depends on perceived opportunities for involvement in either prosocial or antisocial activities as well as the level of perceived rewards for involvement in the activities. Support for the SDM has been shown for a variety of adolescent outcomes [14, 15] and across gender and income groups as well as developmental periods [16,17]. A common feature of these studies is the use of combined indicators from the domains (community, school, family, and peers) into a single cross-domain composite factor. Although this methodology offers certain advantages [14], it obviates the ability to explore some central questions.

First, there is ambiguity about the interrelations among risk and protective factors and, more precisely, the relations between different risk factors and specific adolescent outcomes [18, 19]. Research indicates variation in the magnitude of relations and that generally, risk factors are more influential than protective factors [20,21]. Yet there is debate over which domains of risk or protection are stronger predictors of certain outcomes compared to others. For instance, findings from the 1999 National Household Survey on Drug Abuse showed that the peer and individual domains had the strongest associations with past year marijuana, cigarette, and alcohol use [22]. However, other studies have found that family or school factors were among the strongest predictors of adolescent outcomes [18,20,23].

Studies also vary in conclusions across types of ATOD use. Although some studies conclude that the general patterns of predictor variables for alcohol and marijuana use were similar [24,25], other research has found parents differentially influence alcohol or marijuana initiation

[6]. Finally, there is mixed evidence regarding the influence of different risk and protective factors depending upon levels of ATOD involvement such as initiation or escalation. Although most studies have found evidence that the relevance of factors varied by stage of use [26,27], other studies report little variation [25,28].

Understanding the interrelations among risk and protective factors and adolescent outcomes requires data that include a wide array of individual and environmental risk and protective factors as well as measures of different types of substance use. Furthermore, a large sample of adolescents across several ages is needed to examine stage-specific and age-specific differences. The current study meets these needs using a sample of 91,778 students between grades 6 to 12. We first examine the relative influence of risk and protective factors across several domains on several ATOD outcomes. Risk or protective factors are examined in the context of the other, as well as independently. We then study age-specific patterns of risk factor-substance use associations. Of special interest are three questions: 1) How do risk and protective factors differ in their associations with lifetime use vis-à-vis recent substance use? 2) Do these associations vary by the type of substance? 3) Do these associations vary by age?

Method

Procedure

The data come from the 2005 Pennsylvania Youth Survey (PAYS). PAYS is a state-funded, bi-annual surveillance survey conducted with a representative sample of public and private school districts. Schools were divided into six regions of the state, and for each of the four targeted grades (6, 8, 10, and 12) in each region, a separate random sample was drawn. Each school's grade was assigned a likelihood of participation equivalent to the proportion of the regional student population comprised by the school's grade. In addition to the targeted grades, “piggyback” grades at a school could be included at a financial discount to the school over the typical survey cost (participation was free for the targeted grades). This procedure yielded 55,834 respondents. Additional schools volunteered to participate in the survey to monitor risks and problems in their own community. The full dataset contained data on 180 school districts and 93,884 students. The current study used the sample of 91,778 students from the targeted grades (6, 8, 10, and 12), excluding students who participated but were in other grades.

Apart from two major metropolitan regions, Pennsylvania is largely rural or semi-rural and white. For example, Pennsylvania has the largest rural population of any state in the U.S., and non-white students comprise 13.7% of the student population. The characteristics of our sample, which did not include representation from the state's two major metropolitan regions, reflect this overall demographic profile: The average population of the 180 school districts was 20,673 (range 2576 to 103,717). Although many of the school districts in the rural and small town areas were predominantly white, some areas had predominant minority populations. The average percentage for non-whites in the participating districts was 9.9 (range 0% to 94%), and the average percent Hispanic was 3.2 (range 0% to 52%).[1]

Measures

PAYS utilizes the Communities That Care Youth Survey (CTC-YS), a broad assessment of risk and protective factors as well as problem behaviors [29]. An earlier study demonstrated that aggregate indices of the 31 scales in the CTC-YS provided meaningful and useful measures of adolescent risk and protective factors [30]. Based on these results, risk and protective factor scales were grouped into a total of six risk and protective indices for this study. Each risk or

[1]These figures were calculated based on averages across school districts; a weighted average based on the population of each school district would have indicated higher levels of population density and non-white residents.

protective factor index included 3 to 6 items and all Cronbach alphas were greater than 0.77 except social skills (α = 0.66) and school opportunities and reward for prosocial involvement (αs = 0.63, 0.71, respectively).[2]

The *Individual Risk* index included six scale indices: favorable attitudes toward antisocial behavior, favorable attitudes toward ATOD use, low perceived risks of drug use, sensation seeking, rebelliousness, and social skills. *Peer Risk* was comprised of four scale indices: friends' delinquent behavior, friends' use of drugs, peer rewards for antisocial behavior, and gang involvement. Three scale indices were used for the *Family Risk* domain: parental attitudes favorable to ATOD use, parental attitudes favorable to antisocial behavior, and family history of antisocial behavior.[3]

Family Cohesion included five indices: family attachment, family opportunities for prosocial involvement, family rewards for prosocial involvement, family supervision, and family discipline. The *School Cohesion* domain included school commitment, school opportunities for prosocial involvement, and school rewards for prosocial involvement. *Community Cohesion* was comprised of five indices: neighborhood attachment, community prosocial involvement, laws and norms favorable to drug use and firearms, perceived availability of drugs and firearms, and community disorganization.

The dependent variables included both lifetime and recent ATOD use. The extent of lifetime use of cigarettes was assessed by asking, “Have you ever smoked cigarettes?” with responses on a 5-point likert scale, ranging from *never* to *regularly now*. Lifetime use of alcohol and marijuana were assessed by asking “On how many occasions (if any) have you:” followed by “had beer, wine, or hard liquor in your lifetime?” and “used marijuana in your lifetime?” Each item had seven response categories that ranged between *0* to *40+ occasions*.

Four measures of recent substance use were also assessed. Recent cigarette use was ascertained by the item, “How frequently have you smoked cigarettes during the past 30 days?” Seven response categories were available for this item, ranging from *not at all* to *two packs or more per day*. Recent alcohol and marijuana use were assessed using the same stem as the lifetime measures, followed by “had beer, wine, or hard liquor during the past 30 days” and “used marijuana during the past 30 days.” 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*.

Analysis Plan

Because the distributions of the substance outcomes were non-normal, cumulative logit models for ordinal responses were estimated to examine the relations between the risk and protective indices and the substance use outcomes. Cumulative logit models are one type of ordinal logistic regression models that estimate the odds ratio (OR) for all possible cut-points of the ordinal response variable (e.g., 1 vs. 2, 3, 4; 1, 2 vs. 3, 4; 1, 2, 3 vs. 4). The proportional odds model is a special case of the general cumulative logit model that assumes the ORs for each predictor are constant across all possible cut-points of the response variable. Thus, the OR for a predictor in a proportional odds model can be interpreted as a summary of the ORs obtained from separate binary logistic regressions across the entire range of the response variable.

Two series of models were estimated for each of the four grade levels. In the first models, the relations between the risk and protective factors and lifetime use outcomes were examined.

[2]Specific alpha coefficient reliabilities and details for each index are available from the first author.
[3]As school officials were given the option to exclude the family items (in both risk and protective domains) from the student surveys, 77 (42.78%) of the 180 school districts did so and are excluded from these analyses.

Each lifetime measure of use was specified as an ordered multinomial distribution and these models included all participants, including those who reported no use. The second series of models examined associations with the risk and protective indices and recent use outcomes; these models included only those adolescents who indicated lifetime use of that particular substance. All models took nesting of students within schools into account and included gender as a covariate. Because there is evidence that the aggregated indices of risk and protection are moderately correlated [30], three models were tested within each series. The first set included only the three risk factor indices, the second set included only the protective factor indices, and the final set included all risk and protective factor indices entered simultaneously.

Results

Inter-correlations among the risk indices, protective indices, and substance use items are reported in Table 1. In general, correlations among the aggregated indices were moderate and in the expected directions. Correlations of the indices with the substance use outcomes were significant and in the expected direction. Generally, stronger correlations were found for the risk compared to the protective indices. The substance use outcomes were also moderately correlated. Alcohol was the most frequently used of the substances: 25% of the 6^{th} graders reported lifetime alcohol use and nearly 83% of the 12^{th} graders reported lifetime alcohol use. Among 12^{th} graders, 50% reported 30-day alcohol use and 30% reported binge-drinking. The lowest levels of use were reported for marijuana. Among the older grades, males were somewhat more likely than females to report higher levels of substance use.

Predicting Lifetime Use

The results of the models of lifetime substance use are presented in Table 2. Because of the large sample size, significance levels of $p < .01$ were used in all of the models. We focus on factors most strongly associated with use outcomes (OR > 2 for risk factors and < 0.50 for protective factors, both indicate at least a two-fold change in the outcome). As seen in Table 2 (top), all three risk factor indices were significantly associated with higher levels of lifetime use of all the substance outcomes among all grades.[4] The strongest associations were found for the individual risk index, which resulted in OR > 2 for all of the models. In general, the associations for the family risk index were stronger among the younger grades, whereas the associations for the peer risk index were stronger in the older grades.

The results of models predicting lifetime use with the protective factor indices only are also presented in Table 2 (middle). The strongest associations (i.e., OR near 0) were found for the community index, with OR < 0.50 for all but one model. There was some evidence that the effect of community cohesion was stronger among the younger grades, relative to the older grades, particularly for cigarette and marijuana use. The same pattern (lower OR among younger grades) was found between family cohesion and lifetime cigarette and marijuana use.

When risk and protective factor indices were entered simultaneously (bottom of Table 2), the results indicated that risk indices were generally stronger predictors of lifetime use compared to protective indices, regardless of grade or substance. The strongest associations were found for individual risk, which resulted in OR > 2 for all models. The peer risk index was particularly strong among 10th and 12th graders, especially for lifetime use of alcohol and marijuana. Family and community protective factor indices were significantly associated with lifetime cigarette use, especially among the younger cohorts, but not uniquely predictive of alcohol or marijuana use. In general, relations between protective factors and lifetime alcohol and

[4]Results of models predicting lifetime and 30-day use of marijuana among 6^{th} grade students were also conducted. However, less than 1% of the 6^{th} graders reported any use of marijuana. As a result, 2 of the 3 models for lifetime marijuana use failed to converge and the models for recent use included fewer than 100 participants.

marijuana use were stronger in the younger grades. For protective factors, some findings were in the opposite direction as compared to when they were entered alone (see Table 2). It is likely that these findings are due to the high degree of multicollinearity among the indices.

Predicting Recent Use

As with lifetime use, individual and peer risk factors showed the highest OR across substances and grade levels (Table 3). Stronger associations were found among the older cohorts for the peer risk index. Analyses of protective factors also showed significant associations with most outcomes at most grade levels. Particularly strong associations were found for the community cohesion index, especially for recent marijuana use and binge drinking among the younger grades. Similarly, the family cohesion index was strongly associated with binge drinking and recent cigarette use, particularly among the younger grades. In contrast, there was some evidence that the associations between the school protective index and recent use were stronger among the older grades.

When both risk and protective factors were simultaneously entered (bottom of Table 3), the risk indices were stronger predictors of recent use compared to protective factors. As with lifetime use, the strongest associations were found for individual and peer risk indices. There was evidence that individual and peer risk indices were more strongly related to 30-day alcohol use and binge drinking among older grades. The influence of family risk factors was similar across grade levels. When controlling for the risk indices, few associations between protective indices and recent use were significant. As before, several counterintuitive results were found for the cohesion indices.

To help understand the general patterns of age-related differences between risk and protective factors and substance use outcomes, Table 4 presents a summary of the models. A “Y” indicates a consistent pattern of stronger associations were found among the younger grades and an “O” indicates stronger associations for older grades. A dashed line (--) indicates no clear age-related pattern was found. This summary suggested that family factors (risk and protective) were more salient for younger grades, whereas peer and school factors were stronger among older grade levels. There was also evidence that the community protective factors were more salient among the younger grades.

Discussion

A unique aspect of this study is that we were able to examine several predictors of ATOD use simultaneously (i.e., controlling for other factors in the model). Thus, we were able to identify the relative influence of risk and protective factors across individual, family, peer, school, and community domains. The large, community sample also allowed us to explore these associations across grade levels that spanned early to late adolescence. The findings demonstrate individual and peer risk factors were most closely related to adolescent use. Family risk was less strongly correlated with the ATOD outcomes. Among the protective factors, the strongest associations were found for the community domain, although family and school factors were also important. As expected, models that included both risk and protective factors suggested that risk factors were more closely related to both lifetime and recent ATOD use. There were very few differences in the patterns of these associations for measures of lifetime versus recent use.

As shown in other risk research, individual risk factors place children at substantial risk. This is likely due to factors that originate early in childhood, including early behavioral problems, and both cognitive and emotion regulatory abilities [3]. These have been conceptualized as problems in behavioral disinhibition and in adolescence are related to sensation seeking, rebelliousness, low perceived risk and high reward sensitivity to ATOD use [4]. Similarly,

these findings support the notion that deviant peer influences also predict early initiation and use [7]. Further, these findings show that whereas peer influences are strong, both individual and family risk factors also show important and unique contributions to both initiation and regular use that are not accounted for by peer influences [6].

A growing body of literature suggests that protective factors also play an important role in ATOD use by either exerting positive effects opposite of risk factors or by buffering the negative effects of risk factors [21]. The current study did not examine interactive effects between risk and protective factors; therefore the buffering effect was not addressed. However, support for the main effects of protective factors across family, peer, and community contexts was found when these indices were examined separately from the risk factors. Consistent with other studies, protective indices were much weaker predictors when both risk and protective factors were included in the same model [20,21].

The results also suggest that relations between risk and protective factors and ATOD outcomes may vary across adolescence. Family and community factors were more salient for younger cohorts whereas peer and school domains were more important for older adolescents. These results are consistent with developmental theories that family influences are important in childhood and early adolescence but recede in relative importance as older adolescents spend more unsupervised time with peers [31]. However, the finding that community domain factors were stronger in the earlier grades is inconsistent with this idea and may indicate that community norms and attitudes towards drug use have more effect on initiation than on progression of usage. Given the increasing attention given to contextual effects on adolescent health [9, this result warrants further investigation. National surveys of youth indicate that both self-reported and perceptions of peer substance use increase with age [1,2,22]. However, several studies have found that systematic errors in norm estimation (i.e., pluralistic ignorance [32]) are associated with risk behaviors across all stages of adolescence [33,34]. We were unable to measure this discrepancy; however, exploring how developmental patterns in these misperceptions may mediate or moderate the influence of peer and contextual effects is another important topic for future research.

These findings lend further support to the rationale for implementing preventive programs targeting multiple domains. Several examples of family-based interventions have shown promising results in preventing adolescent problems behaviors [35]. Additionally, comprehensive community-wide programs have demonstrated positive effects in reducing adolescent problem behaviors [36]. There is a growing interest in the important role that schools may play in preventing adolescent antisocial behavior [5] and the finding that school factors were especially protective for the older grades in this study suggests that such efforts should extend throughout the secondary school years. As there has been little focus on environmental policy interventions for younger students, policies in both schools and communities that may influence early teens may be warranted. Moreover, a few studies have examined a multi-pronged approach targeting multiple domains, but more research is needed [37].

The present study had several limitations. First, the cross-sectional design of the study limits the inferences that can be drawn. Causal relations among these variables require longitudinal data, and ideally, an experimental design. Furthermore, the present study used four grade levels to investigate age-related differences. It is possible that these differences could be attributed to cohort effects, rather than developmental differences; a longitudinal, panel design would be helpful here. It is also likely that those who drop out of school use more substances and are less attached to school. This differential selection could affect the nature of the relations. Second, the variables were measured with self-reported items from a school-based survey. Although research has suggested that adolescent interpersonal processes are best measured with the adolescents' perceptions [38], objective measures of these processes are also critical.

This may be especially true for measures of community processes [39]. Past research has demonstrated that the CTC-YS provides reliable measures of risk and protective factors that are invariant across grades 6 to 12 [29,40]. Although factor means varied with grade level, the conceptual definitions of the factors were consistent. Nonetheless, studies that include multi-method measures of community factors are needed to fully explore these relations. Another limitation of the current study concerns the representativeness of the sample. Although students from a wide range of schools were included, the findings may not generalize to more urban samples or to other geographic areas. We plan to explore how geographic diversity and socioeconomic factors may moderate the relations in future studies.

Despite these limitations, these findings contribute to the literature in several ways. The results support the notion that adolescent substance use is associated with factors across multiple spheres of influence, including individual, family, peer, and community domains. Our large sample of students allowed these relations to be examined across several grade levels and the results suggest the importance of considering age-related differences when designing and implementing prevention programs to reduce adolescent substance use. Interventions that emphasize different domains of risk and protective factors at different stages of adolescent development may be most effective.

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Table 1

Pairwise correlations for study variables.

	Risk_indiv	Risk_peer	Risk_family	Prot_family	Prot_school	Prot_comm	smoke_life	smoke_30	alc_life	alc_30	alc_binge	weed_life
Risk_peer	0.65											
Risk_family	0.63	0.54										
Prot_family	-0.52	-0.37	-0.46									
Prot_school	-0.51	-0.38	-0.34	0.49								
Prot_comm	-0.59	-0.50	-0.53	0.56	0.50							
smoke_life	0.55	0.56	0.50	-0.32	-0.30	-0.42						
smoke_30	0.32	0.38	0.33	-0.16	-0.19	-0.23	0.56					
alc_life	0.54	0.50	0.47	-0.28	-0.29	-0.37	0.55	0.35				
alc_30	0.36	0.40	0.32	-0.18	-0.21	-0.23	0.35	0.31	0.56			
alc_binge	0.40	0.41	0.36	-0.20	-0.21	-0.26	0.39	0.31	0.54	0.54		
weed_life	0.45	0.50	0.43	-0.22	-0.23	-0.31	0.57	0.44	0.56	0.39	0.39	
weed_30	0.31	0.37	0.31	-0.15	-0.17	-0.20	0.36	0.37	0.37	0.35	0.31	0.66

Note: all correlations significant at $p < .0001$. Risk_indiv = individual domain of risk factors, Prot_family = family domain of protective factors; smoke_life = 30-day cigarette use, smoke_30 = 30-day cigarette use, alc_life = lifetime alcohol use, alc_30 = 30-day alcohol use, alc_binge = 2-week binge drinking, mar_life = lifetime marijuana use, mar_30 = 30-day marijuana use.

Table 2

Results of proportional odds models predicting lifetime substance use.

	Lifetime Cigarettes				Lifetime Alcohol				Lifetime Marijuana		
Grade Level	**6**	**8**	**10**	**12**	**6**	**8**	**10**	**12**	**8**	**10**	**12**
Risk Only (*N*)	(10,043)	(12,533)	(14,401)	(10,114)	(9,987)	(12,469)	(14,369)	(10,095)	(12,426)	(12,426)	(10,040)
Indiv Risk	**3.00**	**2.69**	**2.75**	**2.29**	**2.69**	**3.10**	**3.32**	**2.72**	**2.72**	**2.75**	**2.46**
Peer Risk	**2.39**	**2.46**	**2.41**	**2.41**	**1.51**	**1.54**	**1.88**	**2.05**	**2.39**	**2.64**	**3.03**
Family Risk	**1.88**	**1.55**	**1.51**	**1.62**	**1.84**	**1.65**	**1.46**	**1.60**	**1.65**	**1.57**	**1.73**
Prot Only (*N*)	(9,391)	(12,032)	(13,971)	(9,850)	(9,336)	(11,972)	(13,938)	(9,834)	(11,936)	(11,936)	(9,778)
Family Prot	**0.64**	**0.61**	**0.70**	**0.75**	**0.84**	**0.72**	**0.77**	**0.84**	**0.62**	**0.76**	**0.77**
School Prot	**0.76**	**0.84**	**0.75**	**0.73**	**0.69**	**0.79**	**0.72**	**0.72**	**0.80**	**0.74**	**0.75**
Comm Prot	**0.30**	**0.33**	**0.37**	**0.47**	**0.49**	**0.41**	**0.44**	**0.53**	**0.24**	**0.31**	**0.42**
Full Model (*N*)	(9,383)	(12,031)	(13,963)	(9,846)	(9,329)	(11,971)	(13,932)	(9,831)	(11,935)	(11,935)	(9,776)
Indiv Risk	**2.41**	**2.41**	**2.61**	**2.25**	**2.34**	**2.89**	**3.35**	**3.32**	**2.53**	**2.75**	**2.56**
Peer Risk	**2.27**	**2.36**	**2.34**	**2.41**	**1.42**	**1.48**	**1.88**	**2.12**	**2.32**	**2.61**	**3.06**
Family Risk	**1.75**	**1.46**	**1.46**	**1.63**	**1.92**	**1.63**	**1.49**	**1.68**	**1.54**	**1.55**	**1.75**
Family Prot	**0.84**	**0.82**	**0.91**	0.94	***1.12***	1.02	***1.09***	***1.15***	**0.85**	1.05	1.00
School Prot	1.01	***1.14***	1.02	1.04	**0.80**	0.99	0.98	1.05	***1.21***	1.06	***1.13***
Comm Prot	**0.65**	**0.71**	**0.84**	0.96	**0.79**	**0.79**	0.98	***1.16***	**0.64**	**0.84**	0.99

Note: Values in table indicate odds ratios of reporting higher levels of use, across the entire range of the outcome categories. Values in **BOLD** indicate $p < .01$; values in ***italics*** indicate counterintuitive result (i.e., odds ratio > 1.0 for protective index, $p < .01$). *N* = sample size included in the model. Indiv = individual, Comm = community, prot = protective.

Table 3

Results of proportional odds models predicting recent substance use.

	30-Day Cigarettes				30-Day Alcohol				2-Week Binge Drinking				30-Day Marijuana		
Grade Level	**6**	**8**	**10**	**12**	**6**	**8**	**10**	**12**	**6**	**8**	**10**	**12**	**8**	**10**	**12**
Risk Only (*N*)	(728)	(2,862)	(5,393)	(5,115)	(2,588)	(6,917)	(10,677)	(8,370)	(2,559)	(6,865)	(10,610)	(8,322)	(1,057)	(3,491)	(4,139)
Indiv Risk	1.97	**2.01**	**1.72**	**1.70**	**1.77**	**2.18**	**2.29**	**2.32**	**2.23**	**2.53**	**2.48**	**2.44**	**1.86**	**1.65**	**1.80**
Peer Risk	**1.86**	**1.88**	**2.01**	**1.80**	**1.60**	**1.58**	**1.93**	**2.16**	**1.63**	**1.73**	**1.75**	**1.92**	**1.48**	**1.77**	**1.77**
Family Risk	**1.26**	**1.22**	**1.40**	**1.36**	**1.30**	**1.34**	**1.23**	**1.26**	**1.52**	**1.43**	**1.25**	**1.27**	**1.25**	**1.22**	**1.23**
Prot Only (*N*)	(661)	(2,714)	(5,194)	(4,953)	(2,388)	(6,650)	(10,358)	(8,142)	(2,365)	(6,600)	(10,294)	(8,095)	(1,004)	(3,358)	(3,988)
Family Prot	**0.63**	**0.80**	**0.82**	**0.88**	**0.73**	**0.70**	**0.76**	**0.90**	**0.54**	**0.68**	**0.77**	**0.89**	0.94	**0.83**	0.94
School Prot	0.77	**0.82**	**0.76**	**0.69**	0.87	**0.78**	**0.69**	**0.68**	0.94	**0.79**	**0.68**	**0.66**	0.82	**0.73**	**0.73**
Comm Prot	**0.58**	**0.51**	**0.48**	**0.64**	**0.58**	**0.49**	**0.58**	**0.64**	**0.36**	**0.34**	**0.54**	**0.64**	**0.49**	**0.70**	**0.62**
Full Model (*N*)	(659)	(2,714)	(5,190)	(4,951)	(2,387)	(6,649)	(10,354)	(8,140)	(2,364)	(6,600)	(10,291)	(8,093)	(1,004)	(3,356)	(3,987)
Indiv Risk	**1.79**	**2.08**	**1.62**	**1.67**	**1.84**	**1.99**	**2.29**	**2.59**	**1.99**	**2.39**	**2.48**	**2.66**	**2.01**	**1.70**	**1.84**
Peer Risk	**1.90**	**1.90**	**1.97**	**1.79**	**1.63**	**1.58**	**1.99**	**2.18**	**1.79**	**1.73**	**1.80**	**1.95**	**1.49**	**1.80**	**1.77**
Family Risk	1.27	**1.27**	**1.40**	**1.36**	1.22	**1.34**	**1.26**	**1.31**	1.34	**1.40**	**1.28**	**1.34**	**1.23**	**1.27**	**1.26**
Family Prot	0.75	0.99	0.94	0.99	0.90	0.92	0.98	***1.19***	**0.68**	0.97	0.99	***1.15***	1.07	0.95	1.06
School Prot	0.95	1.11	0.93	0.90	1.06	0.95	**0.90**	0.95	1.30	1.06	0.91	0.94	1.16	0.90	0.98
Comm Prot	1.20	1.02	0.90	1.00	1.02	0.90	***1.22***	***1.28***	0.84	**0.77**	***1.23***	***1.30***	0.86	***1.32***	1.01

Note: Values in table indicate odds ratios of reporting higher levels of use, across the entire range of the outcome categories. Values in **BOLD** indicate $p < .01$; values in ***BOLD*** indicate counterintuitive result (i.e., odds ratio > 1.0 for protective index, $p < .01$). *N* = sample size included in the model.

Table 4

Evidence of stronger associations for older vs. younger students between risk and protective factor indices and substance use outcomes.

	Lifetime Use			Recent Use			
	Cig	**Alc**	**Mar**	**Cig**	**Alc**	**Binge**	**Mar**
Individual Risk	Y	--	--	--	O	O	--
Peer Risk	--	O	O	--	O	O	O
Family Risk	Y	Y	--	--	--	Y	--
Family Protective	Y	--	Y	Y	Y	Y	--
School Protective	--	--	--	O	O	O	O
Comm Protective	Y	--	Y	--	--	Y	Y

Note: Cig = cigarette use, Alc = alcohol use, Mar = marijuana use, binge = binge drinking. Y = pattern of stronger associations among younger grade grades; O = pattern of stronger associations among older grades.