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Predictors of Future Fight-Related Injury Among Adolescents

Iris Wagman Borowsky, MD, PhD, and Marjorie Ireland, PhD

ABSTRACT. *Objective.* Nonfatal fight-related injuries among youths result in lost capacity and high costs of medical care and rehabilitation and constitute a major public health problem. This study identifies factors that predict the occurrence of a fight-related injury that requires medical attention among boys and girls.

Methods. We analyzed data from 14 787 adolescents who completing 2 interviews, approximately 1 year apart, in the National Longitudinal Study of Adolescent Health, a nationally representative, school-based sample of youths. We identified time 1 factors at the community, family, and individual levels that predicted any self-reported fight-related injury that required medical treatment at time 2.

Results. Factors that predict future injury among both boys and girls in multivariate models were violence-related factors: witnessing or being a victim of violence (odds ratio [OR]: 3.69; 95% confidence interval [CI]: 1.81–7.49 for boys; OR: 5.13; 95% CI: 1.25–21.09 for girls), history of a violence-related injury (OR: 2.30; 95% CI: 1.60–3.29 for boys; OR: 3.18; 95% CI: 1.87–5.41 for girls), and physical fighting (OR: 2.02; 95% CI: 1.44–2.84 for boys; OR: 5.15; 95% CI: 3.18–8.34 for girls). Among boys, illicit drug use was also an independent predictor of future injury (OR: 1.72; 95% CI: 1.24–2.37), whereas excellent perceived general health (OR: 0.48; 95% CI: 0.25–0.93) and a high grade point average (OR: 0.52; 95% CI: 0.29–0.95) were significant protective factors against fight-related injury. Girls who reported a high level of depressive symptoms were much more likely to report fight-related injury than nondepressed girls (OR: 8.98; 95% CI: 2.43–33.25).

Conclusions. Factors related to violence, substance use, school achievement, and physical and mental health predicted a future fight-related injury that required medical treatment. The results could assist health and social service providers, educators, and others in identifying youths who are at high risk for fight-related injury and may benefit from appropriate intervention. *Pediatrics* 2004;113:530–536; *violence, injury, physical fighting, adolescents, risk factors.*

ABBREVIATIONS. Add Health, National Longitudinal Study of Adolescent Health; RR, relative risk.

Nonfatal injuries resulting from violence are a critical dimension of the public health problem of youth violence. National estimates based on emergency department visits indicate that

there were 406 115 assault-related nonfatal injuries among youths ages 10 to 19 in 2000.¹ Thus, for every juvenile fatality as a result of violence, there were >150 nonfatal violent assaults that required medical attention.^{1,2} The health consequences of assault-related violence are severe, including permanent physical disabilities and high costs of medical care and rehabilitation.^{3,4} Whereas arrest records, victimization data, and hospital emergency department records have shown significant declines in violent behavior and firearm use in violent crimes among young people since 1994, confidential youth self-reports of assault with injury remained high and essentially level from 1993 to 1998 with prevalence rates of 10% to 15% among high school seniors.⁵ Thus, although youth violence is less lethal today than it was in 1993, the percentage of adolescents involved in serious, potentially lethal acts of violence remains alarmingly high. Although boys commit more violent acts than girls, there has been a narrowing of this gap between 1993 and 1998, with girls committing more violent acts in 1998 than in earlier years.⁶

Evidence suggests that nonfatal violence often precedes fatal violence among youths.⁷ Similarities between the demographic patterns of physical fighting and homicide nationally suggest that fighting is part of a spectrum of violent behavior that may result in homicide.⁸ Consistent with an association between violence-related nonfatal injury and homicide, injury surveillance among youths in Boston⁹ and Washington, DC,¹⁰ indicate a decline in violence-related injury that parallels the decline in youth homicide since 1994. Identifying predictors of violence-related injury among youths is a necessary first step toward developing screening and assessment tools to identify youths who are at increased risk for violence-related injury and targeting empirically based prevention and intervention strategies. Predictors of acts of violence and violent offending among youths derived from longitudinal analyses, such as the Pittsburgh Youth Study¹¹ and the Seattle Social Development Project,¹² include childhood aggression and antisocial behavior, hyperactivity, low academic performance, drug dealing, exposure to crime and violence, and peer delinquency. The more risk factors to which an adolescent is exposed, the greater the risk for violent outcomes.¹² The few studies that have examined factors that predict violence-related injury that requires medical attention among youths have used small samples limited to a single clinic or emergency department.^{13,14} In addition to limited geo-

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graphic representation, these studies have been characterized by limited gender and racial diversity.

The main objective of this study was to identify predictors of future fight-related injury that requires medical attention in a nationally representative sample of American adolescents. We used 1-year longitudinal data collected as part of the National Longitudinal Study of Adolescent Health (Add Health). Analyses of the Add Health data set have added to our understanding of risk behaviors and protective factors in adolescent development over time.^{15,16} This study compares predictors of fight-related injury for boys and for girls.

METHODS

Study Population

Add Health is a longitudinal study of adolescents in grades 7 through 12 that focuses on their health-related behaviors and the multiple social contexts in which they live. Extensive precautions were taken to maintain confidentiality and guard against deductive disclosure of participants' identities. All protocols received institutional review board approval. More detailed methodological information is available elsewhere.^{15,16}

The primary sampling frame included all high schools in the United States that had an 11th grade and a minimum of 30 enrollees ($N = 26\,666$). A systematic random sample of 80 high schools was selected proportional to enrollment size, stratified by region, urbanicity, school type (public, private, and parochial), and racial composition. For each high school, the primary feeder school that included 7th grade was also recruited. High schools that span grades 7 through 12 served as their own feeder school. The final sample included 134 schools.

Between September 1994 and April 1995, 90 118 of 119 233 eligible students in grades 7 through 12 completed the in-school questionnaire. A total of 164 school administrators also completed a survey describing school policies and environment, student body characteristics, and provision of health services in school. From school rosters and the in-school survey participants, a core random sample of adolescents stratified by grade and gender and oversampled subgroups, eg, black adolescents with at least 1 parent with a college degree, were selected for in-home interviews. The first wave of in-home interviews (time 1) was conducted between April and December 1995. Overall, 20 745 adolescents completed the 90-minute interview, representing 76.8% of those who were invited to participate. The interview included questions regarding health status, family dynamics, attitudes, and health-risk behaviors and yielded 2340 variables. Respondents listened to potentially sensitive questions through earphones and entered their responses directly into a laptop computer, thereby minimizing the potential for interviewer or parental influence on responses. In addition, a parent in each household completed a questionnaire that included items about parental education, employment, and income. From the in-home sample, 14 738 adolescents completed the second wave of interviews (time 2) conducted from April through August 1996. The mean interval between the time 1 and time 2 interviews was 11.0 months (95% confidence interval: 7.6–14.3 months). The 3292 respondents who were in the 12th grade at time 1 were not interviewed at time 2. The participants for this study were the 14 738 youths from the core sample as well as the oversampled subgroups that completed an interview at time 1 and time 2.

Measure of Outcome Variable

The time 2 outcome variable was assessed with the question, "During the past 12 months, how many times were you in a physical fight in which you were injured and had to be treated by a doctor or nurse?" The variable was dichotomized at 0 versus 1 or more times as a result of distributional skew, with 95.7% of respondents indicating 0 fight-related injuries that required medical attention.

Measures of Independent Variables

The time 1 independent variables were derived from a risk and resiliency framework, which proposes that vulnerability to health-

jeopardizing outcomes among youths is affected by the number and nature of life stressors as well as the presence of protective factors that buffer the impact of these stressors (Table 1). Behavioral and health status are described as emanating from the interplay of environmental factors, familial factors, and individual characteristics.^{17–19} Longitudinal studies, such as those by Quinton and Rutter²⁰ and Werner and Smith,²¹ have identified the role of environmental and family contexts and individual characteristics in promoting heightened or diminished well-being among high-risk children and youths who have experienced multiple stressors. Selection of risk and protective factors emphasized variables that can be used for assessment or are amenable to prevention and intervention efforts.

Cronbach's²² α reliability coefficients were used to estimate the internal consistency reliability of multi-item scales (Table 1). Sieving et al²³ demonstrated reliability and evidence of construct validity of self-report measures of school context, family context, and individual characteristics from Add Health.

Demographic variables that were assessed or used as controls in multivariate analyses included age, race/ethnicity, family structure, and socioeconomic status. Age was measured as a continuous variable; race/ethnicity was measured as black, Hispanic, or other, with white as the reference; and family structure was categorized as 2 biological parents in the home versus 2 biological parents not in the home. Socioeconomic status was measured as a composite of family income, parental education, and parental occupation.

Statistical Analysis

Each case in the sample was assigned a weight based on the sampling design so that the sample is nationally representative of adolescents in grades 7 through 12. Sample weights were used in all bivariate and multivariate analyses. Analyses were conducted separately by gender.

Bivariate associations between time 2 fight-related injury and potential predictors at time 1 were examined by using χ^2 tests. Multivariate analyses were used to assess the impact of these predictor variables on reporting a fight-related injury that required medical care while controlling for the other variables. For multivariate analyses, we used a generalized linear models procedure based on generalized estimating equations, PROC GENMOD, which permitted us to control for the cluster sampling plan, stratified by region.^{24,25} Because the dependent variable was dichotomized, we specified the binomial distribution for the dependent variable in the PROC GENMOD code. Initially, all variables were entered simultaneously into the multivariate model. A backward stepwise regression was performed whereby the variable with the largest P value was removed from the model, always retaining key demographic variables: age, race/ethnicity, family structure, and socioeconomic status. This step was repeated until all variables had $P \leq .10$.

RESULTS

The mean age of the sample before sample weights were assigned was 15.6 years: 52.8% were girls; 12.8% of parents reported an annual family income of $\leq \$20\,000$; and 53.5% were white, 21.3% were black, 16.9% were Hispanic, and 8.2% were from other ethnic backgrounds. One or more fight-related injuries that required medical care were reported by 633 (4.3%) of 14 738 adolescents. Of the youths who reported an injury, 386 (61.0%) reported 1 injury, 136 (21.5%) reported 2 injuries, and 111 (17.5%) reported 3 or more injuries. Gender information was available for 14 285 adolescents, with 5.8% of boys (396 of 6891) and 2.7% of girls (198 of 7394) reporting 1 or more fight-related injuries during the previous year.

Most of the variables assessed were significant predictors of a fight-related injury in bivariate analyses. In Table 2, we report only variables that were found to be significantly associated with fight-related injury for boys or girls. Mean age was similar for boys and girls with and without a future fight-

TABLE 1. Independent Variables

Variables	Select Descriptors of Variables	No. of Items Constituting Variables (Reliability Coefficient)*
Community context		
Adult caring	A 5-category variable: perceived caring by adults from not at all to very much	1
School connectedness	Feel that teachers treat students fairly; close to people at school; feel part of your school	6 ($\alpha = 0.76$)
Trouble getting along with teachers	Frequency: a 5-category variable from never to everyday	1
Counseling services at school†	Emotional counseling provided by school district	1
Consequences for violent behavior at school†	Warning/minor action, suspension, or expulsion for fighting with or injuring a student or teacher or carrying a weapon at school	4
Student prejudice	On a 5-point scale, agreement that students at your school are prejudiced	1
School safety	On a 5-point scale, agreement that you feel safe in school	1
Neighborhood safety	Usually feel safe in neighborhood (true or false)	1
Family context		
Parent–family connectedness	Closeness to mother and/or father, perceived caring by mother and/or father, satisfaction with relationship to mother and/or father, feeling loved and wanted by family members	12 ($\alpha = 0.86$ –0.88)
Parental presence	A parent present: before school, after school, at bedtime, or at dinner (summed)	
Parent school expectations	Mother’s and/or father’s expectations for you to complete high school and college	2 ($r = 0.45$)
Household access to guns	Reported easy availability of a gun in the home	1
Individual characteristics		
Fight-related injury	In past year, injury from a fight requiring medical treatment	1
Violence victimization	In the past year, witnessed or been a victim of a shooting, stabbing, or assault	5 ($\alpha = 0.61$ –0.73)
Physical fighting	Had a physical fight in the past year	1
Weapon carrying	Weapon carrying at school	1
Sexual violence	Victim or perpetrator of sexual violence	2
Suicide attempt	Attempted suicide in the past year	1
Symptoms of depression	CES-D	20 ($\alpha = 0.87$)
Perceived risk of death	Expect to be killed by age 21 and/or not alive by age 35	1
Somatic symptoms	In the past year, how often had headache, stomachache, fatigue, weakness, felt sick	8 ($\alpha = 0.75$ –0.81)
General health	On a 5-point scale, perceived general health	1
Physical examination	Routine physical examination in the past year	1
Religious identity	Pray frequently, view self as religious, affiliate with a religion	3 ($\alpha = 0.85$ –0.87)
Grade point average	Available grades in English, math, history/social studies, and science in most recent reporting period	4
Skipping school	This school year, how often skipped school	1
Alcohol use	Frequency: an 8-category variable from never/almost never to daily/almost daily used alcohol	2
Illicit drug use	Ever used marijuana, cocaine, inhalants, heroin, or other illicit drugs	3

CES-D indicates Center for Epidemiological Studies Depression Scale.

* Cronbach’s α coefficient was used to assess internal consistency of scales and is expressed as a range of values obtained for girls and boys. When there were only 2 items in a scale, we report Pearson’s correlation coefficient (r).

† Derived from school administrator questionnaire.

related injury. Under the domain of community, trouble getting along with teachers was associated with the highest relative risk (RR) of future injury for both boys and girls. Feeling unsafe in school was a significant predictor of future injury for boys and girls, whereas feeling unsafe in one’s neighborhood was not a significant predictor for any youth. Perceived student prejudice at school likewise was not a significant predictor of injury for boys or girls. In the context of family, disconnection from parents/family was associated with the highest RR of injury for both boys and girls. Overall, individual characteristics were the strongest predictors of fight-related injury. The highest RRs for future injury for both boys and girls were found for violence-related factors: history of a fight-related injury, witnessing and/or being a victim of violence, and physical fighting.

There were significant differences in variables associated with future injury between boys and girls. Easy availability of a gun in the home and low parental presence were significant predictors of injury for boys but not for girls. Conversely, school policies dictating more severe actions for acts of violence by students, low parental expectations regarding completion of high school and college, and no routine physical examination in the past year were significant predictors of injury for girls but not for boys. The 3 strongest predictors of fight-related injury for all youths were stronger predictors for girls than for boys: history of a fight-related injury (RR: 6.6 vs 3.3; $P < .001$), witnessing and/or being a victim of violence (RR: 4.4 vs 3.3; $P < .001$), and physical fighting (RR: 7.2 vs 3.2; $P < .001$).

Variables that were found to be significant predic-

TABLE 2. RR for Fight-Related Injury (Reported at Time 2): Bivariate Analyses

Time 1 Variable	Boys (<i>n</i> = 6913)		Girls (<i>n</i> = 7419)	
	Total No. (%)	RR (95% CI)	Total No. (%)	RR (95% CI)
Demographic characteristics				
Not living with both biological parents	3173 (45.9)	1.62 (1.33–1.98)	3489 (47.0)	1.41 (1.07–1.86)
Nonwhite	2367 (34.2)	1.62 (1.33–1.97)	2527 (34.1)	2.28 (1.73–3.01)
Low family SES*	3514 (51.2)	1.56 (1.27–1.91)	3976 (54.1)	1.62 (1.21–2.17)
Community context				
Low perceived adult caring†	950 (13.9)	1.93 (1.53–2.42)	804 (10.9)	2.03 (1.44–2.86)
Low school connectedness*	3250 (47.2)	1.66 (1.36–2.03)	3590 (48.6)	1.41 (1.07–1.86)
Trouble getting along with teachers†	1539 (22.6)	2.03 (1.65–2.50)	1079 (14.9)	2.50 (1.86–3.38)
More severe consequences for violent behavior at school*‡	3968 (60.1)	1.10 (0.89–1.36)	4295 (61.0)	1.65 (1.20–2.28)
Feel unsafe at school	859 (12.6)	1.66 (1.29–2.13)	937 (12.9)	1.92 (1.38–2.68)
Family context				
Low family connectedness*	3141 (45.5)	1.60 (1.31–1.96)	3786 (51.1)	1.72 (1.29–2.30)
Low parental presence*	3270 (47.9)	1.47 (1.20–1.79)	3558 (48.7)	1.18 (0.89–1.56)
Low parental school expectations*	3647 (53.5)	1.18 (0.97–1.45)	3713 (51.0)	1.46 (1.10–1.94)
Household access to gun	1985 (29.0)	1.34 (1.09–1.65)	1303 (17.7)	0.91 (0.62–1.32)
Individual characteristics				
Violence-related injury	768 (11.2)	3.33 (2.70–4.11)	403 (5.4)	6.60 (4.91–8.88)
Any violence victimization	2166 (31.6)	3.32 (2.71–4.06)	1238 (16.8)	4.38 (3.33–5.76)
Physical fighting	3053 (44.6)	3.23 (2.59–4.04)	1760 (23.9)	7.22 (5.35–9.73)
Weapon carrying	970 (14.2)	2.20 (1.76–2.74)	345 (4.7)	2.44 (1.57–3.79)
Sexual violence§	90 (1.3)	1.88 (1.00–3.52)	496 (6.7)	1.76 (1.14–2.72)
Suicide attempt	172 (2.5)	2.46 (1.65–3.69)	421 (5.7)	2.77 (1.88–4.08)
Symptoms of depression	939 (13.6)	2.34 (1.88–2.91)	1765 (23.8)	2.26 (1.71–2.98)
Perceived risk of death	993 (15.7)	2.21 (1.76–2.76)	964 (14.4)	1.96 (1.41–2.73)
Somatic symptoms*	3013 (43.6)	1.50 (1.23–1.83)	4335 (58.4)	1.57 (1.17–2.12)
Poor perceived health	422 (6.1)	1.85 (1.35–2.53)	601 (8.1)	1.57 (1.03–2.39)
No routine physical examination in past year	2293 (33.3)	1.19 (0.97–1.46)	2731 (36.9)	1.39 (1.05–1.84)
Low religious identity*	3839 (55.6)	1.37 (1.12–1.68)	3599 (48.5)	1.64 (1.24–2.18)
Low GPA*	3144 (47.0)	2.10 (1.70–2.60)	2638 (36.8)	1.89 (1.43–2.49)
Skipped school	1830 (27.0)	2.46 (2.01–3.01)	1624 (22.4)	2.40 (1.81–3.18)
Any alcohol use	3066 (45.0)	2.24 (1.81–2.76)	3280 (44.6)	2.44 (1.82–3.28)
Any illicit drug use	2040 (30.2)	2.70 (2.21–3.30)	1966 (26.9)	2.21 (1.68–2.92)

CI indicates confidence interval; SES, socioeconomic status; GPA, grade point average.

* In bivariate analyses, multi-item scales were dichotomized at the median.

† Trouble getting along with teachers about once a week or more often versus less often. Perceived adult caring not at all, very little, or somewhat versus more.

‡ Derived from school administrator questionnaire.

§ For boys, ever physically forced someone to have sexual intercourse against her will. For girls, ever physically forced to have sexual intercourse against your will.

|| A score of 22 or greater for boys and 24 or greater for girls was used to define "symptoms of depression." Those scores maximize the sensitivity and specificity of the CES-D for predicting clinical depression in adolescents.²⁶

tors of future injury among both boys and girls in multivariate analyses were violence-related variables: witnessing or being a victim of violence, history of a fight-related injury, and physical fighting (Table 3). Among boys, illicit drug use was also an independent predictor of future injury, whereas better perceived general health and a higher grade point average were significant protective factors against fight-related injury. Girls who reported the highest level of depressive symptoms were much more likely to report fight-related injury when compared with nondepressed girls (odds ratio: 8.98; 95% confidence interval: 2.43–33.25). Variables that were evaluated in bivariate analyses (Table 2) and are not shown in Table 3 were excluded from the final multivariate models because of $P > .10$.

DISCUSSION

We found that 6% of boys and 3% of girls reported sustaining a fight-related injury that required medical care in the previous year. Fighting; witnessing or being a victim of serious violence such as a shooting, stabbing or assault; and previous fight-related injury

were independent predictors of a fight-related injury in the next year for boys and girls. Illicit drug use, poor school performance, and poor perceived general health in boys and symptoms of depression in girls were additional salient independent risk factors for fight-related injury.

It should be noted that the data are based on self-reporting of injury that required medical treatment and do not indicate with whom the respondent fought, the nature of the youth's involvement in the fight, the severity of the injury, or the location where medical care was received. Evidence suggests that self-reported health-related questions produce largely valid and reliable data, including among adolescent populations.^{27,28} The self-reported injury rates that we found using the 1995–1996 Add Health data set are the same as those reported for the 1995 Youth Risk Behavior Survey.²⁹ This school-based, self-report survey found that 5.7% of boys and 2.5% of girls reported a fight-related injury that required medical attention. Reports from the 1993, 1997, 1999, and 2001 Youth Risk Behavior Surveys indicate that these rates have remained stable.²⁹ Injury rates that

TABLE 3. ORs for Fight-Related Injury (Reported at Time 2): Multivariate Analyses*

Time 1 Independent Variable	Boys		Girls	
	OR (95% CI)	P Value	OR (95% CI)	P Value
Violence victimization†	3.69 (1.81–7.49)	<.001	5.13 (1.25–21.09)	.024
Violence-related injury	2.30 (1.60–3.29)	<.001	3.18 (1.87–5.41)	<.001
Physical fighting	2.02 (1.44–2.84)	<.001	5.15 (3.18–8.34)	<.001
Illicit drug use	1.72 (1.24–2.37)	.001	...‡	
Household access to gun	1.36 (0.95–1.94)	.089	...	
Trouble getting along with teacher†	1.37 (0.99–1.89)	.058	...	
Grade point averaget	0.52 (0.29–0.95)	.035	...	
General health†	0.48 (0.25–0.93)	.030	2.29 (0.85–6.20)	.10
Symptoms of depression†	...		8.98 (2.43–33.25)	.001

OR indicates odds ratio.

* ORs and 95% CIs represent relationship between the independent variable at time 1 and violence-related injury at time 2 while controlling for all other independent variables in the table, age, and family SES. Variables evaluated in bivariate analyses (Table 2) that do not appear in the table were excluded from the final models because of $P > .10$.

† Nondichotomous variables and multi-item scales were adjusted to range from 0 to 1. The OR represents the odds of reporting a violence-related injury requiring medical care for those at the highest end of the variable or scale when compared with those at the lowest end of the variable or scale.

‡ Ellipses indicate that the variable was excluded from the final model because of $P > .10$.

are based on confidential youth self-reports are higher than those that are based on surveillance data collected in medical settings. Annualized national estimates of assault-related injury based on emergency department visits from July through December 2000 indicate a rate of 1.3% for boys and 0.8% for girls among youths aged 10 to 19 years in the United States.¹ National estimates of fight-related injury treated by primary care providers and school nurses are not available. Sege et al³⁰ found an intentional injury rate of approximately 6 per 1000 children aged 3 to 18 years among 4 primary care sites affiliated with a health maintenance organization in Massachusetts. The authors reported that this estimate, based on computer-assisted record review, was likely an underestimate. Using medical record review, another study found an intentional injury rate of 12% over a median follow-up period of 5.5 years among 430 patients seen at an adolescent clinic in East Boston.¹⁴ A hospital-based injury surveillance system for youths was found to provide more detailed information than publicly available sources of data, such as the victim–offender relationship, injury circumstance, and weapon use.³¹

Our results are consistent with previous findings that were based on risk factor data collected on an adolescent health intake form for adolescents who sought care at a single clinic.¹⁴ Three factors were identified as independent predictors of future intentional injury: not in school or failing, any drug use, and any fights. Both Sege et al¹⁴ and Lowry et al³² found that the likelihood of being injured increased as the number of physical fights in the past year increased. In addition to fighting, witnessing or being a victim of serious interpersonal violence and previous fight-related injury emerged as independent violence-related predictors of future injury in our study. Girls with each of these violence-related risk factors were at particularly heightened risk for injury as compared with girls without these risk factors. In this national school-based sample of adolescents, we found that 32% of boys and 17% of girls reported witnessing or being the victim of a shooting, a stabbing, or an assault in the past year. Life-

time exposure to serious violence of 88% among preadolescent children from an urban middle school and 57% among preadolescent children from a suburban middle school has been reported,³³ with other studies of inner-city or low-income children and youths also reporting extensive lifetime exposure to violence.^{34–36} In their cross-sectional analysis of a nationally representative sample of adolescents aged 12 to 21 years that included out-of-school youths, Lowry et al³² also found an independent effect of carrying a handgun or other weapon on sustaining a fight-related injury that required medical treatment. Their analysis controlled for the frequency of physical fighting and demographic characteristics. Fights that involve participants who frequently carry weapons, are gang members, or are intoxicated have been found to result in more severe injury, as do fights with more than 4 participants.³⁷ Adolescent girls who sustained serious injuries as a result of assaults were more likely than assaulted adolescent boys to have preexisting psychosocial impairments, including problems with social interactions, such as violent or physically aggressive behaviors.³⁸

Intentional injury has been described as a chronic recurrent disease.^{39,40} Rates of recidivism may be as high as 44% and 5-year mortality rates as high as 20%.³⁹ We found that factors that predict fight-related injury parallel risk factors associated with violence perpetration.^{41,42} Other studies have documented that victims of violence are disproportionately the perpetrators of violence.^{13,43} Although studies suggest that adolescents who present for emergency treatment of violence-related injury are at high risk for both repeated injury and violence perpetration, these patients have been found to be less likely than adolescents who present with other complaints to have follow-up advised at the time of their emergency department visit.⁴⁴ An emergency department intervention that included arranging patient follow-up before discharge from the emergency department, referral to mental health services, and linking families with community resources to help address family needs and violence-related issues

showed promise for decreasing injury recidivism among youths in the program.⁴⁵

Our results underscore the importance of depression as a risk factor for injury from interpersonal violence involvement among adolescent girls. Symptoms of depression markedly increase the risk of fight-related injury among adolescent girls who are involved in violence as a perpetrator, witness, or victim. Although depressive disorders are strongly associated with suicide attempts and completed suicide among girls and boys,⁴⁶ a relationship between depression and interpersonal violence has also been documented.^{41,42,47} Although depression has been characterized as an internalizing problem and aggressive behavior as an externalizing problem,⁴⁸ these psychosocial problems are associated. Encouraging is that there are effective treatments for adolescent depression, including selective serotonin reuptake inhibitors and cognitive-behavioral therapy.^{49,50} Clinicians must be able to identify, diagnose, and treat depression using practice guidelines, accessible mental health referral resources, and consultation with mental health specialists.

Health care professionals can play an important role in identifying and intervening on behalf of young people who are at risk for future intentional injury. Involvement in violence as a perpetrator, victim, and witness should be ascertained. Intervention strategies based in parents, families, schools, and communities have demonstrated effectiveness in preventing violent behavior, even among youths who are already involved in serious violence.^{5,51,52} Effective interventions include parent training programs, family therapy, home-visiting interventions, and school-based social-cognitive curricula. Health care providers should become familiar with these resources in their communities, refer appropriate patients and families to them, and advocate for development of these effective programs where they are lacking. Like patients who present with self-inflicted injuries, patients with fight-related injuries are at risk for recurrence and may present a danger to themselves and others. The period of greatest risk for reinjury is likely in the next month after presenting for an assault-related injury.⁵³ History taking should include details of the injurious event and the youth's future intentions to use violence, as well as a psychosocial assessment that includes involvement in fighting, exposure to violence as a witness or victim, symptoms of depression, drug use, access to guns, and school achievement. The association of fight-related injury with multiple factors in bivariate analyses supports the co-occurrence of adolescent health-risk behaviors. Screening instruments such as the FISTS Mnemonic,⁵⁴ HEADSS assessment,⁵⁵ and Pediatric Symptom Checklist⁵⁶ can be helpful. Zun and Rosen⁵⁷ described the use of an assessment tool that was developed to determine the psychosocial needs of youths who are victims of interpersonal violence in the acute care setting. Computer-assisted assessment may represent a useful tool for increasing adolescent reporting of behavioral risk factors and providing preventive health information, including in the emergency department setting.^{58,59} Incorporating

screening, intervention, and referral for substance abuse into the care of the injured patient would likely reduce injury recurrence.^{60,61} Kuresi et al⁶² found that parents whose children make an emergency department visit for mental health assessment or treatment will take new action to limit access to firearms if instructed to do so. Conversely, there is evidence that unless this discussion is held, parents will not, on their own initiative, take the necessary precautions.⁶³ School-based identification and intervention with at-risk youths is also feasible and can be effective.⁶⁴ Future research should evaluate the effectiveness of screening, assessment, and theoretically grounded intervention in the clinical setting in reducing fight-related injury among youths.

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