The Intricate Link Between Violence and Mental Disorder

Results From the National Epidemiologic Survey on Alcohol and Related Conditions

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Context: The relationship between mental illness and violence has a significant effect on mental health policy, clinical practice, and public opinion about the dangerousness of people with psychiatric disorders.

Objective: To use a longitudinal data set representative of the US population to clarify whether or how severe mental illnesses such as schizophrenia, bipolar disorder, and major depression lead to violent behavior.

Design: Data on mental disorder and violence were collected as part of the National Epidemiologic Survey on Alcohol and Related Conditions (NESARC), a 2-wave face-to-face survey conducted by the National Institute on Alcohol Abuse and Alcoholism.

Participants: A total of 34 653 subjects completed NESARC waves 1 (2001-2003) and 2 (2004-2005) interviews. Wave 1 data on severe mental illness and risk factors were analyzed to predict wave 2 data on violent behavior.

Main Outcome Measures: Reported violent acts committed between waves 1 and 2.

Results: Bivariate analyses showed that the incidence of violence was higher for people with severe mental illness, but only significantly so for those with co-occurring substance abuse and/or dependence. Multivariate analyses revealed that severe mental illness alone did not predict future violence; it was associated instead with historical (past violence, juvenile detention, physical abuse, parental arrest record), clinical (substance abuse, perceived threats), dispositional (age, sex, income), and contextual (recent divorce, unemployment, victimization) factors. Most of these factors were endorsed more often by subjects with severe mental illness.

Conclusions: Because severe mental illness did not independently predict future violent behavior, these findings challenge perceptions that mental illness is a leading cause of violence in the general population. Still, people with mental illness did report violence more often, largely because they showed other factors associated with violence. Consequently, understanding the link between violent acts and mental disorder requires consideration of its association with other variables such as substance abuse, environmental stressors, and history of violence.

Arch Gen Psychiatry. 2009;66(2):152-161

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O N APRIL 16, 2007, SEUNG-Hui Cho killed 32 people, wounded many others, and ended the rampage by committing suicide on the campus of Virginia Tech in Blacksburg, Virginia. Seven months later on December 5, 2007, Robert A. Hawkins shot and killed 8 people at a Von Maur department store in Omaha, Nebraska. After both crimes, it was quickly reported that the perpetrators had previously received psychiatric care, prompting questions as to whether and how their mental illnesses may have led to these appallingly violent acts, whether mental health professionals could have (or should have) foreseen such massacres, and whether adequate treatment might have prevented them.

The relationship between mental illness and violence has been the subject of scientific research for the past 20 years, during which substantial progress has been made in identifying the risk factors empirically related to violence.[1-4] Psychiatrists and other mental health providers now have at their disposal a substantial evidence base and effective risk assessment tools to evaluate a patient's risk of engaging in future violence. Research has focused on the relationship between mental disorders and violence,[5-8] but has yielded mixed results. Some studies appear to support a clear link between mental illness and violence,[9-12] whereas other studies support the notion that alcohol and drug abuse,[1,13,14] not psychiatric illness per se, contribute to violence risk among adults with mental disor-

ders. As a result, there is considerable controversy in the mental health field regarding how to best interpret the link between mental illness and violence.[15,16]

The relationship between mental illness and violence has a significant effect on mental health practice[17] and policy,[18] guides allocation of the limited resources in the mental health[19-21] and criminal justice[22-24] systems, and serves as the basis for imposing mandatory treatment to protect public safety at the expense of patients' self-determination and liberty.[21,25] Reliable data are needed to properly inform public perception about the relationship between mental illness and dangerousness[26-28] to avoid potentially unwarranted stigmatization of people with mental illness.[29,30]

The scientific literature on the association between mental illness and violence is inconclusive for several reasons. First, to establish that mental illness causes violence, it is necessary (though not sufficient) to demonstrate that mental illness precedes later violence; however, cross-sectional epidemiological studies analyze correlations between past violence and current or lifetime psychiatric diagnoses.[6,11] Second, when research has been longitudinal, it has primarily focused on the risk of violence for individuals already in clinical or institutional settings[31-35] instead of samples representative of the general population. Research using those longitudinal samples has contributed substantially to understanding important risk factor for violence in people with mental illness[36] but, by virtue of the inclusion criteria used, is arguably limited in describing whether or to what extent severe mental illness is an independent risk factor for violence. Third, empirical studies often combine all violent acts into one composite variable[37] owing to limited statistical power to distinguish specific forms of violent acts (eg, substance-related violence, severe violence with weapons), leaving unanswered the question of whether mental illness predicts some kinds of violence but not others.

The current study attempts to address gaps in the scientific literature by employing a nationally representative longitudinal data set to examine (1) what risk factors prospectively predict violent behavior; (2) whether severe mental disorders predict future violent behavior; and (3) how different risk factors may predict different types of violence.

METHODS

SAMPLE

The National Epidemiologic Survey on Alcohol and Related Conditions (NESARC) is a 2-wave face-to-face survey conducted by the National Institute on Alcohol Abuse and Alcoholism. Wave 1 was collected from 2001 to 2003 and included 43 093 respondents aged 18 years and older.[38] Of these, 39 959 persons were eligible for inclusion in wave 2 and, ultimately, 34 653 respondents completed wave 2 interviews from 2004 to 2005. Details of the classification system for interviews have been described elsewhere.[39]

The target population of the NESARC is the civilian population residing in the United States, including Alaska and Hawaii. The housing unit sampling frame of the NESARC is based on the US Bureau of the Census Supplementary Survey. The NESARC also includes a group quarters' sampling frame derived from the Census 2000 Group Quarters Inventory,[38] which captures important subgroups of the population with heavy substance use patterns who are not often included in general population surveys, such as military personnel living off base in boarding houses and persons in rooming houses, nontransient hotels and motels, shelters, facilities for housing workers, college quarters, and group homes. Hospitals, jails, and prisons were not sampled.

The wave 2 response rate using wave 1–eligible respondents was 34 653 of 39 959 (86.7%).[39] Nonresponse occurred when an interviewed participant from wave 1 did not complete a wave 2 interview. The NESARC estimates were adjusted at the person level to account for nonresponse. The total wave 1 response rate was 81.0% and the total wave 2 response rate was 86.7%; multiplying these 2 rates indicated that the overall cumulative survey response rate including both waves was 70.2%, substantially higher than other surveys of this kind.

SAMPLE WEIGHTING

Specific weights were included as necessary to ensure the sample resembled the general population and to compensate for attrition between waves 1 and 2. The NESARC sample was weighted to adjust for the probabilities of selection of a sample housing unit or housing unit equivalent from the group quarters' sampling frame, nonresponse at the household and person levels, the selection of one person per household, and oversampling of young adults. Once weighted, the data were adjusted to be representative of the US population for region, age, sex, race, and ethnicity, based on the 2000 Census.[38]

Coverage in the survey sampling process involves the extent to which the total population that could be selected covers the survey's target population. The NESARC undercoverage results from missed housing units and missed persons within interviewed housing units.[39] Compared with estimates from Census 2000, the wave 2 undercoverage is about 14.0%. Undercoverage varies with age, sex, race, and ethnicity. Generally, undercoverage is larger for men than for women and larger for African American participants than for those who are not African American. The weighting procedure uses ratio estimation in which sample estimates are adjusted to independent estimates of the national population by age, race, sex, and ethnicity. This weighting adjustment aims to correct for bias due to undercoverage.

MEASURES

Severe Mental Illness and Substance Abuse and/or Dependence

The National Institute on Alcohol Abuse and Alcoholism Alcohol Use Disorder and Associated Disabilities Interview Schedule–*DSM-IV* Version,[40] a state-of-the-art structured diagnostic interview designed for use by lay interviewers, was administered at wave 1 to determine lifetime and recent (past 12 months) diagnoses of major depression, bipolar disorder, or substance abuse or dependence (including abuse of or dependence on alcohol, marijuana, cocaine, opioids, hallucinogens, methamphetamine, or other illicit drugs). Subjects were also asked questions to ascertain whether they had ever or had in the past 12 months been diagnosed with schizophrenia or another psychotic disorder. Guided by epidemiological studies on mental disorder and violence,[11] subjects in the current study were coded as 1, no major mental illness or substance abuse and/or dependence; 2, schizophrenia only; 3, bipolar disorder only; 4, major depression only; 5, substance abuse and/or dependence only; 6, schizophrenia plus substance abuse and/or dependence; 7, bipolar disorder plus substance abuse and/or dependence; or 8, major depression plus substance abuse and/or dependence.

Dispositional, Historical, Clinical, and Contextual Factors

Following the conceptual framework used in the MacArthur Violence Risk Assessment Study,[2,41] risk factors were divided into 4 domains: dispositional, historical, clinical, and contextual. For the dispositional domain, demographic data from wave 1 about subjects' age, education (0, less than high school; 1, high school or greater), sex (0, female; 1, male), personal annual income in the past year (0, <median of $20 000; 1, >median of $20 000), and ethnicity (0, not white; 1, white) was analyzed.

Regarding historical factors, subjects were asked in wave 1 whether they had ever engaged in (1) serious/severe violence ("Ever use a weapon like a stick, knife, or gun in a fight?" "Ever hit someone so hard that you injured them or they had to see a doctor?" "Ever start a fire on purpose to destroy someone's property or just to see it burn?" "Ever force someone to have sex with you against their will?") and (2) substance-related violence ("Ever get into a physical fight when or right after drinking?" and "Ever get into a fight when under the influence of [a] drug?"). These and other questions ("Ever physically hurt another person in any way on purpose?" "Ever get into a fight that came to swapping blows with someone like a husband, wife, boyfriend, or girlfriend?" "Ever get into a lot of fights you started?") were used to construct a composite of a history of any violent behavior. Additional historical questions asked in the second wave but not in the first were added to the analysis including whether before the age of 18 years, the subject had witnessed his or her parents physically fighting, was physically abused by their parents, had a history of incarceration in a juvenile detention center, or had parents who had spent time in jail.

Clinical data collected in wave 1 other than diagnosis focused on perceived threats[9] in which subjects were asked "Do you detect hidden threats or insults in what people say or do?"

Regarding contextual factors, subjects were asked in wave 1 whether in the past year (1) they or a family member had been criminally victimized; (2) any family or friend had died; (3) they were fired from a job; or (4) they were divorced or separated. Data was used regarding whether the subject was unemployed, meaning not working for most of the past year and was not in school full-time.

Violent Behavior Perpetrated Between Waves 1 and 2

In wave 2 of data collection, subjects were told, "Now I'd like to ask you some questions about experiences you may have had. As I read each experience, please tell me if it has happened since your last interview in (month/year). Since your last interview, did you . . . " Subjects were then asked the equivalent of the aforementioned questions measuring serious/severe violence and substance-related violence. Additionally, as described above, a composite variable was created to capture any violent behavior the subject reported committing between waves 1 and 2 of the NESARC.

STATISTICAL ANALYSIS

Because the wave 2 estimates come from a subset of the wave 1 sample, they may differ from figures that would have been obtained for the entire population using the same questionnaires, instructions, and interviewers.[39] The difference between an estimate based on a sample and the estimate that would result if the sample were to include the entire population (sampling error) is primarily measured by standard errors. In the current analysis, standard errors were computed using SUDAAN (RTI International, Research Triangle Park, North Carolina),

a statistical software package that accounts for the design effects of complex sample surveys.

Statistical analyses were conducted using the SAS 9.1 (SAS Institute, Cary, North Carolina) and SUDAAN software packages. Descriptive analyses were used to present frequencies or means of independent and dependent variables. Also, χ^2 analyses were conducted using SUDAAN to show bivariate relationships between wave 1 factors and wave 2 violent behaviors. Because the data were weighted to be representative of the US population, bivariate analyses were conducted for unweighted and weighted data.

Multivariate logistic regressions were conducted in which wave 2 violent behavior served as dependent variables. Odds ratios (OR) and 95% confidence intervals (CI) for multivariate models were estimated using SUDAAN, which uses Taylor series linearization to adjust for the design effects of sample surveys like the NESARC. The SAS code for receiver operator characteristics generated an area under the curve (AUC) to estimate the effect sizes of multivariate models. Predicted probabilities were calculated to illustrate the combinative effects of risk factors.

Univariate, bivariate, and multivariate analyses were run using lifetime diagnoses of severe mental illness and/or substance abuse and/or dependence. A parallel analysis was run using diagnoses in the past 12 months to determine if recent diagnoses were related to violence.

The length of time between waves 1 and 2 varied among subjects, a measurement issue that could affect results (eg, more time between waves means more opportunities to be violent). Subsequently, multivariate analyses included a variable capturing the number of days between subjects' wave 1 and 2 interviews. The average time between interviews was 1113 days (3 years and 18 days; range, 870-1470 days).

Simple logistic regressions were conducted on wave 1 data to ascertain the bivariate relationship between mental disorder and risk factors in which mental disorder served as the independent variable and risk factors served as the dependent variables. This way it could be elucidated whether mental illness was associated with increased or decreased experience of putative risk factors (eg, recent victimization).

RESULTS

Descriptive analyses for risk factors are found in **Table 1**. In total, 10.87% of subjects were diagnosed with schizophrenia, bipolar disorder, or major depression only and 9.4% of subjects were diagnosed with cooccurring mental disorders and substance dependence. Including the 21.41% of subjects diagnosed with substance abuse and/or dependence, a total of 41.68% of the sample had a lifetime diagnosis of severe mental disorder and/or substance abuse and/or dependence. **Table 2** and **Table 3** show bivariate relationships between wave 1 factors and violence between waves 1 and 2. All factors were statistically related to violence, with the exception of severe mental illness without substance abuse and/or dependence.

Table 4 displays multivariate models of factors predicting any violence, serious/severe violence, and substance-related violence. Predictors of any violence included younger age, male sex, lower income, history of violence, having witnessed parental fighting, juvenile detention, history of physical abuse by parent, comorbid mental health and substance disorders, perception of hidden threats, victimization in the past year, being di-

vorced or separated in the past year, and being unemployed in the past year. This model had an AUC of 0.85 and was statistically significant, accounting for a quarter of the variance in violent behavior.

Predictors of serious/severe violence included a subset of these risk factors, including younger age, being male, having less than a high school education, history of violence, juvenile detention, perception of hidden threats from others, and being divorced or separated in the past year. This model had an AUC of 0.87 and was statistically significant, accounting for a quarter of the variance in serious/severe violent behavior.

Predictors of substance-related violence included younger age, being male, lower income, history of violence, juvenile detention, history of physical abuse by parent, substance dependence only, comorbid mental health and substance disorders, victimization in past year, and unemployed and looking for work in the past. This model had an AUC of 0.90 and was statistically significant, accounting for 30% of the variance in substance-related violence.

Across the 3 multivariate models, violence was not predicted by schizophrenia, major depression, or bipolar disorder alone. Also, analyzing diagnoses within the past year of wave 1 (as opposed to lifetime) did not change the pattern of findings in any of the aforementioned multivariate models.

Table 5 lists effect sizes of the most robust predictors of violent behavior in this multivariate model. To depict how severe mental illness relates to risk of violence, the **Figure** illustrates the predicted probability of any violence as a function of severe mental illness, substance abuse and/or dependence, and history of violence. The base rate of violence in the sample is included as a reference. The predicted probability of violence for severe mental illness alone is approximately the same as for subjects with no severe mental illness. Individuals with severe mental illness and substance abuse and/or dependence posed a higher risk than individuals with either of these disorders alone. The highest risk was shown for dual-disordered subjects with a history of violence, who showed nearly 10 times higher risk of violence compared with subjects with severe mental illness only.

The Figure reveals that there were more people with severe mental illness (33%) in the groups with a history of violence than people without mental illness (14%). Simple logistic regression analyses show that people with any severe mental illness had significantly increased probability of having a history of violence (OR, 2.96; $P < .001$) in the NESARC sample. Severe mental illness was also significantly associated with a number of demographic, historical, clinical, and contextual risk factors associated with elevated risk of violence including reporting parental physical abuse (OR, 3.69; $P < .001$), witnessing parents physically fighting (OR, 2.51; $P < .001$), parental criminal history (OR, 1.73; $P < .001$), substance abuse and/or dependence (OR, 2.33; $P < .001$), juvenile detention (OR, 1.73; $P < .001$), perceiving threats (OR, 4.52; $P < .001$), being unemployed in the past year (OR, 2.37; $P < .001$), being recently divorced (OR, 2.81; $P < .001$), and being recently victimized (OR, 2.41; $P < .001$). People with severe mental illness were, on the whole, more eco-

Table 1. Descriptive Characteristics of Sample

Characteristic	Patients, No. (%) (N=34 653)
Wave 1	
Dispositional factors	
Median age, y	43
Median annual income, $	20 000
<High school education	5666 (16.50)
Female	19 915 (57.99)
Race, white	20 009 (58.26)
Historical factors	
Parental criminal history	2465 (7.20)
Parents severely physically abusive	1312 (3.83)
Witnessed parental physical fighting	3719 (10.84)
History of serious/severe violence	2329 (6.78)
History of substance-related violence	2448 (7.16)
History of any violence	5923 (17.68)
History of juvenile detention	1175 (3.42)
Clinical factors	
Schizophrenia only	136 (0.40)
Bipolar disorder only	458 (1.33)
Major depression only	3138 (9.14)
Substance abuse and/or dependence only	7353 (21.41)
Schizophrenia and substance abuse and/or dependence	158 (0.46)
Bipolar disorder and substance abuse and/or dependence	692 (2.01)
Major depression and substance abuse and/or dependence	2379 (6.93)
Perceives hidden threats in others	2362 (7.07)
Contextual factors	
Victimized in past year	2255 (6.60)
Any family or friend died in the past year	11 197 (32.82)
Fired from job in the past year	2129 (6.23)
Divorced or separated in the past year	2258 (6.61)
Unemployed in the past year	3046 (8.79)
Wave 2	
Violence perpetrated between waves 1 and 2	
Any violent behavior	998 (2.91)
Serious/severe violence	355 (1.03)
Substance-related violence	401 (1.17)

nomically disadvantaged compared with subjects who were not mentally ill (OR, 0.75; $P < .001$).

COMMENT

The NESARC was analyzed to examine what risk factors prospectively predict violent behavior, whether mental disorders predict future violent behavior, and how risk factors may predict different types of violence. Bivariate analyses showed that the incidence of violent behavior, though slightly higher among people with severe mental illness, was only significantly so for those with comorbid substance abuse. Thus, using the nationally representative NESARC sample yielded results similar to those from the MacArthur Violence Risk Assessment Study.[1,42,43] Multivariate analyses confirmed that severe mental illness alone did not significantly predict committing violent acts; rather, historical, dispositional, and contextual factors were associated with future violence. The analyses reveal a significant effect of these ancillary

Table 2. Bivariate Associations Between Risk Factors and Any Violent Act Reported Between Waves 1 and 2

Risk Factor	Total, No.	Violent, No.	Unweighted, %	Weighted, %	χ^2	P Value
Dispositional factors						
Age, y						
Below median (<43)	18 113	798	4.92	4.81	139.43	<.001
Median or above (≥43)	16 232	200	1.1	0.94		
Education						
High school	5666	249	4.22	4.47	28.24	<.001
High school or beyond	28 697	759	2.65	2.53		
Sex						
Male	14 430	599	4.15	4.03	67.87	<.001
Female	19 915	399	2	1.69		
Race						
Not white	14 336	517	3.61	3.57	16.97	<.001
White	20 009	481	2.4	2.5		
Annual personal income, $						
Below median (<20 000)	17 173	655	3.81	3.67	49.28	<.001
Median or above (≥20 000)	17 172	343	2	1.99		
Historical factors						
Parental criminal history						
Yes	2465	210	8.52	8.15	55.99	<.001
No	31 793	783	2.46	2.4		
Physically abused by parents before age 18 y						
Yes	1312	139	10.59	10.88	44.38	<.001
No	32 988	859	2.6	2.52		
Witnessed parents fighting						
Yes	3719	274	7.37	7.06	61.56	<.001
No	30 576	724	2.37	2.34		
History of any violence						
Yes	5923	558	9.42	9.16	126.48	<.001
No	27 571	392	1.42	1.38		
History of juvenile detention						
Yes	1175	173	14.72	14.53	68.07	<.001
No	33 156	823	2.48	2.38		
Clinical factors						
Perceived threats						
Yes	2362	199	8.43	8.2	54.55	<.001
No	31 040	751	2.42	2.4		
Contextual factors						
Victimized in past year						
Yes	2255	172	7.63	7.81	48.88	<.001
No	31 892	814	2.55	2.44		
Any family or friend die in the past year						
Yes	11 197	386	3.45	3.26	7.16	.009
No	22 918	603	2.63	2.6		
Fired from job in the past year						
Yes	2129	172	8.08	8.32	47.66	<.001
No	32 043	817	2.55	2.43		
Divorced or separated in the past year						
Yes	2258	192	8.5	10.13	61.54	<.001
No	31 907	796	2.49	2.39		
Unemployed for the past year						
Yes	3003	276	9.19	9	72.72	<.001
No	31 168	714	2.29	2.23		

factors on an individual's risk of violence and indicate a need for clinicians to look beyond diagnosis and consider a patient's historical and current life situation more closely when assessing risk of violence.[44]

Still, review of this data demonstrates that the link between mental illness and violence is clearly relevant to violence risk management in clinical practice. This link should not be understated or ignored. Analyses revealed that people with co-occurring severe mental illness and substance abuse and/or dependence had significantly higher incidence of violent acts between waves 1 and 2 of the NESARC, even compared with subjects with substance abuse alone. Furthermore, 46% of those with severe mental illness had a lifetime history of comorbid substance abuse and/or dependence. The analyses showed people with severe mental illness were more vulnerable to past histories (eg, physical abuse, parental criminal acts) and prone to experience environmental stressors (eg, unemployment, victimization) that elevate violence risk. People with any severe mental illness were more likely to have a history of violence compared with people without severe mental illness, consistent

Table 3. Bivariate Associations Between Severe Mental Illness and Any Violent Act Reported Between Waves 1 and 2

	Total, No.	Violent, No.	Unweighted, %	Weighted, %	χ^2	P Value
Any severe mental illness						
Yes	6961	357	5.13	5.12	62.68	<.001
No	27 384	641	2.34	2.25		
Broader diagnostic categories						
Severe mental illness only						
Yes	3732	89	2.38	2.40	1.88	.17
No	30 613	909	2.97	2.85		
Substance abuse and/or dependence only						
Yes	7354	331	4.50	4.27	38.52	<.001
No	26 991	667	2.47	2.36		
Severe mental illness and substance abuse and/or dependence						
Yes	3229	268	8.30	8.03	71.42	<.001
No	30 386	730	2.35	2.27		
Specific diagnostic categories						
Schizophrenia only						
Yes	136	7	5.15	6.08	1.80	.18
No	34 209	991	2.9	2.8		
Bipolar disorder only						
Yes	458	16	3.49	4.04	1.30	.26
No	33 887	982	2.9	2.8		
Major depression only						
Yes	3138	66	2.1	2.05	5.86	.02
No	31 207	932	2.99	2.88		
Substance dependence only						
Yes	7353	331	4.5	4.28	38.52	<.001
No	26 992	667	2.47	2.37		
Schizophrenia and substance abuse and/or dependence						
Yes	158	20	12.66	9.31	4.35	.04
No	34 187	978	2.86	2.79		
Bipolar disorder and substance abuse and/or dependence						
Yes	692	94	13.58	12.14	35.92	<.001
No	33 653	904	2.69	2.62		
Major depression and substance abuse and/or dependence						
Yes	2370	154	6.47	6.72	37.17	<.001
No	31 966	844	2.64	2.52		

with other research.[11] As a result, the data suggest that the incidence of violence is higher for people with severe mental illness than for those without.

However, the analyses caution against overstating or exaggerating this higher rate. The NESARC data showed that severe mental illness alone was not statistically related to future violence in bivariate or multivariate analyses. In terms of effect sizes of individual risk factors, severe mental illness did not rank among the strongest predictors of violent behavior in this sample. Also, the analyses revealed that people with any type of severe mental illness were not at increased risk of committing serious/severe violent acts such as use of deadly weapons, inflicting extreme physical harm, or forcing sexual acts. Such data are at odds with public fears such as those reported in a national survey in which 75% of the sample viewed people with mental illness as dangerous[27] and 60% believed people with schizophrenia were likely to commit violent acts.[26] Instead, the current results show that if a person has severe mental illness without substance abuse and history of violence, he or she has the same chances of being violent during the next 3 years as any other person in the general population.

Although clinicians often do not focus on contextual factors when they assess a patient's violence risk,[45] the current data highlight the importance of considering situational variables when assessing an individual's risk of violence.[41,46,47] The findings provide empirical support to hypotheses raised in cross-sectional studies examining the link between mental illness and violence,[6] namely that environmental stressors precede later violent acts, even when controlling for diagnosis. This finding implies that an individual's risk of future violence may vary over time depending on stressors experienced in one's environment.[48,49] Several contextual factors are listed in Table 5, but the strongest predictors of violence were dispositional and historical. Post hoc mediation analyses[50] of the NESARC data show that the link between severe mental illness and violence is reduced but remains statistically significant after controlling for contextual factors, a finding consistent with other research.[6] The data attest to the importance of environment-level variables when assessing the risk of violence but also warn against underestimating the role of key factors at the individual level.

Finally, the results in multivariate models point to dynamic factors that appear to be promising targets for developing approaches to reducing violence risk. While some of the factors we examined were static and less amenable to intervention (eg, history of violence, parental criminal history), others were dynamic in the sense that

Table 4. Multivariate Predictors of Violent Behavior Perpetrated Between Waves 1 and 2

	Any Violence		Serious/Severe Violence		Substance-Related Violence	
	OR (95% CI)	*P* Value	OR (95% CI)	*P* Value	OR (95% CI)	*P* Value
Dispositional factors						
Age (<median, 43 y)	3.60 (2.80-4.63)	<.001	2.69 (1.81-4.00)	<.001	5.71 (3.80-8.60)	<.001
Education (high school or above)		.09	0.68 (0.48-0.95)	.03		.17
Sex, female	0.43 (0.35-0.52)	<.001	0.23 (0.17-0.32)	<.001	0.28 (0.21-0.38)	<.001
Race, white		.51		.33		.33
Annual income (above median, >$20 000)	0.58 (0.48-0.70)	<.001	0.69 (0.51-0.93)	.15	0.47 (0.35-0.63)	<.001
Historical factors						
Parental criminal history	1.65 (1.27-2.15)	<.001	1.91 (1.30-2.82)	<.001	1.56 (1.02-2.35)	.05
Witnessed parental physical fighting	1.40 (1.08-1.83)	.01		.19		.50
History of any violence	2.99 (2.43-3.68)	<.001	4.14 (2.77-6.20)	<.001	2.34 (1.71-3.20)	<.001
History of juvenile detention	2.05 (1.56-2.69)	<.001	2.96 (91.94-4.51)	<.001	1.56 (1.12-2.18)	.01
Clinical factors						
Schizophrenia only		.13		.73		.89
Bipolar disorder only		.64		.87		.73
Major depression only		.64		.58		.67
Substance abuse and/or dependence only	1.28 (0.99-1.64)	.05		.20	2.75 (1.84-4.11)	<.001
Schizophrenia and substance abuse and/or dependence		.66		.68	4.22 (1.35-13.26)	<.001
Bipolar disorder and substance abuse and/or dependence	1.60 (1.08-2.37)	.02		.55	3.53 (1.97-6.32)	<.001
Depression and substance abuse and/or dependence	1.69 (1.22-2.35)	.001		.24	4.04 (2.60-6.32)	<.001
Perceives hidden threats in others	1.45 (1.15-1.83)	.002	1.85 (1.25-2.73)	.002		
Contextual factors						
Victimized in the past year	1.47 (1.15-1.88)	.003	1.59 (1.08-2.19)	.02	1.52 (1.09-2.13)	.02
Any family or friend died in the past year		.19		.13		.85
Fired from job in the past year		.16		.43	1.41 (0.99-2.02)	.05
Divorced or separated in the past year	2.04 (1.62-2.57)	<.001	1.54 (1.07-2.35)	.02	2.58 (1.85-3.61)	<.001
Unemployed for the past year	1.57 (1.25-1.96)	<.001		.18	1.46 (1.05-2.01)	.02
	$\chi^2_{24} = 1842.62$		$\chi^2_{24} = 802.31$		$\chi^2_{24} = 1203.73$	
	P value = <.001		*P* value = <.001		*P* value = <.001	
	$R^2 = 0.24$		$R^2 = 0.23$		$R^2 = 0.30$	
	AUC = 0.85		AUC = 0.87		AUC = 0.90	

Abbreviations: AUC, area under the curve; CI, confidence interval; OR, odds ratio.

Table 5. Most Statistically Robust Predictors in Final Multivariate Model of Any Violent Behavior Between Waves 1 and 2

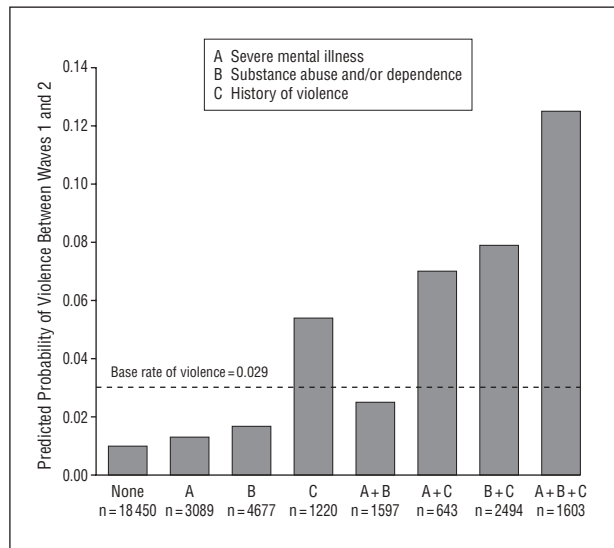| Predictor	Wald *F*	*P* Value	Risk Domain
Age, y	136.746	<.001	Dispositional
History of any violent act	109.932	<.001	Historical
Sex	67.231	<.001	Dispositional
History of juvenile detention	31.007	<.001	Historical
Divorce or separation in the past year	28.154	<.001	Contextual
History of physical abuse	27.492	<.001	Historical
Parental criminal history	21.162	<.001	Historical
Unemployment for the past year	15.453	<.001	Contextual
Co-occurring severe mental illness and substance use	13.342	<.001	Clinical
Victimization in the past year	8.204	.003	Contextual

Figure. Predicted probability of any violent behavior between waves 1 and 2 as a function of severe mental illness, substance abuse and/or dependence, and history of violence.

they can change and therefore be the focus of intervention.[51] The association of current work status with later violence implies that practical and measurable interventions such as vocational training, supported employment, and other means of assisting people to find stable jobs may help reduce violence risk.[52,53] Family therapy or legal mediation in the context of spousal conflict or pending separation might present other points of intervention given the findings linking violence to recent divorce.[54,55] Integrated dual-disorder treatment seems warranted as another avenue for addressing violence risk among those with co-occurring substance abuse and severe mental illness.[56,57] Physical abuse and reports of recent victimization are often associated with stress reactions producing anxiety-related problems. Addressing these issues through cognitive-behavioral therapy and psychotropic medications may be useful as violence risk management tactics.[58] Targeting dynamic factors with a ro-

bust association with violence in the NESARC could lead to effective strategies to reduce violence risk and warrant further investigation.

The current findings do not preclude a causal role of mental illness in violence. Within diagnostic groups, there will invariably be factors related to violence not captured in the current analysis. For example, it is hypothesized that threat-control override characteristics, in which a person fears personal harm and feels he or she is being threatened by others, relates to violence in people with psychotic disorders.[59,60] This may be supported by the current data showing a strong relationship between perceived threats and violence. However, perceiving hidden threats in others may not be a clinical symptom in every case but rather a reflection of the context in which the person lives and acts. Other variables not examined such as medication adherence or treatment engagement[37] may also affect risk of violence in psychiatric disorders. Detailed analysis of the NESARC studying violence risk factors among people with mental illness would therefore be fruitful.

There are additional limitations in the current study. Self-reported violence as used in surveys likely underestimates actual violence,[5,61] and the time lapse between interviews may have affected recall of violent behavior. Furthermore, although we examined severe/serious violence, we are not aware if these acts included murder or attempted murder; thus, generalizations as to whether severe mental illness is associated with homicidal behavior cannot be made. Also, as in other epidemiological studies,[11] information about schizophrenia was based on self-report; thus, it seems likely that a proportion of subjects with schizophrenia did not report their diagnosis. Attrition between waves 1 and 2 introduced a sample bias that can be controlled for statistically by weighting the data. Several sources of nonsampling error could have occurred such as interviewers recording wrong answers, respondents providing incorrect information, respondents inaccurately estimating requested information, unclear survey questions misunderstood by the respondent (measurement error), missed individuals (coverage error), missing responses (nonresponse error), forms lost, and data incorrectly keyed, coded, or recoded (processing error).[39]

That the NESARC targeted noninstitutionalized subjects could affect the generalizability of the current analyses; however, the prevalence of severe mental illness and substance abuse and/or dependence suggests sufficient inclusion of people with these diagnoses. The effect of this is offset, however, because the focus of this study is violence perpetrated by people living in the community. The victims of reported violent acts are unknown; more research is needed to determine whether different factors relate to violence against different types of victims. Not all potential risk factors were analyzed, although the variables included are conceptually grounded in the scientific literature of violence risk assessment. It is not yet known whether other variables exist that would contribute to more robust prediction of violence in statistical modeling.

The findings provide data to support a simple decision rule physicians could use to detect patients at higher risk for violence. For example, the occurrence of 3 factors (severe mental illness, substance abuse and/or dependence, history of violence) was associated with a distinctly higher than average risk of violence. The future violent behavior referred to in the current study is long-term (average 3 years). For clinicians who are asked to assess the immediate risk of violence for individuals presenting in emergency or crisis services, the current findings may help identify individuals who should undergo a more formal violence risk assessment. Structured and empirically-validated instruments such as the Classification of Violence Risk (COVR), based on findings from the MacArthur Violence Risk Assessment Study, provide easily administered (less than 10-minute) and computerized actuarial assessment of a patient's risk of violence after discharge from an acute psychiatric hospital.[33] The HCR-20 (Historical, Clinical, and Risk Management) violence risk assessment tool, a structured clinical guide, can be used to improve risk assessment in civil psychiatric, forensic, and jail populations,[3,62] and considers contextual variables such as the ones found to be relevant in the current study. Future research should be aimed at determining how the long-term factors for risk of violence identified in this study could be helpful in the context of emergency departments or crisis services when a person is screened for short-term or imminent violence risk.

The current study aimed to clarify the link between mental disorder and violence, and the results provide empirical evidence that (1) severe mental illness is not a robust predictor of future violence; (2) people with co-occurring severe mental illness and substance abuse/dependence have a higher incidence of violence than people with substance abuse/dependence alone; (3) people with severe mental illness report histories and environmental stressors associated with elevated violence risk; and (4) severe mental illness alone is not an independent contributor to explaining variance in multivariate analyses of different types of violence. As severe mental illness itself was not shown to sequentially precede later violent acts, the findings challenge perceptions that severe mental illness is a foremost cause of violence in society at large. The data shows it is simplistic as well as inaccurate to say the cause of violence among mentally ill individuals is the mental illness itself; instead, the current study finds that mental illness is clearly relevant to violence risk but that its causal roles are complex, indirect, and embedded in a web of other (and arguably more) important individual and situational cofactors to consider.

The cost of violence to individuals, families, and communities is great. Efforts to make violence risk assessment more scientifically based will ultimately improve our ability to evaluate risk of violence more accurately so we can take steps to manage that risk effectively and humanely, and direct the task of promoting safety without unwarranted stigmatization of people with mental illness. The recent spate of violence serves to underscore the importance of this task and the responsibility of our medical and legal systems to continue study in this area.

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Correction

Errors in Abstract and Text. In the Original Article by Coid et al titled "Raised Incidence Rates of All Psychoses Among Migrant Groups: Findings From the East London First Episode Psychosis Study," published in the November issue of the *Archives* (2008;65[11]:1250-1258), there were errors in the abstract and text. In the "Results" section of the abstract, the third sentence should read, "Only black Caribbean second-generation individuals were at significantly greater risk compared with their first-generation counterparts (incidence rate ratio, 2.2; 95% confidence interval, 1.1-4.2)." In the second paragraph of "Nonaffective Psychoses" in the "Results" section of the text, the second sentence should read, "Second-generation black Caribbean immigrants were at greater risk for nonaffective psychoses than their first-generation counterparts (IRR, 2.2; 95% CI, 1.1-4.2; P=.02) after adjustment for age and sex, although rates were significantly elevated in both generations compared with the UK-born white British group."