

# Mental Disorders and Violence in a Total Birth Cohort

## Results From the Dunedin Study

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**Background:** We report on mental disorders and violence for a birth cohort of young adults, regardless of their contact with the health or justice systems.

**Methods:** We studied 961 young adults who constituted 94% of a total-city birth cohort in New Zealand, April 1, 1972, through March 31, 1973. Past-year prevalence of mental disorders was measured using standardized *DSM-III-R* interviews. Past-year violence was measured using self-reports of criminal offending and a search of official conviction records. We also tested whether substance use before the violent offense, adolescent excessive perceptions of threat, and a juvenile history of conduct disorder accounted for the link between mental disorders and violence.

**Results:** Individuals meeting diagnostic criteria for alcohol dependence, marijuana dependence, and schizophrenia-spectrum disorder were 1.9 (95% confidence interval [CI], 1.0-3.5), 3.8 (95% CI, 2.2-6.8), and 2.5 (95% CI, 1.1-5.7) times, respectively, more likely than con-

trol subjects to be violent. Persons with at least 1 of these 3 disorders constituted one fifth of the sample, but they accounted for half of the sample's violent crimes (10% of violence risk was uniquely attributable to schizophrenia-spectrum disorder). Among alcohol-dependent individuals, violence was best explained by substance use before the offense; among marijuana-dependent individuals, by a juvenile history of conduct disorder; and among individuals with schizophrenia-spectrum disorder, by excessive perceptions of threat and a history of conduct disorder.

**Conclusions:** In the age group committing most violent incidents, individuals with mental disorders account for a considerable amount of violence in the community. Different mental disorders are linked to violence via different core explanations, suggesting multiple-targeted prevention strategies.

*Arch Gen Psychiatry.* 2000;57:979-986

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**I**NDIVIDUALS with mental disorders, including substance dependence, are at risk of committing violence.<sup>1-7</sup> Scientists and professionals do not welcome this finding because it stigmatizes these individuals. However, research that provides sound explanations for the link may help to reduce ignorance that fuels public fears and to inform strategies for preventing or limiting violence among the mentally ill.

Research on violence and mental illness is dominated by data on discharged patients, but most individuals with mental disorders are not hospitalized.<sup>8,9</sup> Likewise, most violent individuals are not convicted of crimes.<sup>10-12</sup> As a result, research sampling of hospitalized patients and convicted offenders selectively undercounts rates of mental illness and violence in the general population, potentially biasing findings about their association.<sup>13,14</sup> Epidemiological studies of official registers

have addressed these associations in the population.<sup>3,4,6</sup> However, these studies overlook unregistered cases, and by examining lifetime records they have not established that mental disorder and violence coincide at the same period in an individual's life. Existing studies also have not established that mental disorder is a risk factor for violence in young adulthood, which is the peak period for violence<sup>15</sup> as shown by self-report,<sup>10</sup> victimization report,<sup>16</sup> and arrest data.<sup>17</sup>

We herein report the first study of the extent of concurrent overlap between mental disorders and violence among young adults to ascertain the proportion of violence attributable to offenders with mental disorders during the age when they contribute most heavily to the burden of violence victimization in the community. Because half of all persons meeting criteria for a mental disorder have at least 1 other disorder,<sup>18-20</sup> it is important to con-

## SUBJECTS AND METHODS

### SAMPLE

Participants are members of the Dunedin Study.<sup>39</sup> The cohort of 1037 children (51.6% boys) was constituted at 3 years of age, when the investigators enrolled children from 91% of consecutive births from April 1, 1972, through March 31, 1973, in Dunedin, New Zealand. Cohort families represent the full range of socioeconomic status in the general population of New Zealand's South Island and are primarily white. Follow-ups occurred at 5, 7, 9, 11, 13, 15, 18, and 21 years of age, when we assessed 961 (94.2%) of the 1020 study members still alive, with no significant attrition effects.<sup>40</sup> Cross-national comparisons lend confidence about generalizing findings concerning violence from the Dunedin Study,<sup>41</sup> and more generally New Zealand,<sup>42,43</sup> to other industrialized nations.

The Dunedin cohort members were free to offend in the community. In the year before the interview, only 1.6% of study members spent on average 25 days in a psychiatric hospital, and 4.7% spent on average 1 or more nights in jail during 3 months of the year. In any case, our self-report measure of violence captured assaults in institutions as well as in the community.

### MENTAL DISORDERS AT 21 YEARS OF AGE

Diagnoses were determined using the Diagnostic Interview Schedule,<sup>44</sup> with a reporting period of 12 months before the interview.<sup>45</sup> The 12-month prevalence (40%) matches the 37% 12-month prevalence for 15- to 24-year-olds in the National Comorbidity Study.<sup>46</sup> We grouped *DSM-III-R*<sup>47</sup> Axis I disorders into the following diagnostic families: (1) depression disorders (17.9%), including major depressive episode and dysthymia; (2) anxiety disorders (17.7%), including generalized anxiety disorder, panic disorder, agoraphobia, social phobia, and simple phobia; (3) manic episode (2.0%); (4) eating disorders (1.4%), including anorexia nervosa and bulimia nervosa; (5) alcohol dependence (9.8%); (6) marijuana dependence (9.5%); and (7) schizophrenia-spectrum

disorder (4.1%), including individuals who responded "yes, definitely" to interview questions about positive symptoms of schizophrenia (hallucinations and delusions) and ruling out symptoms with plausible explanations and symptoms occurring under the influence of alcohol or illicit drugs or during a major depressive episode. Structured psychiatric interviews are known to identify subjects who endorse psychotic-type experiences and beliefs, some of whom are clinically psychotic, but many of whom are not,<sup>48</sup> and whose symptoms lie on a continuous spectrum from schizotypal personality disorder to schizophrenia.<sup>49</sup> Although we expect only one quarter of these 39 study members to emerge with schizophrenia, the group had not been in good mental health in the previous year, when 33 (84.6%) had comorbid diagnoses, 30 (76.9%) said their symptoms interfered with their lives, 21 (53.8%) had corroboration from an informant, 15 (38.5%) had some contact with treatment, and 4 (10.3%) were taking psychiatric medication, although none were hospitalized that year.<sup>45</sup>

### VIOLENT BEHAVIORS AT 21 YEARS OF AGE

Court convictions for violence in all New Zealand and Australian courts were obtained by searching the central computer system of the New Zealand police. Thirty-nine study members were convicted of 107 violent offenses occurring in the 12 months before the interview, including inciting or threatening violence, using an attack dog on a person, presenting an offensive weapon, threatening a police officer, rape, manual assault, assault on a police officer, assault with a deadly weapon, aggravated robbery, and homicide. Thirty-three men and 6 women (4.1% of the sample) were defined as past-year violent offenders according to official records.

Self-reports of violence committed during the past year were obtained using a private standardized interview developed for the National Youth Survey and National Institute of Justice multisite surveys,<sup>30</sup> yielding a 7-item violence scale comprising the most common violent offenses: simple assault (hit someone you lived with; hit someone else); aggravated assault (attacked someone you lived with with a weapon or with the idea of seriously hurting

consider comorbidity in relation to violence risk.<sup>21</sup> We tested which disorders were uniquely related to violence. The risk of violence among discharged patients with mental illness is multiplied by co-occurring substance abuse disorders,<sup>2,6,7,22</sup> and therefore we also assessed the cumulative effects of psychiatric comorbidity on violence risk.

We tested 3 hypotheses to explain the association between disorders and violence. First, substance use in the hours before the violent offense may account for violence among individuals with mental disorders living in the community. Alcohol facilitates violence by disinhibiting aggressive impulses,<sup>23</sup> but most studies of mental disorder and violence have not disentangled effects of a long-standing substance-abuse disorder from situational effects of intoxication.<sup>24,25</sup> A proclivity toward acute intoxication among individuals with mental disorders might account for their risk of violence.

Second, excessive threat perception may account for violence among individuals with mental disorders.

Specific symptoms of psychiatric patients may explain the association between their disorders and violence,<sup>2,5,26-29</sup> because psychotic delusions give patients strong subjective impressions of external threats that suppress self-control and foster preemptive attacks.<sup>26</sup> More generally, the tendency to expect threat is a quantitatively distributed personality trait<sup>30</sup> that emerges in childhood, predicts aggression toward others,<sup>31-33</sup> and remains stable from late adolescence to adulthood.<sup>34</sup> In combination, these findings about threat perception suggest that this preexisting cognitive style might predispose individuals with mental disorders to violence.

Third, a developmental history of conduct disorder may account for violence among individuals with mental disorders living in the community. Children with conduct disorder who learn to use aggression at home generalize aggressive behavior toward others as their social environments expand.<sup>35,36</sup> However, few studies have

or killing them; attacked someone else); robbery (used a weapon, force, or strong-arm methods to rob a person); rape; and gang-fighting. Given that a single simple assault was quite common, but thereafter the distribution of the violence measure was strongly skewed to more serious offending, individuals who reported 2 or more different types of violent offenses (53 men and 20 women [7.6% of the sample]) were defined as self-reported violent offenders.

Self-reported and court-recorded violence overlapped in the sample. The odds of conviction were 17 times greater for persons self-reporting 2 offense types than for persons who did not (95% confidence interval [CI], 8.6-34.1). All but 5 court-recorded violent offenders self-reported at least 1 offense type. A violent group was constituted as those 92 persons who had self-reported 2 or more different violent offense types or had been convicted (9.6% of the sample).

#### MEASURES OF EXPLANATIONS FOR THE LINK BETWEEN DISORDERS AND VIOLENCE

Substance use before the violent offense was assessed during the Self-reported Delinquency Interview<sup>50</sup> to obtain details about offenses. Participants reporting at least 1 violent behavior (35.0% of the sample) were told to "Think of the most serious time you did this offense in the past year, where *most serious* means worst physical injury," and asked if they had been drinking or taking drugs 2 hours before that incident. The yes/no responses were summed to indicate how many of the worst incidents of violence were committed when alcohol or illicit drugs were taken 2 hours before.

Excessive threat perception was measured at 18 years of age via the 17-item Alienation scale ( $\alpha=.76$ ) of the Multidimensional Personality Questionnaire,<sup>51-53</sup> containing such true/false items as "When people act friendly they usually want something from me," and "Some people go against me for no good reason." High scorers feel mistreated and used by so-called friends, think they are a target of false rumors, and believe others wish them harm.

Adolescent conduct disorder was diagnosed according to DSM-IV<sup>54</sup> criteria. At 11, 13, and 15 years of age, the child's own report of conduct symptoms was assessed<sup>41,55</sup>

with a reporting period of 12 months before the interview, and parent and teacher ratings of children's conduct problems were obtained.<sup>56,57</sup> At each age, a symptom was counted present if there was evidence of it from child, parent, or teacher. We classified each study member as having an adolescent history of conduct disorder if they met diagnostic criteria at 11, 13, or 15 years of age.

#### STATISTICAL ANALYSES

Contingency tables were used to test associations between each diagnostic family and violence. To establish that the risk of violence among individuals with mental disorders was not an artifact of sex differences or shared socioeconomic conditions,<sup>58</sup> we also report odds ratios (ORs) with 95% CIs adjusted for sex and social class.<sup>59</sup> Logistic regression analyses with sex-interaction terms did not yield significant improvements in the fit of models predicting violence above and beyond models with main effects only. Thus, analyses were conducted for the whole sample collapsed across sex. To rule out the possibility that psychiatric comorbidity creates spurious associations between some mental disorders and violence, we estimated hierarchical logistic regressions, in which sex and social class were entered on step 1 and Axis I mental disorders were entered simultaneously on step 2. The cumulative risks associated with comorbidity were tested by estimating the linear combination of coefficients and SEs.<sup>60</sup>

The test of whether increased risk of violence among individuals with mental disorders was accounted for by the 3 hypothesized explanatory variables required 2 steps. First, to determine if each explanatory variable was associated with the disorders and violence, we compared the disorder groups vs control subjects, and the violence group vs controls, on the 3 explanatory variables using 2-tailed *t* tests. Second, using logistic regressions, we examined the percentage of reduction in the baseline violence risk associated with each disorder after adding each explanatory variable to the equation. The difference between the baseline and adjusted risks yields an estimate of the percentage of the association between a disorder and violence that is accounted for by each hypothesized explanatory variable.

investigated childhood predispositions toward violent offenses among individuals with mental disorders.<sup>37,38</sup> Adults whose self-control is compromised by a current mental disorder might rely on violence if they had childhood conduct disorder, because they have extensive previous experience with fighting, bullying, and similar acts that victimize others.

## RESULTS

### LINK BETWEEN MENTAL DISORDERS AND VIOLENCE

Individuals who met diagnostic criteria for any disorder were at risk of committing violence (**Table 1**). Depression and anxiety disorders were weakly related to violence (Table 1) but not after controlling for comorbidity (**Table 2**). Manic episodes and eating disorders were significantly associated with violence initially (Table 1), but not after con-

trolling for comorbidity (Table 2); we cannot decisively rule out an association of these disorders with violence, because their low frequency in the sample makes the interpretation hazardous. Alcohol dependence, marijuana dependence, and schizophrenia-spectrum disorder were strongly and robustly related to violence (Table 1), and were uniquely and significantly associated with violence even when controlling for demographic risk factors and all other comorbid disorders (Table 2).

Individuals who were substance dependent and/or had schizophrenia-spectrum disorder constituted 18.3% of the total sample, but were 55.4% ( $n=51$ ) of the sample's 92 violent individuals. They were responsible for 57.9% of the sample's 107 violent court convictions and 54.4% of the sample's 2403 self-reported violent offenses. Moreover, 6.8% ( $n=12$ ) of the individuals with substance dependence and/or schizophrenia-spectrum disorder were recidivists (convicted for  $\geq 2$  violent offenses) according to court records, and 44.3% ( $n=78$ )

**Table 1. Proportions of and Risks for Violent Behaviors in the 12 Months Before 21 Years of Age Among 961 Persons With Different Psychiatric Disorders\***

DSM-III-R Axis I Disorder (No. [%])	Court Convictions for Violence (n = 39 [4.1%])		Self-reported Violence (n = 73 [7.6%])		Court Convictions and/or Self-reported Violence (n = 92 [9.6%])		
	No. (%) of Subjects	OR (95% CI)	No. (%) of Subjects	OR (95% CI)	No. (%) of Subjects	OR (95% CI)	AOR (95% CI)
No psychiatric disorder (n = 572 [59.5])	7 (1.2)	...	18 (3.1)	...	22 (3.8)	...	...
Psychiatric disorder (n = 389 [40.5])	32 (8.2)	7.2 (3.2-16.6)	55 (14.1)	5.1 (2.9-8.8)	70 (18.0)	5.5 (3.3-9.0)	5.8 (3.5-9.7)
Depression disorders (n = 172 [17.9])	7 (4.1)	1.0 (0.4-2.3)	26 (15.1)	2.8 (1.7-4.7)	27 (15.7)	2.1 (1.3-3.4)	2.9 (1.7-4.8)
Anxiety disorders (n = 170 [17.7])	10 (5.9)	1.6 (0.8-3.4)	16 (9.4)	1.3 (0.7-2.4)	21 (12.4)	1.4 (0.9-2.4)	1.8 (1.0-3.1)
Manic disorder (n = 19 [2.0])	3 (15.8)	4.8 (1.3-17.1)	5 (26.3)	4.6 (1.6-13.2)	5 (26.3)	3.5 (1.2-10.0)	4.9 (1.6-14.9)
Eating disorders (n = 13 [1.4])	1 (7.7)	2.0 (0.3-15.7)	4 (30.8)	5.6 (1.7-18.7)	4 (30.8)	4.3 (1.3-14.4)	6.8 (1.8-25.2)
Alcohol dependence disorder (n = 94 [9.8])	8 (8.5)	2.5 (1.1-5.6)	23 (24.5)	5.4 (3.1-9.4)	24 (25.5)	4.0 (2.4-6.8)	3.4 (2.0-5.9)
Marijuana dependence disorder (n = 91 [9.5])	16 (17.6)	8.1 (4.1-16.0)	24 (26.4)	6.1 (3.5-10.5)	31 (34.1)	6.9 (4.1-11.4)	5.4 (3.2-9.2)
Schizophrenia-spectrum disorder (n = 39 [4.1])	6 (15.4)	5.1 (2.0-13.1)	13 (33.3)	7.1 (3.5-14.6)	13 (33.3)	5.4 (2.6-10.9)	4.6 (2.2-9.7)

\*OR indicates odds ratio; CI, confidence interval; AOR, estimates of risk adjusted for socioeconomic status and sex; and ellipses, not applicable. Of the 1020 living cohort members, 961 (94%) had present data for our primary measures of mental disorders, violence, and socioeconomic status.

**Table 2. Unique Association Between Each Axis I Mental Disorder and Violence 12 Months Before 21 Years of Age\***

Variables	$\beta$	SE	OR (95% CI)
Step 1			
Sex	1.08	0.29	3.0 (1.7-5.2)
SES	-0.47	0.12	0.6 (0.5-0.8)
Step 2			
Depression disorders	0.53	0.31	1.7 (0.9-3.1)
Anxiety disorders	-0.01	0.33	1.0 (0.5-1.9)
Manic disorder	1.15	0.64	3.2 (0.9-11.1)
Eating disorders	1.11	0.73	3.0 (0.7-12.7)
Alcohol dependence disorder	0.64	0.32	1.9 (1.0-3.5)
Marijuana dependence disorder	1.35	0.29	3.8 (2.2-6.8)
Schizophrenia-spectrum disorder	0.90	0.43	2.5 (1.1-5.7)

\*Results are derived from a hierarchical logistic regression analysis controlling for sex, socioeconomic status (SES), and all other concurrent disorders. The SES of study members' families was coded into 1 of 6 categories based on the educational level and income associated with occupations in New Zealand.<sup>59</sup> The scale ranges from 1 (unskilled laborer) to 6 (professional). The variable used in our analyses, parental SES, is the average of the highest SES level of either parent across the 7 assessments of the Dunedin study from birth through 15 years of age; thus, it reflects the socioeconomic conditions experienced by study members while they grew up. Female subjects received a score of 0 for the sex variable and male subjects a score of 1. Listwise, n = 936. OR indicates odds ratio; CI, confidence interval.

were recidivists according to self-report. This heavy concentration of violence among the mentally disordered group may be contrasted against a lesser concentration among individuals who did not manifest schizophrenia-spectrum disorder or substance dependence. Individuals who did not meet diagnostic criteria for either substance dependence or schizophrenia-

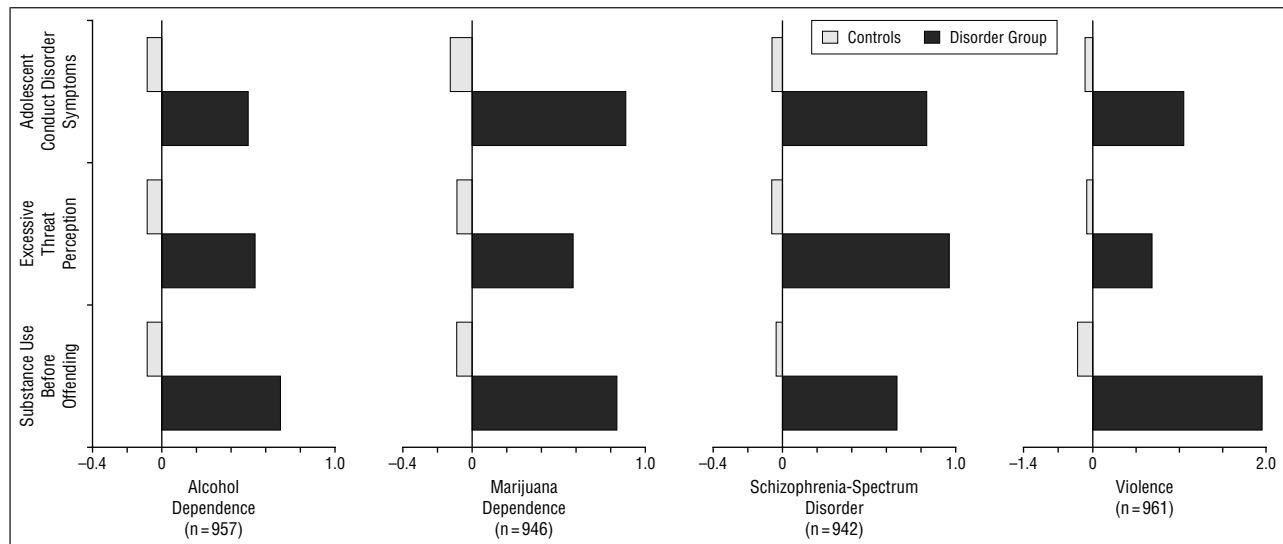
spectrum disorder constituted 81.7% of the total sample but only 44.6% of the violent offenders, and were responsible for 42.1% of the sample's violent court convictions and 45.6% of its self-reported violent offenses. Only 0.6% (n=5) of individuals without substance dependence or schizophrenia-spectrum disorder were official recidivists and only 18.0% (n=141) were self-reported recidivists.

In all, 11.3% of the sample's risk of becoming a violent offender was uniquely attributable to alcohol dependence, 28.2% to marijuana dependence, and 9.6% to schizophrenia-spectrum disorder. Having two of these disorders at once more than doubled the risk of violence, compared with having one of them; for alcohol dependence plus schizophrenia-spectrum disorder, the OR was 8.3 (95% CI, 3.2-21.5); for alcohol plus marijuana dependence, 11.7 (95% CI, 5.9-23.4); and for marijuana dependence plus schizophrenia-spectrum disorder, 18.4 (95% CI, 7.5-45.3).

### EXPLAINING LINKS BETWEEN DISORDERS AND VIOLENCE

Individuals with alcohol dependence, marijuana dependence, or schizophrenia-spectrum disorder were more likely to use substances before offending, to perceive threat in the environment, and to have a history of conduct disorder (**Figure**). Because these 3 variables were also linked to violence, we tested whether they accounted for elevated rates of violence committed by individuals with mental disorders.

Once substance use before the violent act was taken into account, the baseline risk of violence among persons with a diagnosis of alcohol dependence was reduced by 58% (**Table 3**). Because of the frequent co-occurrence of alcohol and marijuana dependence,



Mean standardized z scores on explanatory variables for individuals meeting diagnostic criteria for (1) alcohol dependence, (2) marijuana dependence, (3) schizophrenia-spectrum disorder, and (4) violent offenses (disorder group) and among control subjects. Relative to controls, alcohol-dependent subjects showed more substance use before offending ( $t_{955} = 7.0$ ;  $P = .001$ ; effect size [ $d$ ] = .77), more excessive threat perception ( $t_{955} = 5.6$ ;  $P = .001$ ;  $d = .62$ ), and more adolescent conduct disorder symptoms ( $t_{955} = 5.3$ ;  $P = .001$ ;  $d = .56$ ); marijuana-dependent subjects showed more substance use before offending ( $t_{944} = 8.2$ ;  $P = .001$ ;  $d = .91$ ), more excessive threat perception ( $t_{944} = 5.9$ ;  $P = .001$ ;  $d = .67$ ), and more adolescent conduct disorder symptoms ( $t_{944} = 9.8$ ;  $P = .001$ ;  $d = 1.00$ ); subjects with schizophrenia-spectrum disorder showed more substance use before offending ( $t_{940} = 4.0$ ;  $P = .001$ ;  $d = .68$ ), more excessive threat perception ( $t_{940} = 6.3$ ;  $P = .001$ ;  $d = 1.03$ ), and more adolescent conduct disorder symptoms ( $t_{940} = 5.7$ ;  $P = .001$ ;  $d = .89$ ); and violent offenders showed more substance use before offending ( $t_{959} = 23.8$ ;  $P = .001$ ;  $d = 2.15$ ), more excessive threat perception ( $t_{959} = 6.8$ ;  $P = .001$ ;  $d = .75$ ), and more adolescent conduct disorder symptoms ( $t_{959} = 11.6$ ;  $P = .001$ ;  $d = 1.17$ ).

**Table 3. Testing Explanations for the Link Between Mental Disorders and Violence in Young Adulthood\***

Axis I Mental Disorders Uniquely Linked to Violence	Baseline OR of Violence (95% CI)	Controlling for Each Potential Explanatory Variable					
		Substance Use Before Offending		Excessive Threat Perception		Adolescent Conduct Disorder	
		AOR (95% CI)	% of Change†	AOR (95% CI)	% of Change†	AOR (95% CI)	% of Change†
Alcohol dependence disorder (n = 957)	4.0 (2.4-6.8)	1.7 (0.8-3.5)	58	3.3 (1.9-5.7)	19	2.8 (1.6-5.1)	29
Marijuana dependence disorder (n = 946)	6.9 (4.1-11.4)	3.5 (1.8-6.8)	49	5.6 (3.3-9.5)	19	3.6 (2.1-6.4)	47
Schizophrenia-spectrum disorder (n = 942)	5.4 (2.6-10.9)	4.3 (1.5-12.3)	19	3.6 (1.7-7.8)	32	3.0 (1.3-6.6)	44

\*We controlled for substance use before the most serious violent offense, excessive threat perception at 18 years of age, and adolescent conduct disorder from 11 through 15 years of age. OR indicates odds ratio; AOR, estimates of risk adjusted for each potential explanatory variable.  
 †Indicates percentage of the association between a disorder and violence accounted for by the explanatory variable.

further analyses controlled for comorbidity. Substance use before offending still accounted for 49% of the violence risk among alcohol-dependent persons, regardless of their heavy psychiatric comorbidity. The risk of violence among marijuana-dependent persons was reduced by 49% once substance use before offending was taken into account. However, controlling for comorbidity between marijuana and alcohol dependence, substance use before offending accounted for only 32% of violence risk among marijuana-dependent persons, suggesting that substance use before offending accounted for violence among marijuana-dependent persons partly because many of them were also heavy users of alcohol. The risk of violence among persons with schizophrenia-spectrum disorder was reduced by 19% when substance use before offending was taken into account.

The psychological predisposition to perceive excessive threat in the environment accounted for 19% of the association between each of the substance dependence disorders and violence (Table 3). This psychological predisposition was especially relevant to the link between schizophrenia-spectrum disorder and violence; 32% of the violence risk among individuals with schizophrenia-spectrum disorder was accounted for by the fact that they were predisposed to perceive threats in their environment, at least since 18 years of age.

Once adolescent conduct disorder was taken into account, violence risk among persons with a diagnosis of marijuana dependence was reduced by 47% (Table 3). Controlling for comorbidity, a developmental history of conduct disorder continued to account for 42% of the violence risk among marijuana-dependent persons, re-

ardless of their concurrent alcohol dependence or schizophrenia-spectrum disorder. Violence risk among persons with a diagnosis of alcohol dependence was reduced by 29% and that of persons with a diagnosis of schizophrenia-spectrum disorder by 44% when adolescent conduct disorder was taken into account. When controlling for comorbidity, a history of conduct disorder accounted for only 9% of the violence risk among alcohol-dependent persons and 32% of the violence risk among persons with schizophrenia-spectrum disorder.

When entered as a set, the 3 explanatory variables did not explain any more of the association between schizophrenia-spectrum disorder and violence than could be explained by conduct disorder alone (43% vs 44%). More than half of the link between schizophrenia-spectrum disorder and violence remained unexplained by the variables in our study, suggesting that other factors will help to explain the violence of individuals with psychoses. However, all 3 variables entered together accounted for 67% of the association between violence and dependence on alcohol and marijuana. After controlling for violence attributable to these 3 variables, alcohol dependence no longer posed a significant risk for violence (OR, 1.3 [95% CI, 0.6-2.9]) and marijuana-dependent individuals' risk shrunk from 6.8 to 2.3 (95% CI, 1.1-4.6). In combination, the 3 explanatory variables were sufficient to account for virtually all the significant association between substance dependence and violence.

#### COMMENT

Not all individuals with mental disorders living in the community engage in violence; among young adults, the link is limited to 3 diagnoses: alcohol dependence, marijuana dependence, and schizophrenia-spectrum disorder. Persons with at least one of these 3 disorders constituted only one fifth of the sample, but they accounted for more than half of the sample's violent convictions, violent acts, and violent offenders. Because each disorder carries its own unique risk, persons with two of these disorders simultaneously carry risk for violence that is 8 to 18 times greater than that for individuals with no disorders. Although our cohort is from New Zealand, these findings are remarkably similar to findings from the United States,<sup>1</sup> Scandinavia,<sup>4,6</sup> and Israel.<sup>61</sup>

Studies of discharged patients reassure that "the public's fears of violence on the street by discharged patients who are strangers to them is mis-directed."<sup>7(p400)</sup> The Dunedin study should be considered a study of the contribution to violence at its peak age by young adults with mental disorders who are as yet mostly untreated; only 8.1% of the 389 mentally disordered cohort members were taking psychiatric medications and only 3.1% had been hospitalized in the past year. Our study suggests that a significant proportion of the burden of violence that frightens and injures the general public may be attributed to young adults who are prone to schizophrenia-spectrum disorders or dependent on alcohol or other drugs, many of whom have not been hospitalized or treated.

The violence of alcohol-dependent individuals was explained by their substance use before offending, point-

ing to the possible role of alcohol's disinhibiting effects. An alternative hypothesis is that because alcohol-dependent persons spend much of their time drinking alcohol, it is merely coincidental that they drank alcohol in the 2 hours before a violent incident. Arguing against this alternative is the fact that substance use before offending was strongly correlated with violence not only among alcohol-dependent individuals, but also among study members without mental disorders ( $r=0.46$ ;  $P=.001$ ). We conclude that violent offenses were mostly committed when, and possibly because, alcohol-dependent individuals were under the influence of alcohol.

The link between marijuana and violence may seem counterintuitive, as cannabis is not thought to precipitate aggression, but an equally strong link has been reported in American studies.<sup>1,62</sup> The violence of marijuana-dependent individuals was best explained by their developmental history of conduct disorder. Drug-dependent individuals with a delinquent history become early and active participants in the illegal economy of drug markets. Indeed, 83.3% of marijuana-dependent Dunedin study members reported in the interview at 21 years of age that they sold drugs during the past year (compared with 7.4% of nondependent individuals). Illicit drug markets promote violence because, when transactions go awry, actors do not have recourse to legal means of dispute resolution, and intimidation of adversaries by violence is their remaining option.<sup>63</sup> Delinquent conduct thus acquaints young people with the underground economy, and development of an illicit-substance dependence requires access to the illicit market. Our finding that youthful conduct disorder explained the unique contribution of marijuana dependence to violence, and did so better than substance use before the violent act, suggests that individuals who first become heavily involved in delinquency and drugs as youths and then become drug-dependent may learn early to rely on violence for addressing disputes.

The risk of violence among Dunedin subjects with schizophrenia-spectrum disorders was similar to rates reported for hospitalized psychotic patients<sup>4,6</sup> and psychotic community residents,<sup>61</sup> although our diagnosis of disorders in the schizophrenia spectrum was broad. All 4 studies report ORs of approximately 6.0. Like all other studies, we found that the modest risk from schizophrenia-spectrum disorder is magnified more than 2-fold in the presence of comorbid substance dependence. However, of the violent cases in our cohort, 10% were uniquely attributable to schizophrenia-spectrum disorder apart from substance abuse, offering a slightly different view from the observation that the contribution of serious mental illness to violence in society is minuscule,<sup>64(p403)</sup> and suggesting that more research into psychotic symptoms and violence is warranted.

The tendency to perceive the world as a threatening place, measured at 18 years of age, explained much of the violence of individuals who endorsed the bizarre symptoms of schizophrenia at 21 years of age. Our finding suggests that this cognitive personality style may tip schizophrenic patients toward violence during episodes of psychosis, but also that distorted information processing may promote the violence of a broader group of in-

dividuals in whom subclinical syndromes in the schizophrenia spectrum develop.<sup>65</sup> A history of childhood conduct disorder also contributed to the link between schizophrenia-spectrum disorder and violence. This finding is reminiscent of case reports of "pseudo-psychopathic schizophrenia." Bender<sup>66</sup> argued that many youngsters in the process of entering their first psychotic episodes may be given a misdiagnosis of conduct disorder because their disorganized behavior on the surface resembles antisocial activity. It is possible that conduct problems motivated by bizarre beliefs constitute a heretofore under-researched prodromal adolescent phase of some adult psychotic disorders.

These findings have implications for treatment and prevention, as each disorder was linked to violence via different core explanations. For example, successful prevention of access to alcohol might reduce the violence of alcohol-dependent individuals. Prevention programs that reduce conduct problems and entry into illicit drug markets among youth might also reduce later substance-related violence. Finally, cognitive therapy or medication that reduces threat perceptions might reduce violence among individuals with schizophrenia-spectrum disorders. Forensic psychiatry and community mental health services may benefit from multiple violence-prevention strategies that are tailored to offenders' diagnoses. Most directly, the results of our study imply that the link between adult mental disorders and violence is often rooted in childhood and adolescent conduct problems, and thus may be susceptible to primary prevention.

Accepted for publication April 12, 2000.

Supported by fellowships from the Social Sciences and Humanities Research Council of Canada, Ottawa, and the National Science Foundation–National Consortium on Violence Research, Pittsburgh, Pa (grant SBR 9513040) (Dr Arseneault); by the United Kingdom High Security Psychiatric Services Commissioning Board, London, England; the New Zealand Health Research Council, Auckland; and by grants 45070, 49414, and 46344 from the National Institutes of Mental Health, Rockville, Md.

We thank HonaLee Harrington, Sheilagh Hodgins, PhD, Matt Smart, the Study members, and the New Zealand Police.

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