

Risk and protection: Are both necessary to understand diverse behavioral outcomes in adolescence?

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Prevention science has suggested that preventive interventions should reduce risk factors and enhance protective factors. Recently, some researchers have proposed that preventive interventions focused on enhancing protective factors and promoting resilience will produce more positive outcomes than interventions that focus attention on risk factors. Others have argued that focus solely on the resilience of young people emphasizes individual characteristics and ignores important social and contextual risk factors. The present study explored relationships between self-reported exposure to a comprehensive set of risk and protective factors and outcomes, including substance use, school outcomes, and delinquency, in a five-state sample of sixth- through 12th-grade students. The results indicate that prevention policies and programs should focus on the reduction of risk and the promotion of protective influences if reduction in the substance use, crime, and violence among adolescents or the improvement in academic performance are intended outcomes.

Key words: **assets; delinquency; drug use; protective factor; risk factor**

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Substance abuse, delinquency, and other problem behaviors persist among youths in the United States. Although the use of marijuana and other illegal drugs declined among high school students during the 1980s, the prevalence of substance use among school-age young people has increased since 1992 (Johnston, O'Malley, & Bachman, 1997).

Criminal offenses by juveniles also are a concern. Arrests of juveniles for violent crimes increased rapidly during the 1980s and early 1990s, with rates for murder, assault, and rape all increasing. Violent offenses by juveniles have declined substantially during the past three years but are still at high levels in the United States compared with other industrialized nations (Federal Bureau of Investigation, 1997). Concerns about adolescent substance use, delinquency, and violence have created a demand for effective strategies to prevent these problem behaviors (Fraser, 1997).

A number of recent reviews suggested that risk and protective factors, empirically established longitudinal predictors of problem behavior, are promising targets for preventive intervention (Coie et al., 1993; Hawkins, Arthur, & Catalano, 1995; Mrazek & Haggerty, 1994; Wasserman & Miller, 1997). This perspective suggests that preventive interventions should focus on risk reduction and protective factor enhancement to prevent later substance abuse, crime, and other problem behaviors. Risk factors have been broadly defined as "those characteristics, variables, or hazards that, if present for a given individual, make it more likely that this individual, rather than someone selected from the general population, will develop a disorder" (Mrazek & Haggerty, 1994, p. 127). Protective factors are those factors that mediate or moderate the effect of exposure to risk factors, resulting in reduced incidence of the problem behavior (Garmezy, 1985; Rutter, 1979).

Mediator variables are constructs that lie between two related variables and account for much, if not all, of the relationship between the two variables. For example, attitudes toward drug use might be hypothesized to mediate the relationship between peer and individual drug use. Peer drug use might influence some youths to adopt favorable attitudes toward drug use, which, in turn, makes them more likely to use drugs themselves, while youths who believe that drug use is socially unacceptable or harmful might be protected against peer influences to use drugs. Alternately, protective factors may interact with risk factors to change or moderate the predictive relationships between risk factors and outcomes. For example, a strong commitment to education might moderate the relationship between peer and personal drug use by increasing the perceived personal costs of drug use and thus weakening the relationship between peer and individual drug use.

Several authors have identified specific risk and protective factors that have shown significant and predictive correlations with adolescent substance use and criminal behavior across multiple longitudinal studies (Hawkins, Catalano, & Miller, 1992; Loeber, Stouthamer-Loeber, Van Kammen, & Farrington, 1991). Although not all these risk or protective factors ultimately will prove to be causal factors, manipulation of risk and protective factors through prevention experiments will help to determine their causal role in the etiology of behavior.

Risk and protective factors have been identified in different domains, including the broader community, the school, the family, the peer group, and the individual (Hawkins et al., 1995). Empirically supported community risk factors include the legal and normative expectations for behavior, as well as characteristics of the community and neighborhood environment, such as high levels of community disorganization and poverty (Sampson, Raudenbush, & Earls, 1997). In the school setting, academic failure and lack of commitment to school have been found to predict crime and drug use (Maguin & Loeber, 1996). A family history of crime or substance abuse, poor family management practices, and high levels of family conflict have been found to be predictors of problem behavior (Yoshikawa, 1994). Peer factors such as drug use and delinquency have been shown to predict adolescent problem behavior (Loeber, 1990). Individual factors, including constitutional factors resulting from head injuries or exposure to toxins in utero or in early childhood, sensation seeking, poor impulse control, early ag-

gressive behavior, and early initiation of substance use, also have been identified as risk factors for delinquency and substance abuse (Hawkins et al., 1992; Werner & Smith, 1992; Rutter, 1990).

Protective factors fall into three basic categories (Hawkins et al., 1992; Rutter, 1990; Werner & Smith, 1992): individual characteristics (a positive social orientation, high intelligence, and a resilient temperament); social bonding (warm, affective relationships and commitment to conventional lines of action); and healthy beliefs and clear standards for behavior. Social bonding can occur in the community, family, school, and peer group and is theorized to develop as a result of opportunities for involvement, skills for successful involvement, and perceived rewards for involvement (Catalano & Hawkins, 1996; Hawkins & Weis, 1985).

Research indicates that antisocial behaviors are more prevalent among youths exposed to multiple risk factors (Bry, McKeon, & Pandina, 1982; Newcomb, 1995). Rutter (1979, 1990) observed a multiplicative relationship between the number of risk factors in a child's background and the likelihood of psychiatric disorder. Kolvin, Miller, Fletting, and Kolvin (1988), using the same six risk factors (marital instability, parental illness, poor domestic and physical care of children, social dependency, overcrowding, and poor mothering ability), found increased likelihood of criminal offending associated with increased risk exposure.

Newcomb, Maddahian, Skager, and Bentler (1987) and Newcomb and Felix-Ortiz (1992) found that exposure to multiple risks was associated with increased likelihood and frequency of substance use. Sameroff and Fiese (1990) found that the number of risk factors to which children were exposed was strongly associated with greater likelihood of decreased intellectual and social competence.

The consistency of these findings across studies and outcomes is striking. Multiple forms of problem behavior consistently appear to be predicted by increasing exposure to identifiable risk factors (Jessor & Jessor, 1977; Osgood, Johnston, O'Malley, & Bachman, 1988). More risk exposure is associated with greater likelihood of problems.

Many of the studies that have documented a relationship between risk exposure and problem behaviors also have found evidence of protective factors that decrease the likelihood of problem behaviors among those at risk (Bradley et al., 1994; Rutter, 1985; Smith, Lizotte, Thornberry, & Krohn, 1995). These findings have prompted studies focused on "resilience," which sought to understand

why some children exposed to multiple risk factors avoid negative outcomes. (Garmezy, 1985; Werner, 1994). It has been hypothesized that protective factors might contribute to resilience either by exerting positive effects in direct opposition to the negative effects of risk factors (additive models) or by buffering individuals against the negative effects of risk factors (interactive models) (Kirby & Fraser, 1997; Rutter, 1990).

Recently, some authors have advocated for a paradigm shift in the prevention field to focus exclusively on building assets, the protective factors associated with resilience, rather than trying to reduce risk (for example, Benard, 1993; Benson, 1997). These scholars asserted that targeting risk factors emphasizes the deficits of young people. They suggested that focusing on building children's strengths will produce more positive outcomes than interventions focusing on reducing risk factors. In contrast, others have argued that a focus solely on the resilience of young people emphasizes individual characteristics and ignores important social and contextual risk factors that should also be a focus for prevention policies and interventions (Tolan, 1996).

The effect of ignoring risk and of focusing solely on enhancing protection or assets on the development of adolescent problem behaviors is unknown. Given the strong relationship between exposure to increasing numbers of risk factors and involvement in multiple problem behaviors, the likely effect of interventions focused exclusively on building resilience depends on whether protective factors can fully mitigate the negative effects of exposure to multiple risk factors during a child's development. This article seeks to assess this question by simultaneously measuring a range of risk and protective factors to determine the nature of the relationship among increasing levels of risk exposure, increasing levels of protective factors, and a range of adolescent behavioral outcomes.

Understanding the relative strength of aggregated risk and protective influences considered simultaneously in relation to the likelihood of adverse outcomes has important implications for prevention policy and practice. If focusing exclusively on strengths, assets, or protective factors can eliminate the effects of high levels of exposure to multiple risks, then attention to risk is not required in prevention policy and planning. If this is not the case, then those concerned with preventing adolescent behavior problems of substance abuse, crime, and violence should maintain focus both on reducing risk factors and on increasing protective factors.

METHODS

The data for this study were collected as part of a project funded by the federal Center for Substance Abuse Prevention to develop prevention needs assessment methods for states and communities to guide prevention planning (O'Donovan, 1994). In that project, a survey instrument measuring a comprehensive set of risk and protective factors and diverse behavior outcomes, including academic achievement, substance use, violence, and delinquency, was created, validated, and administered to statewide probability samples of adolescents in Kansas, Maine, Oregon, South Carolina, and Washington in grades six through 12 in 1994 and 1995 (Hawkins, Arthur, & Catalano, 1997). These survey data are used to investigate the prevalence of a range of adolescent behavioral outcomes in a large sample of adolescents exposed to widely varying levels of risk and protection.

Survey Instrument

The survey instrument assessed 28 factors predictive of substance abuse and other antisocial behaviors in adolescents (Pollard, Catalano, Hawkins, & Arthur, 1998). The factors measured are organized into four primary domains (Table 1). The survey measures 20 risk constructs and eight protective constructs. Scales measuring additional protective factor constructs such as resilience and positive social orientation were developed for this instrument but were deleted after pilot testing because of the poor psychometric properties of the scales. Only scales with adequate reliability and validity were retained in the survey instrument (Pollard et al.). Reliabilities of the 28 retained factor scales were good (average Cronbach's alpha = .78), and all showed moderate to strong correlations (.20 to .70) with substance use and delinquent behavior in the predicted direction. (See Pollard et al. for a description of the survey's development and psychometric properties.) The survey also assessed school achievement, substance use, and violent and nonviolent delinquent activity as outcomes. The difference in the numbers of risk and protective factors measured by the survey was addressed in the method used to compute aggregated risk and protection scores for analysis. Aggregate risk and protective factor scores were computed by averaging each student's standardized scores across the relevant scales rather than counting the numbers of elevated risk and protective factor scores for each individual. Thus, the aggregated scores reflect each individual's relative levels of risk and protection across the constructs measured rather

TABLE 1—Risk and Protective Factor Scales and Scale Reliabilities

Domain	Risk Factors	Protective Factors	Cronbach's Alpha
Community	Low neighborhood attachment		.83
	Community disorganization		.79
	Many transitions and high mobility		.74
	Laws and norms favor drug use		.78
	High perceived availability of drugs, firearms		.87
	High perceived rewards for community involvement		.83
School	Low degree of commitment to school		.80
		Many opportunities for school involvement	.48
		High perceived rewards for involvement	.58
Family	Poor supervision by family		.80
	Poor family discipline		.78
	High degree of family conflict		.57
	Family history of antisocial behavior		.81
	Parental attitudes promote antisocial behavior		.72
	Parental attitudes promote drug use		.76
		High degree of family attachment	.77
		High perceived opportunities for family involvement	.76
	High perceived rewards for family involvement	.66	
Individual/ Peer	High degree of rebelliousness		.76
	Early initiation to antisocial behavior		.76
	Attitudes favor antisocial behavior		.81
	Attitudes favor drug use		.85
	Peer antisocial behavior		.85
	Peer drug use		.80
	Rewards for antisocial behavior		.85
	High degree of sensation seeking		.79
		Belief in moral order	.70
		High degree social problem-solving skills	.63

than the absolute numbers of risk and protective factors assessed.

Participants

Selection of participating students in Maine, Oregon, South Carolina, and Washington was based on statewide probability sampling of schools, stratified to produce regional estimates for five to 16 regions within each state. All school districts in Kansas were invited to participate, and about 60 percent of eligible Kansas school districts did so (Table 2). The high level of missing data in Washington reflects the state's decision to use four alternate forms in its survey, only two of which contained the risk and protective factor questions necessary for the

current analyses. Data were not weighted to represent the public school student populations in the five states. Although statistical methods exist for refining estimates of population parameters (for example, Shah, Barnwell, & Beiler, 1997), it is not clear whether improving generalizability to these states would improve the overall generalizability of the findings beyond the unweighted data. In either case, generalizations to the population of young people in the U.S. are limited by the sample.

Missing data on the outcomes ranged from 1.5 percent to 9.3 percent. There were very low but significant correlations between missingness in the outcome variables and aggregate risk and protection scores, averaging $r = .05$ and $r = -.03$, respectively.

TABLE 2—Characteristics of the Five Statewide Surveys and Samples

Characteristic	State				
	Kansas	Maine	Oregon	South Carolina	Washington
Time	Fall 1994	Spring 1995	Spring 1994	Spring 1995	Spring 1995
Grades	6, 8, 10, 12	6–12	6, 8, 11	6, 8, 10, 12	6, 8, 10, 12
Original sample	45,180	7,291	10,833	6,986	20,836
Final sample ^a	44,527	7,156	10,546	6,359	10,122
Age ^b	14.1±2.2	14.6±2.0	14.1±2.0	15.0±1.6	14.4±2.3
English as first language (%)	96.3	98.5	95.0	98.4	NA
Ethnicity (%)					
White	81.3	92.2	67.0	45.1	77.1
African American	6.5	0.7	3.0	47.0	1.9
Native American	2.6	2.7	5.6	1.8	2.7
Hispanic	6.2	1.2	4.1	1.2	11.0
Asian American	1.6	1.0	3.9	0.8	4.5
Other	1.8	2.2	16.4	4.2	2.8

^aFinal sample size excludes students removed from the original sample because of insufficient risk and protection factor data.

^bAge is means ± SD. NA = not available.

These data suggest that the sample analyzed was at slightly lower risk and was more protected overall than the general population samples from these states. There were equally low correlations between missingness on these items and the demographic variables, suggesting that missing data on outcomes did not seriously bias the results reported here.

Calculation of Aggregate Risk and Protection Scores

A challenge in assessing the influence of exposure to multiple risk and protective factors lies in determining how to combine individual risk and protective factor measures into indicators of aggregated levels of exposure to risk and protection. Newcomb and Felix-Ortiz (1992) defined exposure to a risk or protective factor as a score in the upper 20 percent of the scale's distribution and reported the aggregate number of risk and protective factors as a count of the number of scales for which an individual was in the top 20 percent of the distribution. This approach creates difficulties. Dichotomizing the individual scales results in a loss of information. Moreover, there is little empirical basis for specifying cut points in the distributions of self-report measures of risk and protective factors. To avoid these difficulties, a different method was implemented to assess aggregated risk and protection. For each risk and protective factor scale, *z*-score distributions were calculated within each grade level.

Then, for each student, two scores were calculated: a mean of the *z*-scores across all of the risk factor scales (aggregate risk) and a mean of the *z*-scores across all of the protective factor scales (aggregate protection).

RESULTS

The prevalence of the substance use, school, and delinquency behavioral outcomes by grade level is shown (Table 3). It is noteworthy that the prevalence of substance use corresponds closely to the prevalence at the same grade levels reported in the "Monitoring the Future" survey in 1994 and 1995 (Johnston et al., 1997). School outcomes included the proportion of students reporting a grade point average of 3.0 or more (that is, at least a B) and the proportion of students who reported they had brought a gun to school during the past year. Delinquency outcomes included the proportion of students who responded that they had been arrested or had "attacked someone with the idea of seriously hurting them" during the past year.

Distribution of Risk and Protection in the Sample

Cell frequencies for each combination of the aggregate risk and protection scores were categorized into five quintiles (level 0 to level 4; Table 4). Each quintile (row or column) contains 20 percent of the surveyed students. With increasing levels of risk,

TABLE 3—Prevalence of Outcome Behaviors by School Grade

Factor	Percent Missing	Grade							Combined
		6th	7th	8th	9th	10th	11th	12th	
Substance Use, Past 30 Days									
Alcohol	1.8	10.5	23.1	27.8	45.3	44.6	43.7	54.3	32.1
Marijuana	1.9	1.7	6.7	9.1	22.6	15.9	19.2	16.6	10.5
School, Incidents during Past Year									
Grade point average > 3.0	7.0	84.5	70.5	72.9	68.9	67.3	68.8	72.3	74.2
Gun taken to school	9.3	0.9	1.9	3.0	2.0	2.3	2.8	2.3	2.4
Delinquency, Incidents during Past Year									
Arrested	7.4	3.0	6.2	7.5	7.5	7.9	6.0	6.7	6.3
Attacked with intent to hurt	9.6	9.9	14.9	15.6	16.9	16.2	11.4	13.2	13.7

fewer individuals have high levels of protection, and conversely, more individuals with high levels of protection are found as overall risk decreases. Risk and protection are not independent, as indicated by the large χ^2 statistic (Table 4).

Across all students, the aggregate risk and protection scores show a substantial negative correlation of $r = -.66$. The shaded cells in Table 4 indicate combinations of high risk and high protection, or conversely, low risk and low protection. Although these represent nearly 50 percent of the cells in Table 4,

only about 21 percent of the respondents were in these cells. In this sample, there were not large numbers of adolescents who were exposed to high levels of risk who had high levels of protection. In the face of high risk exposure, it may be particularly challenging for young people to develop high levels of assets or protection. Conversely, it is noteworthy that few of those who had been exposed to low levels of risk failed to develop high levels of protection or assets.

Figures 1 through 3 show the prevalence of outcome variables plotted for each combination of risk

TABLE 4—Number and Percentage of Youths Exposed to Varying Levels of Risk and Protection

Risk Level	Protection Level					Row Totals
	0	1	2	3	4	
0	220	850	2,103	4,348	8,221	15,742
0-20%	0.3	1.1	2.7	5.5	10.4	20.0
1	733	2,273	3,929	4,779	4,008	15,742
20-40%	1.0	2.9	5.0	6.1	5.1	20.0
2	1,856	3,768	4,358	3,619	2,141	15,742
40-60%	2.4	4.8	5.5	4.6	2.7	20.0
3	4,010	4,948	3,565	2,199	1,020	15,742
60-80%	5.09	6.29	4.53	2.79	1.30	20.0
4	8,903	3,903	1,794	790	352	15,742
80-100%	11.3	5.0	2.3	1.0	0.4	20.0
Column totals	15,742	15,742	15,742	15,742	15,742	78,710
	20.0	20.0	20.0	20.0	20.0	100

$\chi^2_{(16)} = 36,804, p = .001.$

and protection levels. The horizontal axis of each figure arrays respondents in quintiles of increasing overall risk, whereas respondents' protection quintile level is coded using symbols on the plotted lines. Each data point on the plotted lines indicates the prevalence of the respective outcome behavior for students with that combination of risk and protection exposure level, for example, the relationship between risk level, protection level, and alcohol use in the past 30 days (Figure 1a). For each risk level, the lowest prevalence rate is for students with the highest level of protection, level 4, indicated by the plotted line with an *. The prevalence of alcohol use in the past 30 days among respondents at risk level 1 and protection level 4 was 14 percent. The prevalence of alcohol use in the past 30 days among students with a risk level of 3 but with a low level of protection (level 1) was about 48 percent. Because of the large number of students, the 95 percent confidence intervals for most of the data points are less than ± 2 percent. The cell with the lowest number of students in Table 4 (risk level = 0, protection level = 0) has a confidence interval of ± 6.6 percent. Given the large sample size, tests of statistical significance are less meaningful than observable differences in prevalence rates, and so statistical tests are not reported here.

The consistency of findings across the figures is striking. Increased levels of risk exposure are associated with increases in the prevalence of substance use, school problems, and delinquency. These relationships are curvilinear, with steep increases in prevalence associated with the highest levels of risk exposure. The degree of curvilinearity for risk appears to be related to the overall prevalence rate of the outcome. Outcomes such as marijuana use, taking a gun to school, or delinquent behavior, which have low baseline prevalence rates, show the highest degree of curvilinearity. More widespread behaviors like alcohol use show less curvilinearity, suggesting that exposure to high levels of risk is less necessary as a precondition for engaging in more prevalent (less deviant) behaviors in adolescence.

The results for protection are slightly less consistent across behaviors. Increasing protection is associated consistently with a decreasing prevalence of alcohol and marijuana use (Figures 1a and 1b), but increasing protection is related less clearly to a higher prevalence of high grade point average (GPA) (Figure 2a) or to lower prevalence of school misbehavior (Figure 2b), delinquency (Figure 3a), and violence (Figure 3b). Whereas students reporting the lowest level of protection (level 0) consistently

showed the highest prevalence of problem behavior and the lowest prevalence of academic success, students reporting the highest level of protection (level 4) did not always fare as well as students reporting moderate levels of protection.

The figures also show that the effects of protection are different at different levels of risk. Whereas more protection is associated typically with a lower prevalence of any problem behavior at any level of risk, the effects of protection on reducing problem behaviors become stronger as levels of risk exposure increase. Significant effects of protection in reducing the prevalence of problem behaviors are present only at the higher levels of risk exposure. For example, in Figure 1a, among respondents at the highest level of risk (level 4), for those with the lowest level of protection (level 0), the prevalence of alcohol use in the past 30 days was 69 percent, whereas for those with the highest level of protection (level 4), the prevalence of alcohol use in the past 30 days was 46 percent. It should also be noted that at these high levels of risk exposure, high levels of protection did not eliminate problem behaviors. Even among those with high protection, prevalence rates of all problem behaviors increased with more risk exposure.

Generally, variation in levels of risk exposure appeared more strongly related to problem behavior outcomes than did variation in levels of protection. In Figure 1a, for example, within each level of risk the prevalence of alcohol use was reduced by about 30 percent from the highest to the lowest protection levels. In contrast, within each level of protection, the prevalence of alcohol use was decreased by more than 80 percent from the highest to the lowest risk levels.

The pattern of relationships between risk and protective levels and the positive behavior outcome of high GPA generally were consistent with the patterns seen for the problem behaviors (Figure 2a). At higher levels of overall risk exposure, the prevalence of respondents with high GPAs declined as hypothesized. However, the relation of overall risk and protection to GPA at lower levels of both risk and protection was less consistent than that found with respect to problem behaviors. For example, among students with the two lowest levels of protection, those with the lowest levels of risk (level 0) had lower prevalence of high GPAs than students with slightly higher levels of risk (levels 1 and 2). At low levels of risk, increased risk exposure was not associated with decreased prevalence of high GPAs among those with low levels of protection. However, the expected decreases in the prevalence of high

FIGURE 1a—The Association of Risk and Protective Factor Levels with Alcohol Use (Past 30 Days)

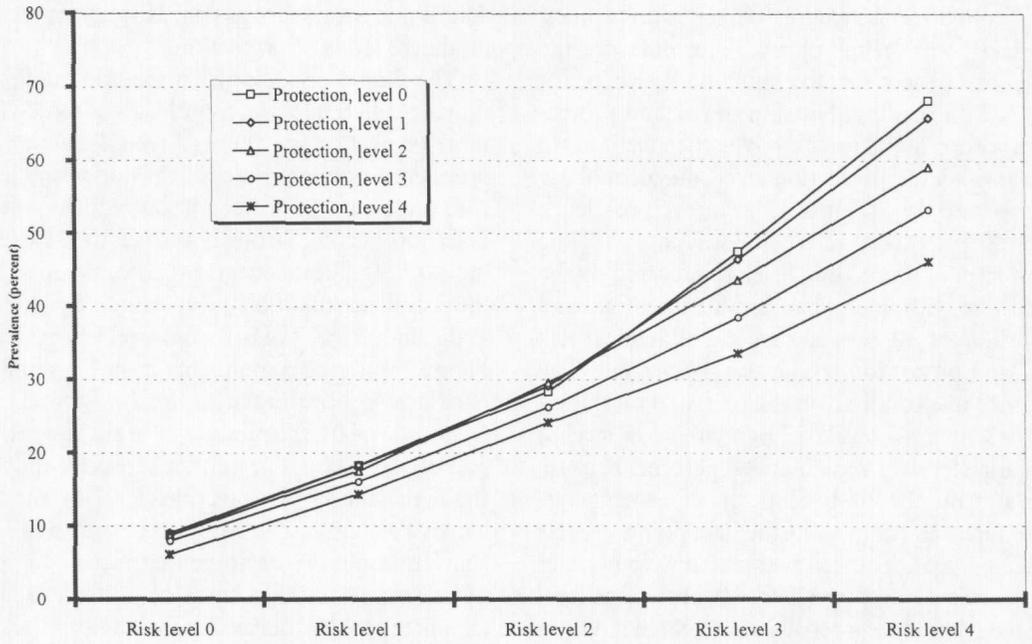


FIGURE 1b—The Association of Risk and Protective Factor Levels with Marijuana Use (Past 30 Days)

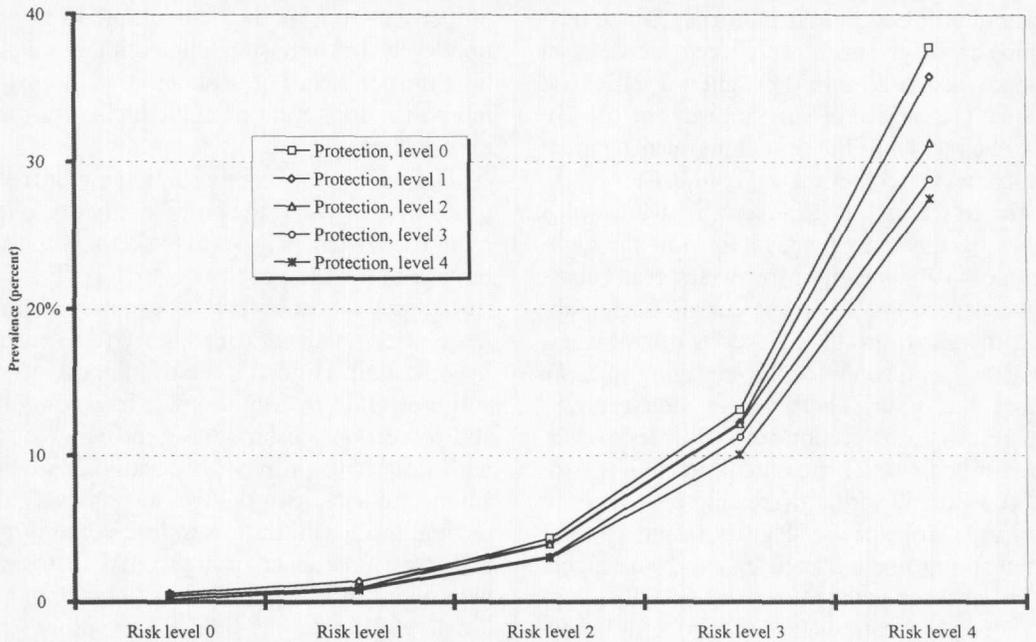


FIGURE 2a—The Association of Risk and Protective Factor Levels with High GPA (Past Year)

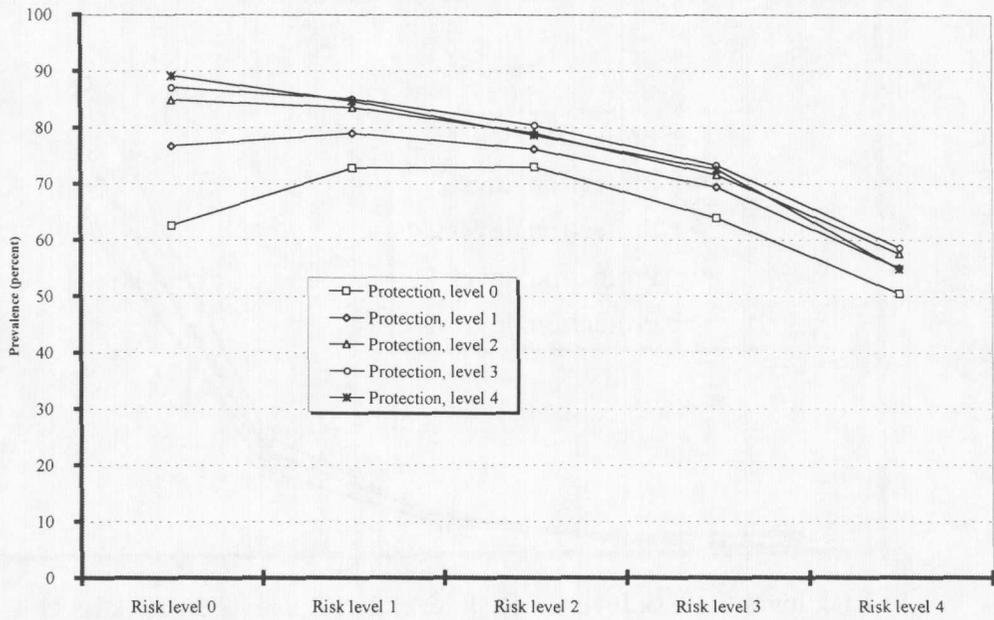


FIGURE 2b—The Association of Risk and Protective Factor Levels with Taking a Gun to School (Past Year)

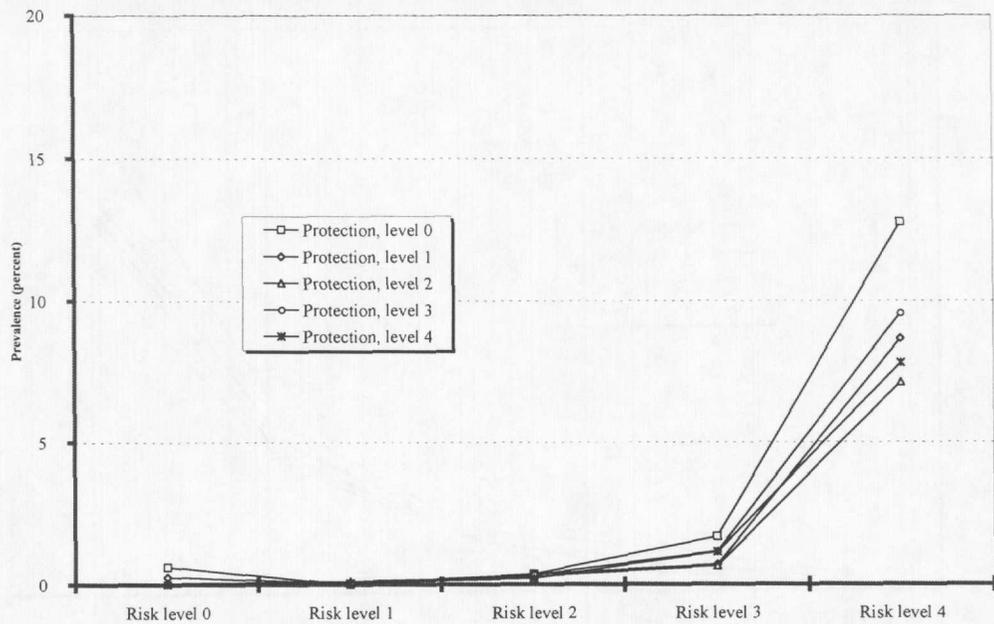


FIGURE 3a—The Association of Risk and Protective Factor Levels with Arrest (Past Year)

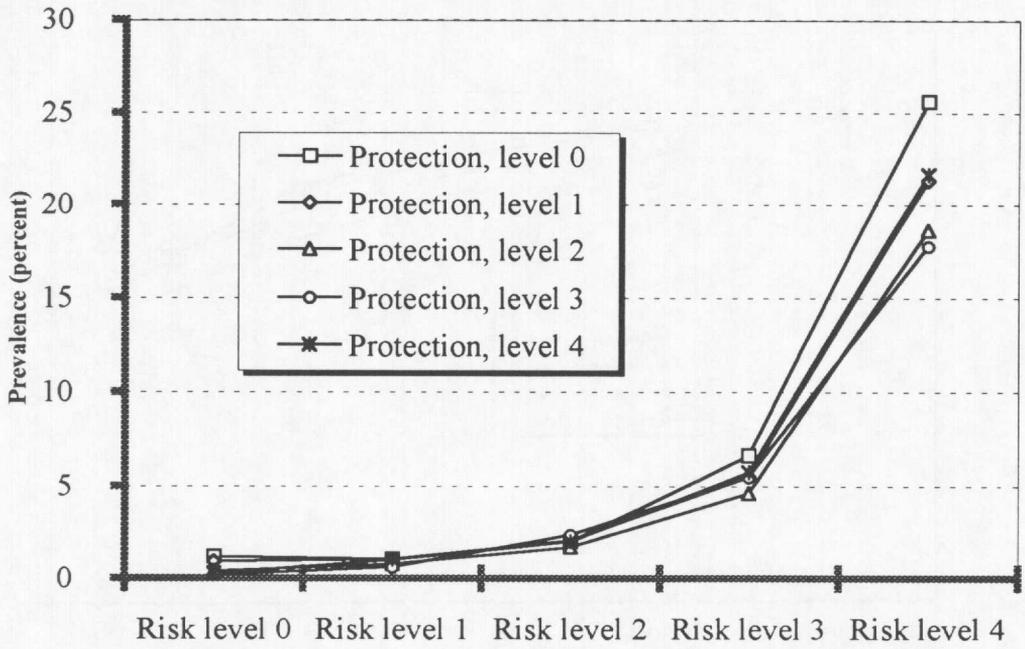
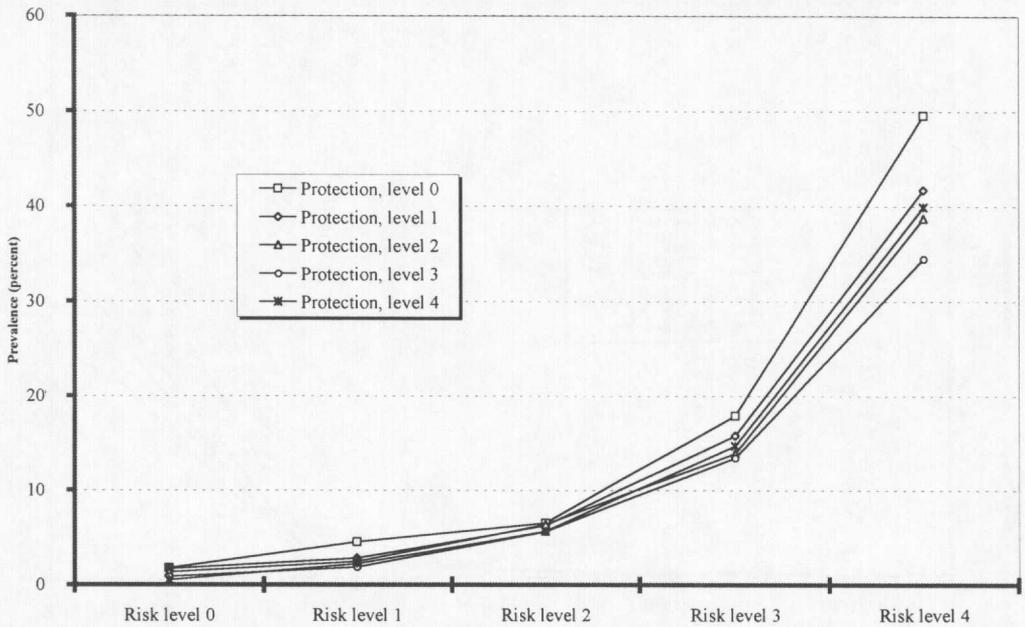


FIGURE 3b—The Association of Risk and Protective Factor Levels with Attacked to Hurt (Past Year)



GPA among those with low protection were observed as risk exposure increased to high levels. It should be noted that only 0.3 percent of the sample were at risk level 0 and protection level 0. More research is needed on the relationships between risk and protective factor exposure and positive outcomes in adolescence, especially for those with both low levels of risk and low levels of protection.

Logistic regression was used to test for the presence of an interaction between risk and protection in predicting each of the outcome behaviors. The aggregate risk and aggregate protection scores and a variable coding for the interaction (aggregate risk \times aggregate protection) between the two variables were included as predictors in models estimating the likelihood of each outcome.

The columns in Table 5 show the logistic *R* statistics and the odds ratios associated with each independent variable. The logistic *R* statistic is similar to a correlation coefficient and shows the degree of association between each independent variable and the presence of the outcome behavior. The odds ratio values indicate the change in odds of the behavior being present with a one-unit change in the independent variable, holding constant the contribution of the other variables. For example, an odds ratio value of 2.0 means that a one-unit increase in the predictor variable doubles the odds of the behavior being present. Conversely, a value less than 1.0 indicates a decrease in the odds of the behavior being present with a one-unit increase in the predictor variable.

Table 5 shows a significant interaction effect between aggregated risk and aggregated protection

scores in predicting the likelihood of each these behavioral outcomes. Given that the interaction term is significant, the logistic *R* statistics and odds ratios associated with each main effect cannot be taken at face value. The main effects for aggregate risk and for aggregate protection vary in relation to each other. Aggregate protection does not simply act in opposition to aggregate risk but instead moderates the negative effects of exposure to risk with increasing associations at increasing levels of risk.

DISCUSSION

Several methodological issues should be noted. These analyses allowed each risk factor and each protective factor to contribute equally to the overall risk and overall protection scores. Whereas this simplifying assumption was useful for the present analyses, it is likely that different factors contribute differentially to overall risk and protection. More research is needed on the relative strengths of specific risk and protective factors in predicting various outcomes and on the interactions of factors in the etiology of behavior.

Moreover, while the risk and protective factors measured in this study have been identified in longitudinal prospective studies as predictors of later problem behaviors, the data analyzed here were cross-sectional. Causal interpretation of the relationships among aggregate risk, aggregate protection, and the behavioral outcomes cannot be made from these analyses. The observed associations are not in and of themselves evidence that the risk and protective factors measured here produced or inhibited the observed behavioral outcomes. Furthermore, the set

TABLE 5—Summary of Logistic Regression Analysis and Odds Ratios Linking Risk and Protective Factors to Substance Use, School, and Delinquency Outcomes

Factor	Logistic <i>R</i> Risk	Odds Ratio Risk	Logistic <i>R</i> Protection	Odds Ratio Protection	Logistic <i>R</i> Risk \times Protection	Odds Ratio Risk \times Protection
Substance Use, Past 30 Days						
Alcohol	.27***	6.52	-.05***	.77	.08***	1.65
Marijuana	.35***	14.5	-.07***	.62	.13***	2.25
School, Incidents during Past Year						
Grade point average	-.17***	.37	.06***	1.33	-.04***	.80
Gun taken to school	.37***	20.3	-.06***	.58	.10***	1.85
Delinquency						
Arrested in past year	.35***	13.4	-.03***	.78	.08***	1.65
Attacked with intent to hurt	.34***	14.7	-.04***	.74	.07***	1.64

****p* < .001.

of risk and protective factors assessed was limited to those with reliable and valid measures in the survey used. Measuring a broader range of risk and protective factors might produce different results.

Given these caveats, several conclusions with important implications for prevention are noteworthy. First, increasing levels of risk exposure were consistently associated with greater prevalence of all the problem behaviors assessed here. This relationship was exponential. Large increases in the prevalence of problem behaviors were associated with the highest levels of risk exposure. These findings suggest that preventive interventions should be focused on geographical areas or populations exposed to high overall levels of risk.

Second, the findings indicate that simply focusing on strengthening assets or on protective factors without attending to risk exposure is incomplete as a strategy for reducing the prevalence of problem behaviors. Building assets among those exposed to low levels of risk will not reduce the prevalence of problem behaviors much, because in these groups the prevalence of these behaviors is already low as shown in Figures 1-6. Figures 1-6 also show that although the effects of protective factors were greatest at the highest levels of risk exposure, high levels of protection did not eliminate problem behaviors among those exposed to high levels of risk. The data suggest that building assets or protection among those exposed to high levels of risk is not likely to reduce the prevalence of problem behaviors as much as a strategy that is effective both in enhancing protection and reducing risk exposure in these groups.

Third, the results consistently indicated an interactive relationship between overall levels of risk and protection. For each of the problem behavior outcomes, the reduction in prevalence associated with higher levels of protection was greatest at the highest risk levels. These findings support a buffering hypothesis (for example, Landerman, George, Campbell, & Blazer, 1989; Rutter, 1979) of the relationship among aggregate risk, aggregate protection, and these behavioral outcomes. Protective factors moderate the negative effects of exposure to risk.

The strength and stability of these findings across different adolescent problem behavior outcomes are consistent with assertions that aggregated risk and protection levels exert a common etiological mechanism on multiple adolescent problem behaviors (Jessor & Jessor, 1977; Osgood et al. 1988). These data provide support for preventive interventions that seek to prevent multiple problem behaviors by

reducing shared risk factors and increasing shared protective factors for these problems.

Finally, as observed, the aggregate risk and protection variables were moderately negatively correlated. Both variables exhibited a positive skew, so that respondents were concentrated in the lower levels of aggregation and very few exhibited high levels of risk and protection.

These findings do not support the contention that programs and policies for children and youth should focus solely on strengthening assets or protective factors if the goal is to reduce the prevalence of adolescent problem behaviors. As measured here, overall levels of risk exposure accounted for most of the predicted variance of the problem behavior outcomes. Furthermore, in this large sample of 6th-through 12th-grade students, very few exposed to high levels of risk developed high levels of protection. It may be difficult to create and sustain high levels of assets or protection in the highest risk environments unless efforts also seek to reduce overall risk exposure as well.

Prevention policies and programs should focus on both the reduction of risk and the promotion of protective influences in communities. Epidemiological data on a comprehensive set of risk and protective factors can be useful in identifying populations in greatest need of preventive interventions. Access by local prevention planners to geographically specific epidemiological data on the prevalence of risk and protective factors is an important component of an ongoing community-centered process of tailoring prevention programming to address the risk and protective factors most salient in a neighborhood or community (Developmental Research and Programs, 1996). ■

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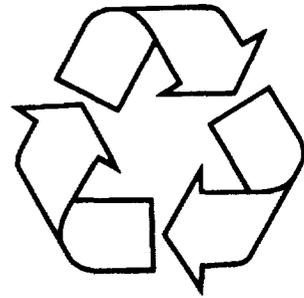
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