

Violence, Alcohol, and Completed Suicide: A Case-Control Study

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Objective: Violent behavior may represent a risk factor for suicide. The authors tested the hypothesis that violent behavior in the last year of life is associated with completed suicide, even after controlling for alcohol use disorders.

Method: The authors analyzed data from the 1993 National Mortality Followback Survey, a nationally representative survey conducted by telephone interview with decedents' next of kin. Data on 753 victims of suicide were compared with data on 2,115 accident victims. Decedents ranged in age from 20 to 64. Dichotomous measures of violent behavior in the past year and history of alcohol misuse were derived by using the four-item CAGE questionnaire. Multiple logistic regression was

used to evaluate the interactions of violent behavior with alcohol misuse, gender, and age, respectively, in predicting suicide versus accidental death. Education and race were included as covariates.

Results: Violent behavior in the last year of life was a significant predictor of suicide; the relationship was especially strong in individuals with no history of alcohol misuse, those who were younger, and women.

Conclusions: Violent behavior distinguished suicide victims from accident victims, and this finding is not attributable to alcohol use disorders alone. Given that violent behavior increases the risk of suicide, violence prevention initiatives may serve to decrease the risk of suicide as well.

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Suicide is the eighth leading cause of death overall in the United States (1). Many have conceptualized suicide as an inherently aggressive act (2), and the role of hostility, aggressive behavior, and anger in completed suicide has been emphasized for most of the last century (3, 4). With the exception of some neurobiological studies (5), much of the research on the interrelationship of suicide and aggression has focused on personality traits and psychiatric diagnoses related to self-reported hostility and aggression. There remains a paucity of data about overtly violent behavior. In this study, we examined the relationship between violent behavior and suicide.

Research suggests a common neurobiology of suicide and other forms of aggressive behavior (6). Lower levels of central serotonin distinguish clinical samples of suicide attempters from nonattempters (7) and are associated with more lethal suicide attempts after psychiatric illness has been controlled for (8, 9). Longitudinal investigations have demonstrated associations of self-reported aggression (10) and hostility (11) with completed suicide.

It is critical to account for alcohol misuse in investigations of the potential role of violence in suicide. For example, alcohol use disorders are strongly related to aggression toward others (12) and suicide (13, 14). Therefore, the apparent link between violent behavior and suicide may be spurious, attributable to the high base rate of alcohol use disorders among suicide victims. However, traits related to aggression are associated with attempted suicide

(15–17) and completed suicide (18) among individuals with alcohol use disorders. Therefore, it appears that the relationship between aggression and suicide cannot be ascribed to alcohol misuse alone.

The present study tested the hypothesis that violent behavior in the last year of life is associated with completed suicide, even after alcohol use disorders have been controlled for. Given the greater incidence of violent behavior among younger men (19), we also examined the effects of gender and age on the apparent link between violence and suicide.

Method

Because of their efficiency, retrospective case-control designs are typically employed in studies of rare outcomes or diseases (20). Suicide, with a base rate of 11.4 per 100,000 per year in the United States (21), warrants such a design. The case-control approach assumes that variables distinguishing suicide victims from an appropriate comparison group are likely to be risk factors for suicide (22).

We analyzed data from the 1993 National Mortality Followback Survey (23). The data were released in 1998 with identifying information expunged to facilitate analyses. The 1993 National Mortality Followback Survey represents a 6-year collaborative project between the National Center for Health Statistics and several federal agencies, state and local governments, colleges and universities, and private associations and organizations. The survey was the sixth in a series first initiated by the National Center for Health Statistics in the early 1960s to provide additional information related to mortality in the United States beyond that obtained through the registration of deaths.

TABLE 1. Frequency of Violent Threats or Attempts in the Year Before Death Reported by Informants for Suicide Victims and Accident Victims^a

Variable	Accident Victims (N=2,115)				Suicide Victims (N=753)			
	Violence Exhibited Rarely or Never		Violence Exhibited Sometimes or Often		Violence Exhibited Rarely or Never		Violence Exhibited Sometimes or Often	
	N	%	N	%	N	%	N	%
Age (years) ^b								
20–34	910	43.0	82	3.9	237	31.5	86	11.4
35–49	617	29.2	73	3.5	171	22.7	62	8.2
50–64	400	18.9	33	1.6	161	21.4	36	4.8
Gender								
Male	1,337	63.2	146	6.9	390	51.8	127	16.9
Female	590	27.9	42	2.0	179	23.8	57	7.6
Alcohol misuse								
No history (no items endorsed on CAGE questionnaire)	1,313	62.1	43	2.0	328	43.6	60	8.0
Positive history (one or more items endorsed on CAGE questionnaire)	614	29.0	145	6.9	241	32.0	124	16.5
Total	1,927	91.1	188	8.9	569	75.6	184	24.4

^a Data depicted here are unweighted; weighted data were used in regression analyses.

^b Age categorized here for descriptive purposes was continuous in regression analyses.

The 1993 National Mortality Followback Survey was based on a sample of 22,957 death certificates from 2,215,000 individuals aged 15 years and older who were residing and died in the United States in 1993. Death certificates were drawn from the 1993 Current Mortality Sample, a 10% systematic sample of death certificates received at the National Center for Health Statistics from state vital statistics offices. For each sampled decedent, sex, age, and cause of death were recorded from the death certificate.

To produce more robust analyses of predictors of death from violent causes, the National Mortality Followback Survey oversampled certain causes of death (e.g., homicide, suicide, accidental injury), certain age groups (e.g., individuals who were less than 35 years old at death) and black decedents (23). Trained personnel contacted the decedent's next of kin (or another person familiar with the decedent's life history) by telephone or in person and asked them to participate in the survey and provide information on the decedent. Informed written consent was obtained before in-person interviews; verbal consent was obtained before telephone interviews. Questions tapped numerous domains, including mental health and health care utilization.

Subjects

We limited the study to individuals between the ages of 20 and 64 because aggression appears to be more closely associated with suicide in younger than older adults (3). Cause of death was defined by death certificate. Victims of suicide were compared with accident victims. The accidents included motor vehicle accidents (drivers, passengers, motorcycle operators, pedestrians) and poisonings, falls, and other accidents (e.g., drowning or choking).

A total of 3,689 accident victims and 1,363 suicide victims met inclusion criteria. Analyses are based on a subgroup of 2,115 (57%) of the accident victims and 753 (55%) of the suicide victims. Of those included in the analyses, 1,483 (70%) of the accident victims and 517 (69%) of the suicide victims were men; 1,693 (80%) of the accident victims and 653 (87%) of the suicide victims were white, 358 (17%) and 80 (11%), respectively, were black, and 64 (3%) and 20 (3%), respectively, were other minorities. In education, 531 (25%) of the accident victims and 157 (21%) of the suicide victims had less than 12 years of education, 971 (46%) and 329 (44%), respectively, had 12 years, and 613 (29%) and 267 (36%), respectively, had more than 12 years. The remaining accident victims and suicide victims were excluded because of missing data on violence and/or history of alcohol misuse, either because a potential informant could not be contacted, declined to participate, or did not answer one or more of the survey questions

regarding these variables. Data were routinely available for demographic variables.

The 653 white suicide victims included in the study represented a higher percentage (57%) of the 1,148 white subjects in the total sample of suicide victims than the 80 black suicide victims (47% of 171) or the 20 suicide victims of other races (45% of 44) ($\chi^2=7.9$, $df=2$, $p<0.05$). This also held for accident victims: the 1,693 white accident victims represented a higher percentage (59%) of the white subjects in the total sample of accident victims ($N=2,878$) than the 358 black accident victims (52% of 692) or the 64 accident victims of other races (55% of 116) ($\chi^2=12.5$, $df=2$, $p<0.01$). The 632 female accident victims included in the study represented a higher percentage of the women in the total sample (61% of 1,030) than the 1,483 men (56% of 2,659) ($\chi^2=9.5$, $df=1$, $p<0.01$). Likelihood of inclusion in the study did not differ significantly between male (56% of 932) and female (55% of 431) suicide victims. There were no significant age differences in the accident victims or suicide victims that were or were not included in the study.

Measures

Violent behavior in the last year of life was defined dichotomously by response to the question, "During the last year of life, how often did... [the decedent subject] make violent threats or attempts?" Informants were provided with a 4-point scale ranging from often to never. Subjects reported as displaying these behaviors often or sometimes were coded as displaying violent behavior; those reported as displaying these behaviors rarely or never were coded as not displaying violent behavior. The question did not specify the target of violent threats or attempts or if they were directed externally or inwardly. History of alcohol misuse was coded as positive if the informant endorsed one or more items on the CAGE questionnaire, a 4-item screening tool for detecting alcohol use disorders (24); it was coded as negative if no CAGE items were endorsed.

Statistical Analyses

We used multiple logistic regression to predict case status (suicide victims versus accident victims). A correction for extra-binomial variation was included in each analysis (25). When this correction is used, statistical significance is tested by using F statistics rather than the usual chi-square statistics. Independent variables of primary interest were violence in the last year, history of alcohol misuse, gender, and age. Race and education were included as covariates, and all variables were entered simultaneously. We tested the main effects for all variables in the model

TABLE 2. Results of Regression Analyses to Predict Suicide Based on Data Provided by Informants for 753 Suicide Victims and 2,115 Accident Victims^a

Variable	Odds Ratio	95% CI	F (df=1, 2856)	p
Interaction of violence and alcohol misuse			14.3	<0.001
Not violent in past year, no history of alcohol misuse	1.0			
Not violent in past year, history of alcohol misuse	1.5	1.3–1.8		
Violent in past year, history of alcohol misuse	6.9	3.1–15.3		
Violent in past year, no history of alcohol misuse	11.6	4.8–28.1		
Interaction of violence and gender			3.8	0.05
Not violent in past year, female	1.0			
Not violent in past year, male	1.5	1.2–1.9		
Violent in past year, male	6.9	3.0–15.9		
Violent in past year, female	8.0	3.1–21.0		
Interaction of violence and age			4.5	0.03
Not violent in past year per 20 years decreased age	0.8	0.5–1.1		
Violent in past year per 20 years decreased age	1.2	1.0–1.4		
Main effect of violence			28.6	<0.001
Rarely or never in past year	1.0			
Sometimes or often in past year	4.6	2.0–5.4		

^a Independent variables were the main effects of age, gender, race, education, violent behavior, and alcohol misuse and the interactions of violent behavior with alcohol misuse, gender, and age. Odds ratios are adjusted for all of the variables in the model.

and interactions of violence with alcohol misuse, gender, and age in predicting case status. In addition to performing the overall significance test for multilevel categories, we also examined the parameter estimates and their associated significance tests to help determine the nature of the different effects. All tests were two-tailed, and alpha was set at 0.05. Case weights, provided in the database (23), were assigned to each case and comparison record to adjust for oversampling and nonresponse.

Results

The history of violence in the past year of the suicide and accident victims as well as the variables (gender, age, history of alcohol misuse) investigated for their interaction with violence in predicting suicide are shown in Table 1. These data are unweighted and thus were not entered in the regression analyses. They are presented in order to provide a concrete indication of the greater level of violence among the suicide victims compared with the accident victims.

Results of regression analyses are shown in Table 2. There were significant interactions between violence and alcohol misuse, violence and gender, and violence and age in predicting suicide. The association of violence and suicide was stronger among individuals without a history of alcohol misuse (Table 2). It was also stronger among women and younger individuals. Suicide risk was also associated with higher education ($F=11.7$, $df=1$, 2856, $p<0.001$), and white race ($F=14.9$, $df=1$, 2856, $p<0.001$).

Discussion

Results indicate that violence in the last year of life is more frequent among suicide victims than accident victims. Alcohol misuse, gender, and age are important considerations in explaining the violence-suicide link.

Violence and Alcohol

The relationship between violence and suicide cannot be attributed entirely to a violent subgroup of alcoholics.

Indeed, individuals displaying violent behavior but not in the context of alcohol misuse were especially more likely to take their own lives than to die accidentally. Agitated depression, altered serotonergic function (6), personality disorder characterized by impulsivity and aggression (26–28), and/or interpersonal crises (29, 30) may be driving their violent behavior, placing them at high risk for suicide. Still, violent behavior distinguishes a subgroup of individuals reported to abuse alcohol who are at heightened risk for suicide. These individuals may represent a subtype of alcoholism marked by impulsive and aggressive behavior (31).

Violence and Age

The relationships of younger adults are generally less stable and more prone to violence than those of older adults (32, 33), and this may be especially true of individuals vulnerable to suicide. Relationship disruptions are more likely to precede suicide in younger than in older individuals (29, 30). Risk for spousal homicide (34) and homicide followed by suicide (35) increase during relationship disruptions, often punctuating a pattern of domestic violence (34, 35). Although data on relationship violence and completed suicide are preliminary (36), improved understanding of such patterns may be a key component of suicide prevention, especially in younger adults. Given that the present analyses controlled for age and aggressive behavior, the age-related patterns of aggression and suicide were not entirely attributable to a higher rate of aggressive behavior in younger versus older adults (19).

Violence and Gender

Violence in women appears to confer greater risk for suicide than violence in men. Harris and Barraclough (37) reported a similar phenomenon with respect to alcohol use disorders in women. In a meta-analysis, they calculated higher relative risks for suicide associated with alcohol use disorders in women than men and speculated

that “women who break the convention opposing female heavy drinking may have a psychology which greatly increases their suicide risk” (p. 207). This may also apply to women displaying violent behavior. Among individuals with histories of violence, gender does not appear to protect against suicide risk.

Strengths and Limitations

Because of its large sample size and the representative nature of the data, the National Mortality Followback Survey offers a valuable opportunity to examine the interrelationship of violence and suicide and to consider patterns related to age, gender, and alcohol misuse. Proxy respondents have been demonstrated to be a valid source of data in epidemiologic research (38). The CAGE questionnaire is an effective screening tool for detecting alcohol use disorders in clinical (24, 39) and community populations (40). Indeed, the proportion of suicide victims determined to have histories of alcohol misuse in this study according to the CAGE questionnaire (48.5%) is comparable to estimates based on retrospective studies of adult suicides conducted in the United States (41–43). Despite representing a single dichotomous item, violence was a powerful discriminator of suicide and accident victims. We chose accident fatalities to control for sudden death (44). It is important to note that misclassification of driver suicides as accidents is infrequent and has a trivial influence on suicide statistics (45).

The present analyses have limitations. Data are retrospective and primarily based on telephone interviews with informants. Diagnostic data are unavailable. African Americans and other minorities were less likely to be included, raising concerns about the generalizability of our findings. The CAGE questionnaire does not provide information about the recency or severity of alcohol misuse and has traditionally been used as a self-screen rather than with informants. There is no comparison group of living subjects available in the National Mortality Followback Survey. The comparison group for the present analyses, fatal accident victims, may deviate from individuals in the community in personality characteristics, alcohol misuse, and demographic factors (46, 47). Indeed, the high base rate of alcohol misuse in the comparison group likely muted the association of alcohol and suicide. Finally, the degree to which the informants may have included the decedent's threats of suicide or self-directed violence when asked about violent threats or attempts is not known.

Conclusions

Even after controlling for alcohol misuse, we found that violence is a potent risk factor for suicide. Given that violence and suicide appear to share many common risk factors (4), interventions effective in reducing violence may also reduce the potential for suicide. For example, providing behavioral marital therapy to treated alcoholics ap-

pears to be effective in decreasing domestic violence (48). Principal targets of this treatment, alcohol misuse and marital distress and conflict, are also putative risk factors for suicide, and so progress in these areas may also minimize risk for self-harm. Given the apparent risk for suicide among men with histories of domestic violence (36, 49), family violence courts and mandated domestic violence intervention programs may also be promising settings for suicide prevention initiatives. These efforts are likely to have their greatest impact on relatively younger men. The association between violence and suicide in women suggests that there is a need for novel prevention strategies targeting women displaying aggressive behavior. Overall, violence prevention and suicide prevention initiatives can inform one another and stand to gain by coordination.

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