

# Early Predictors of Adolescent Violence

## ABSTRACT

**Objectives.** This study sought to identify early predictors of adolescent violence and to assess whether they vary by sex and across different types and levels of violence.

**Methods.** Data from a 5-year longitudinal self-report survey of more than 4300 high school seniors and dropouts from California and Oregon were used to regress measures of relational, predatory, and overall violence on predictors measured 5 years earlier.

**Results.** Deviant behavior in grade 7, poor grades, and weak bonds with middle school predicted violent behavior 5 years later. Attending a middle school with comparatively high levels of cigarette and marijuana use was also linked with subsequent violence. Early drug use and peer drug use predicted increased levels of predatory violence but not its simple occurrence. Girls with low self-esteem during early adolescence were more likely to hit others later on; boys who attended multiple elementary schools were also more likely to engage in relational violence.

**Conclusions.** Violence prevention programs for younger adolescents should include efforts to prevent or reduce troublesome behavior in school and poor academic performance. Adolescent girls may also profit from efforts to raise self-esteem; adolescent boys may need extra training in resisting influences that encourage deviant behavior. Programs aimed at preventing drug use may yield an added violence-reduction bonus. (*Am J Public Health.* 2000;90:566-572)

Phyllis L. Ellickson, PhD, and Kimberly A. McGuigan, PhD

During the last decade, violence has received increasing attention as a major public health issue for Americans of all ages.<sup>1</sup> Of particular concern is the degree to which violence affects the lives of youth, either as the perpetrators or as the victims of violence. Between 1985 and 1990, arrests for murder, manslaughter, and aggravated assault rose by 60% for children younger than 18 years.<sup>2</sup> Between 1985 and 1991, homicide arrest rates actually declined among those older than 25 years, but they doubled among younger males.<sup>3</sup>

These high rates of violence are mirrored by high rates of youth victimization, and violence and victimization tend to have common antecedents.<sup>4</sup> Moreover, despite the fact that rates of violent crime have declined across all age groups since 1994, adolescents between the ages of 12 and 19 years remain at highest risk for victimization by violent crime.<sup>5</sup>

Among the general population of adolescents, as opposed to those apprehended by the criminal justice system, violent behavior is also becoming increasingly common. Estimates of self-reported assaults among 17-year-olds who responded to the National High School Senior Study show that assault rates increased by at least 20% between 1975 and 1985.<sup>6</sup> Reports of violent victimization at school increased substantially between 1989 and 1995.<sup>7</sup>

In 1997, results from the Youth Risk Behavior Surveillance System Survey showed that 37% of students nationwide had engaged in a physical fight in the previous year, with the prevalence rates for local school-based surveys varying between 27% and nearly 50%.<sup>8</sup> Male students were nearly twice as likely as female students to have been in a physical fight (46% vs 26%); African Americans and Hispanics had substantially higher rates than Whites (43% and 41% vs 34%).<sup>8</sup> A study of high school seniors and dropouts from 8 California and Oregon communities

estimated that slightly more than one half had engaged in some form of relational or predatory violence in the previous year, and about 20% had engaged in multiple and persistent violence.<sup>9</sup>

The widespread nature of youth violence suggests that efforts to combat it need to be broad as well, to reach youth from different racial and social class groups in urban, suburban, and rural communities. However, although violence prevention programs are proliferating, few have been rigorously evaluated, and even fewer have been shown to yield positive results.<sup>10</sup> To improve our ability to prevent or curb violence among youth, we need a better understanding of how it comes about, the factors that promote it, and the factors that inhibit it. Some of our understanding of the etiology of youth violence comes from studies of youth in the criminal justice system,<sup>11,12</sup> but these studies do not allow us to identify factors that discriminate between violent and nonviolent youth.

In addition, although research on the predictors of general delinquency yields potentially important clues about the causes of violence, violent and nonviolent delinquents may differ from each other in significant ways.<sup>13</sup> Because very few studies distinguish the two, we still do not know whether the predictors of general delinquency and those of violent behavior are the same.<sup>14</sup>

We also need better information on whether boys and girls are differentially vulnerable to environmental and individual characteristics that might foster later violence. Because boys are far more prone to both general delinquency and violence,<sup>15-17</sup> studies of what leads to either behavior have often focused solely on boys or failed to ask how

The authors are with RAND, Santa Monica, Calif.

Requests for reprints should be sent to Phyllis L. Ellickson, PhD, RAND, PO Box 2138, Santa Monica, CA 90407-2138.

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the antecedents of delinquency or violence may vary by sex.<sup>12,18</sup> However, recent evidence suggests that teenaged girls are as likely as teenaged boys to hit family members and that girls with violent or deviant behavior are differentially vulnerable to family problems and poor mental health.<sup>9,19</sup> These findings suggest the need for further examination of sex differences in violence predictors.

The finding that boys and girls are equally likely to be violent toward family members also suggests the need to ask whether different types of violence have different antecedents. Two dimensions of particular interest are relational and predatory violence. The former refers to violence that arises from interpersonal disputes between family members, friends, and acquaintances; the latter refers to violent behaviors, such as mugging, robbery, and gang assaults, that are “perpetrated intentionally to obtain some gain or as part of a pattern of criminal or anti-social behavior.”<sup>10(p9)</sup> Among adolescents, relational violence is far more common than predatory violence.<sup>9,10</sup> Whether it also has roots in different childhood experiences and characteristics remains relatively unexplored.

In this study we used data from a longitudinal panel study of more than 4000 high school seniors and dropouts to address the following questions: What characteristics of seventh graders and their environments discriminate between those who will be violent 5 years later and those who will not be violent? Are the predictors of violence different for adolescent girls and boys? for relational vs predatory violence? for any violence vs amount of violence?

## Methods

### Subjects

Subjects included in this study were participants in the RAND Adolescent Panel Study, a multiyear examination of substance use and related health-compromising behaviors. The study sample included students originally drawn from 30 California and Oregon middle or junior high schools. Schools were selected to reflect a broad range of community environments, including urban, suburban, and rural school districts. Nine schools had minority populations of 50% or greater, and 18 schools drew from areas with household incomes below the state median.

In this study we used data from the first and seventh data collection waves, conducted in 1985 and 1990. At baseline, when the students were in the 7th grade, 6527 subjects completed surveys administered in school; 5 years later, when the students were in the

12th grade (or of comparable age), 4390 students (67%) completed surveys mailed to their homes. Of these students, 10.4% had dropped out of high school. The sample was composed of 3128 White students (71%), 345 African Americans (8%), 387 Hispanics (9%), 392 Asians (9%), and 133 Native Americans or students who identified themselves as having other racial/ethnic backgrounds (3%). Nonresponse weights were developed to minimize attrition bias (as described subsequently).

### Measures

For the dependent variables, we used dichotomous and continuous measures of 3 types of violence assessed at grade 12: relational violence (persistent hitting), predatory violence, and overall violence.<sup>9</sup> These measures were derived from confirmatory factor analysis, which showed evidence of an overall violence factor and 2 subfactors similar to the constructs of relational and predatory violence discussed by Tolan and Guerra.<sup>10</sup> Two items contributed to relational violence: hitting or threatening to hit a family member or someone outside the family. Four items contributed to predatory violence: past-year use of force or strong-arm methods to obtain money or things from people, involvement in gang fights, attacking someone with the intent of seriously hurting or killing them, and carrying a hidden weapon. All 6 items contributed to overall violence.

Because the hitting items included threats, we required a response of 3 or more times in the previous year to either item for a positive code on the dichotomous measure of relational violence. Subjects who responded positively to 1 or more of the relevant scale items were given a score of 1 on the dichotomous variables for predatory and overall violence. We examined predictors of any violence for each category and, given the occurrence of violence, the amount (or frequency) of each type of violence in the previous year (ranging from 1 time to 20 or more times).

We chose predictor variables representing 7 key domains identified as influential in theories of adolescent development and empirical research on delinquency: school bonds, family bonds, other problem behaviors, exposure to deviant social influences, personality and attitudes, school and neighborhood context, and sociodemographic characteristics.<sup>20–27</sup> Each predictor was assessed at grade 7, 5 years before completion of the outcome measures (Table 1).

We treated poor school performance (represented by self-reported grades) as an indicator of weak commitment or bonding to the academic environment.<sup>28</sup> Number of

elementary schools attended taps disruption in the child's relationship to school; it may also reflect the family's residential or marital stability.<sup>29</sup> We measured family bonds by whether the student was raised in a nuclear or disrupted family (with the latter defined as one in which 1 or both natural parents were absent) and whether the student reported that he or she discussed personal problems with his or her parents.

Other problem behaviors were represented by early deviance and substance use. Deviance at grade 7 was measured with a 4-item scale that includes stealing, skipping school, cheating on tests, and being sent out of class (Cronbach  $\alpha=0.64$ ); substance use was an average of 3 items tapping the frequency—from never to daily—of using alcohol, cigarettes, and marijuana ( $\alpha=0.71$ ). We measured exposure to deviant social influences (i.e., drug users) according to perceived prevalence of friends and peers who use cigarettes, alcohol, and marijuana ( $\alpha=0.81$ ) and reported number of offers of these substances ( $\alpha=0.77$ ).

Personality and attitude scales included self-esteem and rebelliousness (2 items each). Although these items have low reliability ( $\alpha=0.55$  and  $0.42$ , respectively), we included them because they represent theoretically important predictors. Sociodemographic characteristics included the child's reported age at baseline, sex, parental education, and race/ethnicity (with separate dummy variables for White, African American, Hispanic, Asian, Native American, or multiracial). Parental education (average of mother's and father's educational level) was a proxy for household socioeconomic level. Contextual measures were ecologic and were assessed at the school and neighborhood levels: actual prevalence of drug use (cigarettes and marijuana) among eighth graders in the subject's middle school and socioeconomic status of the middle school's catchment area, indicated by census data (see Table 1).

### Nonresponse Weights and Missing Data Imputation

One third of the baseline sample subjects did not return a survey at grade 12; nonrespondents were more likely than respondents to be male, to have poor grades, to have used marijuana or cigarettes by grade 7, and to be African American or Hispanic. To correct for this attrition bias, we created nonresponse weights derived from a logistic regression model that regressed grade 12 survey return on multiple baseline characteristics (sex, race/ethnicity, disrupted family structure, academic ability, deviance, and drug-related beliefs). The resulting weights

**TABLE 1—Means and Zero-Order Correlations of Predictor Variables With Violence at 18 Years of Age: California and Oregon Adolescents 1985 and 1990**

	Mean (SD)	No. of Items	Zero-Order Correlation		
			Any Violence	Any Relational Violence	Any Predatory Violence
<b>Dependent variable (grade 12)</b>					
Any violence	0.50 (0.50)	6	...	...	...
Any relational violence (persistent hitting)	0.21 (0.41)	2	...	...	...
Any predatory violence	0.20 (0.40)	4	...	...	...
Amount (ln) of overall violence <sup>a</sup>	0.87 (0.82)	6	...	...	...
Amount (ln) of relational violence <sup>a</sup>	0.63 (0.66)	2	...	...	...
Amount (ln) of predatory violence <sup>a</sup>	0.75 (0.79)	4	...	...	...
<b>Predictor variable (grade 7)</b>					
School bonds					
Poor grades (A = 1, F = 5)	2.00 (0.80)	1	0.19	0.15	0.21
No. of elementary schools attended	2.10 (1.16)	1	0.07	0.08	0.07
Family bonds					
Nuclear family	0.64 (0.48)	1	-0.09	-0.07	-0.08
Talks to parents	0.63 (0.48)	1	-0.06	-0.03	-0.07
Problem behavior					
Deviance	0.47 (0.58)	4	0.20	0.17	0.23
Drug use frequency <sup>b</sup>	0.00 (0.80)	3	0.13	0.12	0.17
Social influences					
Perceived peer drug use <sup>b</sup>	-0.10 (0.88)	6	0.09	0.09	0.09
Drug offers	0.98 (1.11)	3	0.16	0.13	0.17
Personality and attitudes					
Self-esteem (low)	2.20 (0.90)	2	0.09	0.07	0.08
Rebelliousness <sup>b</sup>	-0.04 (0.79)	2	0.08	0.09	0.08
Sociodemographics					
Age at baseline	12.70 (0.54)	1	0.04	0.02 <sup>c</sup>	0.09
Sex (female)	0.54 (.50)	1	-0.22	-0.14	-0.25
Race					
White	0.71 (0.45)	1	-0.05	-0.04	-0.09
Black	0.08 (0.27)	1	0.06	0.05	0.07
Hispanic	0.09 (0.28)	1	0.02 <sup>c</sup>	0.03 <sup>c</sup>	0.06
Asian	0.09 (0.29)	1	-0.02 <sup>c</sup>	-0.01 <sup>c</sup>	0.00 <sup>c</sup>
Native American	0.02 (0.13)	1	0.01 <sup>c</sup>	-0.01	0.01 <sup>c</sup>
Multiracial	0.01 (0.12)	1	0.02 <sup>c</sup>	0.01 <sup>c</sup>	0.01 <sup>c</sup>
Parent education	2.00 (1.01)	4	-0.06	-0.04	-0.07
Contextual					
Neighborhood socioeconomic status <sup>d</sup>	0.34 (0.83)	3	-0.09	-0.06	-0.09
School drug use prevalence <sup>e</sup>	122.20 (32.17)	2	0.08	0.06	0.08

Note. Unless otherwise indicated, correlations are statistically significant at  $P < .05$ . ln = natural logarithm.

<sup>a</sup>Scale derived from confirmatory factor analysis.

<sup>b</sup>Scale created as the average of individual items that have been standardized with mean = 0 and standard deviation = 1.

<sup>c</sup>Not statistically significant.

<sup>d</sup>Weighted sum of standardized median family income, average education of adults, and percentage of families with both parents present in census tract of subject's middle school.

<sup>e</sup>Sum of percentage of school's eighth graders who indicated that they had ever used cigarettes or marijuana and percentage who had used each substance in the previous month.

were the reciprocals of the predicted probabilities of returning a survey at grade 12.<sup>30</sup> Note that weighting produces larger standard errors of estimates and, thus, more conservative hypothesis tests.

The weights removed 90% or more of the bias discussed earlier.<sup>31</sup> For example, the weighted 12th-grade sample yielded nearly the same estimate (49.7%) of baseline cigarette use as did the original group of 7th-grade respondents (50.2%), whereas the unweighted estimates (44.8%) understated the actual prevalence of cigarette use. However, because this strategy assumes that nonrespondents are

missing at random (once the predictors in the model are controlled), the weights cannot correct for any additional nonresponse bias that is not associated with the model's baseline predictors.<sup>32</sup> The weights allowed us to generalize to the baseline participants rather than to the entire 7th-grade cohort of each school. Nevertheless, nonresponse at baseline had little effect on sample characteristics, because baseline respondents closely resembled the entire cohort.<sup>33</sup>

Although the percentages of missing cases for any single predictor ranged from 1% to 6% of the sample, listwise deletion of

these cases would have resulted in a loss of 15% of the subjects. To reduce subject loss due to item nonresponse, therefore, we replaced missing values with regression imputation, using the other nonmissing predictors to estimate these values.

### Model Development

We used a 2-part model to analyze the prospective determinants of violence.<sup>34</sup> This approach is appropriate when (1) the outcome variable's distribution has a large proportion of zeros and a positive skew and (2)

the determinants of “any” occurrence of the outcome may differ from the determinants of the level of the same outcome. For example, boys and girls may be equally likely to engage in relational violence, but boys may do it more frequently than girls. The 2-part model would indicate that the data are consistent with this expectation if the predictor “gender” was not statistically significant in the logistic model (the first part) but was significant in the subsequent least squares regression (the second part). We used logistic regression to model whether any violence had occurred and least squares regression to model amount of violence, conditional on any violence having occurred.

We used explanatory variables measured at grade 7 to predict each of the 3 types of violence at grade 12: overall, relational, and predatory. We developed the models with a randomly selected sample of 50% of the observations, using stepwise logistic regression for the “any violence” measures and stepwise least squares regression for

the continuous measures. To guard against type I errors (findings of significance due to chance), we then cross validated the models on the remaining 50% of the sample. The decision rules used for variable inclusion with cross validation ensured that our type I error rate would be less than 0.0075 for a single hypothesis test. To account for both clustering of students within schools and the use of nonresponse weights, we adjusted the standard errors for all estimates with the Huber correction in the Stata 4.0 software package (Stata Corp, College Station, Tex).

## Results

### Bivariate Findings

Table 1 shows the zero-order correlations between the dichotomous measures of violence (any overall violence, relational violence, and predatory violence) and the hypothesized predictors. As we predicted, variables

from each domain were related to both general and more specific measures of violence. All of the predictors were significantly related to the occurrence of any violence except those tapping membership in 4 racial/ethnic groups: Asian, Hispanic, Native American, and multiracial. The results were similar for relational and predatory violence, with the following exceptions: age was not a significant predictor of persistent hitting, while being Hispanic was a significant predictor of predatory violence.

### Multivariate Predictors of Violence

When we controlled for all of the variables simultaneously, fewer predictors remained significant. Table 2 shows the logistic regression results for the dichotomous measures of violence and the ordinary least squares regression results for the continuous measures. Three characteristics measured during grade 7 consistently foretold the occurrence of violence (overall, relational, and

**TABLE 2—Grade 7 Predictors of Violence at Age 18 Years (Multivariate Models): California and Oregon Adolescents, 1985 and 1990**

	Presence of Violence at 18 Years of Age (Logistic Regression)			Amount of Violence at 18 Years of Age (OLS Regression)		
	Any Violence (n = 4380; Pseudo-R <sup>2</sup> = 0.082)	Any Relational Violence (n = 4326; Pseudo-R <sup>2</sup> = 0.060)	Any Predatory Violence (n = 4390, Pseudo-R <sup>2</sup> = 0.125)	Overall Violence (ln) (n = 2161 <sup>a</sup> ; R <sup>2</sup> = 0.057)	Relational Violence (ln) (n = 903 <sup>a</sup> ; R <sup>2</sup> = 0.005)	Predatory Violence (ln) (n = 743 <sup>a</sup> ; R <sup>2</sup> = 0.080)
	OR (95% CI)	OR (95% CI)	OR (95% CI)	β (SE)	β (SE)	β (SE)
School bonds						
Poor grades	1.34 (1.26, 1.43)	1.32 (1.16, 1.52)	1.49 (1.34, 1.65)	0.09 (0.021)****	NS	NS
No. of elementary schools attended	1.12 (1.06, 1.17)	1.14 (1.06, 1.23)	NS	0.04 (0.022*)	NS	NS
Family bonds						
Nuclear family	NS	NS	NS	NS	NS	0.12 (0.069)**
Talks to parents	NS	NS	NS	NS	NS	NS
Problem behavior						
Deviance	1.62 (1.37, 1.90)	1.46 (1.32, 1.63)	1.64 (1.46, 1.84)	0.13 (0.030)****	NS	NS
Drug use frequency	NS	NS	NS	NS	NS	0.11 (0.028)****
Social influences						
Perceived peer drug use	NS	NS	NS	NS	NS	0.07 (0.026)***
Drug offers	NS	NS	NS	NS	NS	NS
Personality and attitudes						
Self-esteem (low)	NS	1.13 (1.03, 1.23)	1.14 (1.03, 1.26)	NS	NS	NS
Rebelliousness	NS	NS	NS	NS	NS	0.07 (0.029)***
Sociodemographics						
Age at baseline	NS	0.85 (0.74, 0.96)	NS	NS	NS	NS
Sex (female)	0.43 (0.38, 0.49)	0.53 (0.46, 0.62)	0.29 (0.24, 0.36)	-0.23 (0.034)****	NS	-0.38 (0.062)****
Race						
White	NS	NS	0.68 (0.57, 0.80)	NS	NS	NS
Black	NS	NS	NS	NS	NS	NS
Hispanic	NS	NS	NS	NS	NS	NS
Asian	NS	NS	NS	NS	NS	NS
Native American	NS	NS	NS	NS	NS	NS
Multiracial	NS	NS	NS	NS	NS	0.44 (0.101)****
Parent education	NS	NS	NS	NS	NS	NS
Contextual						
Neighborhood socio- economic status	NS	NS	NS	NS	NS	NS
School drug use prevalence	1.004 (1.002, 1.007)	1.004 (1.001, 1.007)	NS	NS	0.0015 (0.00051)***	NS

Note. OLS = ordinary least squares; OR = odds ratio; CI = confidence interval; ln = natural logarithm.

<sup>a</sup>Subjects with a value of 1 in the logistic regression model and no missing data.

\*P < .10; \*\*P < .05; \*\*\*P < .01; \*\*\*\*P < .001.

predatory) by the end of the high school years: doing poorly in school, early deviant behavior, and being male. Middle school context and high mobility during elementary school also predicted later violence; adolescents who went to middle schools with relatively high levels of drug use among the student population and those who had shifted from one elementary school to another were more likely to engage in both overall and relational violence. Low self-esteem predicted both relational and predatory violence, but rebelliousness dropped out as a predictor. In contrast to the bivariate results, greater maturity (as measured by being comparatively older for one's grade level) acted as a damper for relational violence once we controlled for other predictors.

*Multivariate Predictors of Amount of Violence*

Our ability to predict the amount of violence exhibited by an adolescent, given that he or she had engaged in some violence, was limited (see Table 2). The models explained

less than 6% of the variance for overall violence, less than 1% for relational violence, and 8% for predatory violence. Only 1 variable, actual prevalence of drug use in the adolescent's middle school, predicted the amount of relational violence 5 years later. Four variables—poor grades, high elementary school mobility, early deviance, and sex—predicted amount of overall violence.

For predatory violence, there were 6 predictors: frequency of using alcohol, cigarettes, and marijuana during grade 7; higher levels of perceived drug use by one's middle school peers; being male; being multiracial; coming from a nuclear family; and rebelliousness. However, the last 2 variables had an impact that was contrary to our predictions, with adolescents from nuclear families more likely to be frequent perpetrators of predatory violence and rebellious youth less likely to be frequent perpetrators of predatory violence.

As Table 2 shows, different types of violence have both common and unique antecedents. Both relational and predatory violence are fostered by early deviance,

doing poorly in middle school, and low self-esteem; both are inhibited by being female. Unique predictors of relational violence included having attended 2 or more elementary schools and attending a middle school with comparatively high levels of drug use among its enrollees. Unique predictors of amount of predatory violence included early drug use and high perceived levels of drug use among one's middle school friends and peers.

*Multivariate Predictors by Sex*

Table 3 shows the degree to which sex differences in predictors of violence emerge during early adolescence. Variables with similar effects on whether seventh-grade boys and girls exhibited violence in the future included engaging in deviant behavior as younger adolescents and attending middle schools with comparatively high levels of drug use. Having poor grades in middle school was also important for both sexes, but it increased the odds for different types of violence: relational violence for girls and predatory violence for boys.

**TABLE 3—Grade 7 Predictors of Any Violence at 18 Years of Age, by Sex (Multivariate Logit Models): California and Oregon Adolescents, 1985 and 1990**

	Female Subjects			Male Subjects		
	Any Violence (n=2350, Pseudo-R <sup>2</sup> =>0.038)	Any Relational Violence (n=2322, Pseudo-R <sup>2</sup> =>0.054)	Any Predatory Violence(n=2354, Pseudo-R <sup>2</sup> =0.058)	Any Violence (n=2030, Pseudo-R <sup>2</sup> =>0.041)	Any Relational Violence (n=2004, Pseudo-R <sup>2</sup> =0.04)	Any Predatory Violence (n=2036, Pseudo-R <sup>2</sup> =>0.065)
	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)
School bonds						
Poor grades	1.37 (1.23, 1.52)	1.44 (1.19, 1.73)	NS	NS	NS	1.53 (1.35, 1.73)
No. of elementary schools attended	NS	NS	NS	1.20 (1.10, 1.32)	1.15 (1.04, 1.27)	NS
Family bonds						
Nuclear family	NS	NS	NS	NS	NS	NS
Talks to parents	NS	NS	NS	NS	NS	NS
Problem behavior						
Deviance	1.60 (1.32, 1.94)	1.41 (1.16, 1.73)	1.78 (1.40, 2.26)	1.84 (1.46, 2.33)	1.31 (1.10, 1.56)	1.72 (1.45, 2.02)
Drug use frequency	NS	NS	NS	NS	NS	NS
Social influences						
Perceived peer drug use	NS	NS	NS	NS	NS	NS
Drug offers	NS	NS	NS	NS	1.29 (1.15, 1.44)	NS
Personality and attitudes						
Self-esteem (low)	NS	1.21 (1.05, 1.38)	NS	NS	NS	NS
Rebelliousness	NS	NS	NS	NS	NS	NS
Sociodemographics						
Age at baseline	NS	0.67 (0.53, 0.83)	NS	NS	NS	NS
Sex (female)	NS	NS	NS	NS	NS	NS
Race						
White	NS	0.67 (0.49, 0.91)	0.57 (0.43, 0.76)	NS	NS	0.77 (0.62, 0.94)
Black	NS	NS	NS	NS	NS	NS
Hispanic	NS	NS	NS	NS	NS	NS
Asian	NS	NS	NS	NS	NS	NS
Native American	NS	NS	NS	NS	NS	NS
Multiracial	NS	NS	NS	NS	NS	NS
Parent education	NS	NS	NS	NS	NS	NS
Contextual						
Neighborhood socio- economic status	NS	0.79 (0.69, 0.91)	0.70 (0.61, 0.80)	NS	NS	NS
School drug use prevalence	1.005 (1.002, 1.008)	NS	NS	1.005 (1.003, 1.007)	NS	NS

Note. OR = odds ratio; CI = confidence interval.

Other variables acted as risk factors for girls but not for boys, and vice versa. Adolescent girls were more vulnerable to having low self-esteem as seventh graders and living in neighborhoods of low socioeconomic status: the former predicted relational violence for girls but not for boys; the latter predicted relational and predatory violence for girls alone. Adolescent boys, on the other hand, were more susceptible to the effects of high mobility during elementary school and being offered drugs during the seventh grade, both of which predicted future relational violence for male students but not for female students. Being White lowered the odds of predatory violence for both sexes but diminished the likelihood of relational violence for girls alone.

When we considered the amount of violence in which these adolescents engaged (data not shown), the most telling sex difference involved the number of predictors: 6 for boys and 2 for girls. These differences reflect the fact that both the frequency and the range of scores for amount of violence were lower for girls than for boys. Nevertheless, sex similarities and differences that were consistent with the results for any violence also emerged. Doing poorly in school raised the frequency of relational violence for girls and of overall violence for both girls and boys, while being White acted as a protective factor against increased relational violence only for girls. Boys, but not girls, engaged in more frequent violence if they had attended multiple schools during their elementary school years and had been exposed to deviant social influences in middle school (offers of drugs and perceived exposure to peers who use them). The sex analyses also showed that the counterintuitive effects noted earlier—those for family disruption and rebelliousness—occurred only for boys.

## Discussion

Analyses of predictors of violence among high school seniors and dropouts show that early deviant behavior, poor grades, weak elementary school bonds, and pro-drug middle school environments fostered violent behavior several years later. Adolescents who acted out by stealing or getting in trouble at school in grade 7 were significantly more likely to be violent 5 years later than those who did not. Coupled with poor grades, these deviant behaviors predicted relational and predatory violence, as well as overall violence. In addition, adolescents who attended several elementary schools, and who thus may not have developed strong bonds at any of them, were more likely to engage in overall

and relational violence as older teenagers. Similarly, “bad” school environments—specifically, those middle schools characterized by comparatively high levels of cigarette and marijuana use—also promoted subsequent violence. Such school environments provided an added stimulus to violent behavior even after we accounted for individual perceptions and behavior.

Background characteristics that predicted subsequent violence included 2 protective factors, being White and being female. Being White lowered the probability of engaging in predatory (but not relational) violence. However, identification with other racial/ethnic groups had no impact on violence once we controlled for early behavioral problems and environmental influences. Being female lowered the probability of engaging in both relational and predatory violence and, if engaged in, the amount of predatory (but not relational) violence. Thus, girls who stepped over the threshold and engaged in relational violence (hitting others at least 3 times or more in the previous year) were as likely as their male counterparts to engage in such violence frequently. Being comparatively older for one’s grade emerged as a damper on subsequent relational violence when we controlled for behavioral and environmental predictors.

Boys and girls were differentially susceptible to certain individual and environmental characteristics. Girls who exhibited low self-esteem as early as grade 7 were more likely to engage in relational violence 5 years later; those who attended schools in neighborhoods of low socioeconomic status were more likely to engage in both relational and predatory violence. Neither of these variables was significant for boys. Boys, on the other hand, were particularly vulnerable to repeated moves that involved attending different elementary schools and to exposure to pro-drug social influences (drug offers). The first raised the odds of persistently hitting other people along with the amount of hitting that occurred; the second increased the likelihood of engaging in relational violence and the amount of both relational and predatory violence.

Two other drug-related variables, early use of drugs and perceived prevalence of drug use among one’s middle school peers, affected the amount of violence in which teenagers subsequently engaged but did not predict its simple occurrence. The greater the frequency of one’s own drug use during middle school and the higher the perceived level of drug use among one’s peers, the greater the likelihood of frequent predatory violence. As with drug offers, the social influence variable (perceived drug use among one’s peers) was significant for boys alone.

Because early deviance and poor grades provide useful warning signals of later violence, these results suggest that violence prevention programs aimed at younger adolescents should include efforts to prevent or reduce troublesome behavior in school and poor academic performance. Such efforts should begin in elementary school, reflecting the fact that the deviant behavior and poor academic orientation that we measured had started at least as early as grade 6 and probably earlier. The fact that greater maturity acted as a damper on later violence, once we controlled for early deviance and other factors, also supports early prevention and intervention.

Little in this analysis argues for differential violence prevention efforts by race/ethnicity or social class. Most of the bivariate relationships between racial group and violent behavior disappeared when we controlled for behavioral and environmental factors, as did the links between parental socioeconomic status and violence. However, the differential impact of certain predictors by sex suggests that violence prevention efforts should be sensitive to the special needs of both sexes, particularly the higher-risk profiles of girls with low self-esteem and of boys who have experienced substantial discontinuity in their early school environment. In addition, the link between exposure to pro-drug environments and subsequent violence for boys suggests that they may profit from extra training in how to resist social pressures that encourage deviant behavior.

The results of this study also suggest that programs aimed at preventing drug use may yield an added violence-reduction bonus. Because middle schools with high rates of drug use foster later violence, reducing overall levels of drug use in the middle school population might limit the subsequent contextual impact of “bad” school environments. Because exposure to drug offers increases the likelihood of more frequent relational or predatory violence, helping middle school children—particularly boys—learn how to resist such offers might have the added benefit of reducing levels of violence several years later. Future research is needed to determine whether drug prevention programs actually yield these added benefits.

In terms of study limitations, we observed a good deal of unexplained variation for each of the models, which may be partly attributable to the nature of the dependent and independent variables, the types of models used, and the magnitude of elapsed time between measuring predictors and outcomes. In the part 1 (logistic regression) models, the outcome variables were dichotomous and had a restricted range of variation that could

be explained; hence, the pseudo- $R^2$  measure would typically be smaller in logistic regression than in linear regression. Because they were limited to explaining amount of violence given that some violence had already occurred, the part 2 (linear regression) models also had a restricted range of variation to be explained. In addition, we would expect a considerable amount of unexplained variation in behavior simply because we predicted violent behavior over a long time horizon (5 years).

Nevertheless, better measures of the theoretical constructs might also have improved the models' predictive power. For example, we lacked measures of family violence and parental supervision, both of which have been linked with later violence among children.<sup>35,36</sup> In addition, low reliabilities for the rebelliousness and self-esteem scales could account for the unanticipated negative relationship between violence and rebelliousness and for our failure to find consistent associations between self-esteem and later violence for both sexes. Future research would also benefit from improved operationalization of the underlying theoretical constructs. □

## Contributors

Both authors were involved in the design and analysis. P. L. Ellickson wrote the drafts; K. A. McGuigan offered revisions.

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