Exploring the Correlates of Suicide Attempts Among Individuals With Major Depressive Disorder: Findings From the National Epidemiologic Survey on Alcohol and Related Conditions

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Objective: There are no previous studies describing the correlates of suicide attempts in individuals with major depressive disorder in a nationally representative sample. This study explores the sociodemographic variables, mental disorders, and specific depressive symptoms associated with suicide attempts in depression.

Method: Data were drawn from Wave 1 of the National Epidemiologic Survey on Alcohol and Related Conditions (NESARC), a large (N = 43,093) nationally representative survey of mental illness in the United States conducted between 2001 and 2002. Persons with lifetime major depressive disorder (N = 5128; diagnosed according to DSM-IV) were categorized according to the presence (N = 865) or absence (N = 4263) of a lifetime history of suicide attempts. Multivariate logistic regression was used to compare the 2 groups across a broad range of sociodemographic and mental disorder correlates, as well as to compare specific depressive symptoms associated with a history of suicide attempts. Positive predictive values (PPVs) were calculated to evaluate the effectiveness of each correlate in predicting suicide attempts. Analyses were conducted separately for men and women.

Results: Sociodemographic factors significantly associated with a history of suicide attempts included Hispanic or Latino ethnicity (p < .05), younger age (p < .01), and low annual income (p < .01). A history of suicide attempt was significantly associated with any anxiety, personality, or substance use disorder among both men and women (all p < .01). Personality disorder comorbidity was most predictive of suicide attempt. In men, suicide attempts had a strong association with dependent personality disorder (adjusted odds ratio [AOR] = 3.81; 95% CI = 1.14 to 12.73), whereas in women, suicide attempts had a strong association with antisocial personality disorder (AOR = 2.71; 95% CI = 1.72 to 4.25). Dependent personality disorder predicted suicide attempt in almost three quarters of depressed men (PPV = 74.3%; 95% CI = 54.2 to 87.6). The depressive symptom most strongly associated with a history of suicide attempts in both men and women was feelings of worthlessness (AOR = 5.48, 95% CI = 3.36 to 8.94 for men; AOR = 4.93, 95% CI = 3.56 to 6.84 for women).

Conclusions: This study contributes to the existing literature on risk factors for suicide attempts in depressed individuals. Identifying specific depressive symptoms and comorbid mental illnesses may improve the clinical assessment of suicide risk in people with major depressive disorder.

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C linical and epidemiologic studies have consistently demonstrated a strong correlation between major depressive disorder (MDD) and suicide attempts.¹⁻⁷ However, the majority of individuals with MDD do not attempt suicide despite being at substantially increased risk. This fact represents a significant challenge for clinicians in the area of risk assessment. Consequently, the identification of risk factors for suicide attempts among people with MDD is of great importance.

Clinical characteristics of depression appear to increase the risk for suicidal behavior in such individuals. A highly severe depression or depression of early onset puts the depressed person at a higher risk for suicide attempt.^{5,6,8–11} Total time spent in major depressive episodes⁷ indicates that chronicity also elevates the risk for suicide attempt. Depression-related cognitions such as hopelessness,^{12–14} pessimism,⁶ and self-blame¹⁵ are potential risk factors, as is the presence of melancholia¹⁵ and irritability.¹⁶ Indeed, even the presence of subthreshold depressive symptoms appears to elevate the risk for suicide attempts.¹⁷ The low levels of social and occupational functioning frequently accompanying depression are also associated with suicide attempts.⁵

Several sociodemographic factors are related to suicidal behavior in people with MDD. Marital isolation or discord^{7-9,18} and younger age^{5,19,20} are associated with suicidal behavior. Higher socioeconomic status in the elderly is reported as a risk factor.²¹ The relationship between suicide attempts and gender is not clear. In the general population (including those not necessarily depressed), some studies have shown higher attempt rates among women,^{1,22} whereas others have found no gender difference.^{3,23} Among depressed individuals, many studies have found no gender difference in incidence of suicide attempts.^{5,7} Other studies, however, have found higher attempt rates for women.^{24–27} Beyond prevalence rates, men and women seem to differ on characteristics associated with suicide attempts; for example, borderline personality disorder has been significantly associated with suicide attempts in men but not in women.²⁶

Comorbid illness has also been identified as a risk factor for suicide attempt in MDD, including the presence of a comorbid personality disorder, 13,28-32 comorbid alcohol abuse or dependence,^{5,8,9,27,33} and chronic physical illness.33 There are conflicting findings regarding the influence of anxiety disorders on suicidal behavior in depressed individuals, with some studies identifying anxiety disorders as potential risk factors^{34,35} and others not.³⁶ The type of anxiety disorder appears to be an important factor in this regard. Posttraumatic stress disorder^{32,37} and social anxiety disorder³⁸ contribute to the risk for suicide attempt in MDD, whereas panic disorder may not.³⁶ From a more general perspective, there is evidence that the total number of comorbid psychiatric conditions contributes to the risk for suicide attempt in depressed persons, suggesting an effect mediated by overall burden of mental illness.³⁹

While the above-mentioned studies have been instrumental in helping to identify depressed individuals at risk for suicide attempt, a common limitation relates to their sample populations. The majority of the studies, to date, have focused on treatment-seeking samples composed of either inpatients or outpatients, with only a few examining general population samples.^{17,38,39} To the best of our knowledge, there has not been a study examining the potential risk factors of suicide among people with MDD in a nationally representative population. The advantage of such a study is that it can potentially determine correlates of suicide attempts in persons who meet criteria for MDD but who have not presented for treatment. Furthermore, these findings can be extrapolated to the general population, with the ultimate goal of improving risk assessment in depressed individuals.

There are other important limitations of previous studies examining suicidal acts in depressed persons. One pertains to comorbid personality disorders. Although there are elevated rates of suicide attempts in depression with comorbid personality disorders,^{40,41} the focus has primarily been restricted to borderline personality disorder.^{13,28-32} Very little is known about the risk for suicide attempts in depressed people with cluster A or C personality disorders. Another limitation is that individual DSM-IV depressive symptoms have not been systematically assessed as correlates for suicidal behavior. While hopelessness is perhaps the depressive cognition most examined,^{12–14} it is not a DSM-IV symptom of MDD.42 Clinical studies have revealed depressed mood, anhedonia, psychomotor agitation, and feelings of worthlessness to be associated with suicide attempts in pediatric^{43,44} and adult samples.⁴⁵ Further clarification of depressive symptoms associated with suicide attempts in a general population sample of depressed men and women would be of interest for clinicians in order to better identify those at risk.

The National Epidemiologic Survey on Alcohol and Related Conditions (NESARC) is a nationally representative study of mental illness in the United States (NESARC information and data are available at the official Web site: http://www.nesarc.niaaa.nih.gov). NESARC has the advantage of a large sample size (N = 43,093), as well as the most complete epidemiologic assessment of personality disorders to date. It is a sample population that is therefore well suited to allow a thorough exploration of possible correlates of suicide attempts among individuals with MDD-the principal goal of this study. Additional goals of this study are (1) to examine sociodemographic and mental disorder correlates of suicide attempts, including Axis I disorders and personality disorders, (2) to determine which individual DSM-IV symptoms of MDD are associated with suicide attempts, and (3) to compare the above correlates for men and women in an effort to determine whether the profiles for individuals who attempt suicide differ depending on gender.

METHOD

Sample

The sample used in this study is from Wave 1 of the NESARC, a nationally representative face-to-face survey of noninstitutionalized U.S. civilians aged 18 and over. The survey was conducted between 2001 and 2002 by the National Institute on Alcohol Abuse and Alcoholism (NIAAA). The overall response rate was 81%. The NESARC used a multistage sampling design that oversampled specific racial groups, including African

Americans and Hispanics, and also oversampled young adults. Data were weighted to account for the sampling of 1 individual per household, to account for the oversampling of young adults, and to adjust for the probability of nonresponse. The weighted data were then adjusted to be representative of the U.S. civilian population on the basis of the 2000 Decennial Census of Population and Housing.⁴⁶ The specific aspects of the sampling design of the NESARC are described elsewhere in detail.⁴⁷

Sociodemographic Factors

Sex, age, race/ethnicity, education, marital status, household income, urbanicity, and region were used as covariates in the analyses. Age was categorized into 4 groups: (1) 18–29 years, (2) 30–44 years, (3) 45–64 years, and (4) 65 years or older. Race/ethnicity was used as it was collected and included 5 categories: (1) white, (2) black, (3) American Indian/Alaska Native, (4) Asian/ Native Hawaiian/Pacific Islander, and (5) Hispanic/ Latino. Education was trichotomized into (1) less than high school, (2) high school graduate, and (3) some college or higher. Marital status was also trichotomized into (1) never married, (2) married/common-law, and (3) widowed/separated/divorced. Household income was divided into 4 categories: (1) \$0-\$19,999; (2) \$20,000-\$34,999; (3) \$35,000-\$59,999; and (4) \$60,000 or more. Urbanicity was a dichotomous variable divided into urban versus rural. Region referred to the area of the United States where the respondent resided, and categories included Northeast, Midwest, South, and West.

Assessment of Mental Disorders

DSM-IV diagnoses were generated using the NIAAA Alcohol Use Disorders and Associated Disabilities Interview Schedule–DSM-IV version (AUDADIS-IV).48 The AUDADIS-IV is a fully structured assessment tool used by trained lay interviewers and has shown good test-retest reliability⁴⁹⁻⁵¹ as well as good validity.⁵² It allowed for the determination of separate abuse and dependence diagnoses for alcohol as well as 10 individual classes of drugs (sedatives, tranquilizers, opiates, stimulants, hallucinogens, cannabis, cocaine, inhalants/solvents, heroin, and other drugs). Retest reliability values for substance use disorders were excellent, with kappas exceeding 0.74 for alcohol use disorders and 0.79 for drug use disorders. Mood and anxiety disorders assessed in the survey included MDD, dysthymia, hypomania, mania, panic disorder with and without agoraphobia, social phobia, specific phobia, and generalized anxiety disorder. Retest reliability values for mood and anxiety disorders were fair to good, with kappas ranging from 0.42 for specific phobia to 0.64 for MDD. Personality disorders assessed in the survey included antisocial, histrionic, paranoid, schizoid, dependent, obsessive-compulsive, and avoidant personality disorders. Schizotypal, borderline, and narcissistic personality disorders were not included in the AUDADIS-IV because of additional time required for accurate diagnosis.⁴⁸ The reliability of the personality disorder diagnoses was fair to good, with kappas ranging from 0.40 for histrionic personality disorder to 0.67 for antisocial personality disorder.

Assessment of Suicidal Behavior

Suicide attempts in the NESARC were assessed only in individuals who endorsed positive responses to at least 1 of the 2 following questions: "In your entire life, have you ever had a time when you felt sad, blue, depressed, or down most of the time for at least 2 weeks?" or "In your entire life, have you ever had a time, lasting at least 2 weeks, when you didn't care about the things that you usually cared about, or when you didn't enjoy the things you usually enjoyed?" For the purposes of this study, we included suicide attempts only among people meeting full criteria for MDD (N = 5128). Suicide attempt was assessed using the following question: "During that time when your mood was at its lowest or you enjoyed or cared the least about things, did you attempt suicide?" The design of the NESARC did not allow for determination of age at time of suicide attempt. For all analyses, we created a dependent variable composed of individuals with MDD with suicide attempts (N = 865) versus individuals with MDD who did not endorse either suicidal ideation or suicide attempts (N = 4263).

Assessment of Depressive Symptoms

Table 1 lists the NESARC questionnaire statements that were used to assess for the presence of MDD. For ease of use in this study, we paired each statement with a corresponding brief descriptive term. Depressive symptoms are thus referred to in the manuscript by their shortened form. In DSM-IV, many of the cluster A criteria are a collection of symptoms; for example, appetite and weight changes are 1 criterion. These were separated in our analyses in an effort to more accurately characterize the depressive symptom correlates of suicide attempts.

Statistical Analyses

In all analyses, the appropriate statistical weight was employed to ensure the data were representative of the population. Standard errors were calculated using the Taylor series linearization method in the SUDAAN⁵³ program based on stratification information provided specifically for calculating design-based standard errors.

First, we explored the sociodemographic characteristics of the sample. We then used multiple logistic regression to determine whether differences existed in terms of sociodemographic factors when comparing depressed individuals who made a suicide attempt with those who did not make an attempt.

Table 1. NESARC^a Survey Questions and Their Corresponding DSM-IV Depressive Symptoms

Actual Question From the NESARC Low Mood Questionnaire	DSM-IV Depressive Symptom
In your ENTIRE LIFE, have you ever had a time when you felt sad, blue, depressed, or down most of the time for at least 2 weeks?	Depressed mood
In your ENTIRE LIFE, have you ever had a time, lasting at least 2 weeks, when you didn't care about the things that you usually cared about, or when you didn't enjoy the things you usually enjoyed?	Anhedonia
Lose at least 2 pounds a week for several weeks or at least 10 pounds altogether within a month, other than when you were physically ill or dieting?	Weight loss
Lose your appetite nearly every day for at least 2 weeks?	Decreased appetite
Gain at least 2 pounds a week for several weeks or at least 10 pounds altogether within a month (other than when you were growing or pregnant)?	Weight gain
Find that you wanted to eat a lot more than usual for no special reason, most days for at least 2 weeks?	Increased appetite
Have trouble falling asleep nearly every day for at least 2 weeks?	Initial insomnia
Wake up too early nearly every day for at least 2 weeks?	Early morning awakening
Sleep more than usual nearly every day for at least 2 weeks?	Hypersomnia
Feel tired nearly all the time or get tired easily most days for at least 2 weeks, even though you weren't doing more than usual?	Excessive fatigue
Move or talk MUCH more slowly than usual, most days for at least 2 weeks?	Psychomotor retardation
Become so restless that you fidgeted or paced most of the time for at least 2 weeks?	Psychomotor agitation
Become so restless that you felt uncomfortable for at least 2 weeks?	Restlessness
Feel worthless nearly all the time for at least 2 weeks?	Feelings of worthlessness
Feel guilty about things you normally wouldn't feel guilty about, most of the time for at least 2 weeks?	Excessive guilt
Have trouble concentrating or keeping your mind on things, most days for at least 2 weeks?	Diminished concentration
Find it harder than usual to make decisions, most of the time for at least 2 weeks?	Impaired decision- making
^a NESARC information and data are available at the http://www.nesarc.niaaa.nih.gov.	official Web site:

Abbreviation: NESARC = National Epidemiologic Survey on Alcohol and Related Conditions.

Second, 2 sets of regression analyses were conducted to examine the association between mental disorders and suicide attempts among depressed individuals: (1) adjustment for sociodemographic factors and (2) adjustment for sociodemographic factors, number of depressive symptoms, and each of the other mental disorders, all entered simultaneously into the regression. These analyses were stratified by gender on the basis of previous findings showing a gender difference among persons attempting suicide.¹ Sociodemographic covariates in the regressions included age, race, marital status, education, household income, level of urbanicity, and region. The positive predictive value (PPV) for each mental disorder correlate was also reported in an effort to evaluate the effectiveness of each correlate in predicting suicide attempts. PPV is calculated on the basis of the probability that an individual will have a suicide attempt (disease) given the presence of a disorder (positive test).⁵⁴ The formula used for these calculations is based on the following:

PPV = a/(a + b) = true positive/(true positive + false positive).

The way that the formula was utilized in our calculations is the following:

PPV = DX + SA/[(DX + SA) + (DX + no SA)],

wherein DX refers to the presence of a mental disorder and SA refers to the presence of a suicide attempt.

Third, 2 final sets of regression analyses were conducted, again stratified by gender, to explore the association between depressive symptomatology and suicide attempts among depressed individuals: (1) adjustment for sociodemographic factors and (2) adjustment for sociodemographic factors and for each of the other depressive symptoms (i.e., all depressive symptoms were entered simultaneously into the regression). Additionally, the PPV for each depressive symptom correlate was calculated.

Due to the exploratory nature of the analyses, a number of different models were tested. For ease of reading, the number of analyses reported was reduced by removing model 1 (adjustment for sociodemographic factors) from the tables. However, the key findings of these analyses are reported in the text of the Results section.

RESULTS

The sociodemographic correlates of suicide attempts among individuals with MDD are presented in Table 2. Depressed women and men did not differ significantly in prevalence of suicide attempts in this sample. The Hispanic/Latino ethnic group had increased odds of suicide attempt when compared with whites (OR = 1.30; 95% CI = 1.00 to 1.69). Older age was significantly associated with decreased odds of suicide attempts, as was an income higher than 0-19,999. Being widowed/ separated/divorced or never married was associated with significantly increased odds of suicide attempts when compared with married individuals.

Tables 3 and 4 show the relationship between Axis I and Axis II mental disorder comorbidity and suicide attempts among depressed men and women, respectively.

Sociodemographic Variable (N)	No Suicide Attempt $(N = 4263), N (\%)^{a}$	Suicide Attempt $(N = 865), N (\%)^{a}$	Odds Ratio ^{b,c} (95% CI)
Sex			
Male (1504)	1255 (33.1)	249 (32.0)	1.00
Female (3624)	3008 (66.9)	616 (68.0)	1.05 (0.86 to 1.27)
Race/ethnicity			
White (3229)	2725 (77.1)	504 (71.7)	1.00
Black (761)	628 (8.0)	133 (9.5)	1.28 (0.99 to 1.65)
American Indian/Alaska Native (121)	92 (3.1)	29 (3.8)	1.31 (0.76 to 2.25)
Asian/Native Hawaiian/Pacific Islander (115)	87 (2.9)	28 (4.1)	1.53 (0.92 to 2.55)
Hispanic/Latino (902)	731 (9.0)	171 (10.9)	1.30 (1.00 to 1.69)*
Age, y			
18-29 (1092)	840 (20.7)	252 (31.9)	1.00
30-44 (1744)	1453 (33.7)	291 (33.9)	0.65 (0.50 to 0.84)**
45-64 (1687)	1403 (34.8)	284 (30.8)	0.57 (0.44 to 0.75)**
65+ (605)	567 (10.7)	38 (3.5)	0.21 (0.13 to 0.34)**
Marital status			
Married/common-law (2234)	1920 (57.1)	314 (45.6)	1.00
Widowed/separated/divorced (1692)	1375 (23.2)	317 (29.3)	1.59 (1.27 to 1.98)**
Never married (1202)	968 (19.7)	234 (25.1)	1.60 (1.24 to 2.05)**
Education			
Less than high school (878)	700 (15.1)	178 (18.1)	1.00
High school graduate (1417)	1178 (27.3)	239 (28.0)	0.86 (0.65 to 1.14)
Some college or higher (2833)	2385 (57.6)	448 (54.0)	0.79 (0.60 to 1.02)
Income			
\$0-\$19,999 (1571)	1213 (21.5)	358 (32.8)	1.00
\$20,000-\$34,999 (1117)	925 (20.5)	192 (22.9)	0.73 (0.58 to 0.93)**
\$35,000-\$59,999 (1537)	1317 (33.2)	220 (28.8)	0.57 (0.46 to 0.71)**
\$60,000 or greater (903)	808 (24.9)	95 (15.6)	0.41 (0.31 to 0.55)**
Urbanicity			
Urban (1783)	1445 (28.8)	338 (31.8)	1.00
Rural (3345)	2818 (71.3)	527 (68.2)	0.86 (0.71 to 1.05)
Region			
Northeast (955)	785 (18.2)	170 (18.5)	1.00
Midwest (1182)	991 (24.9)	191 (26.0)	1.03 (0.79 to 1.33)
South (1817)	1533 (33.9)	284 (31.2)	0.90 (0.72 to 1.14)
West (1174)	954 (23.1)	220 (24.4)	1.04 (0.79 to 1.36)

Table 2. Sociodemographic Correlates Among People With Major Depressive Disorder and Suicide Attempts (total N = 5128)

^aNs are unweighted values; percentages are weighted values.

^bOdds ratio of 1.00 indicates reference group.

^cBoldface type indicates significance.

The presence of any comorbid anxiety disorder, personality disorder, or substance use disorder increased the odds of suicide attempts, even after adjusting for sociodemographic factors (not shown in tables). Agoraphobia was the only comorbid disorder not significantly associated with suicide attempts when adjusting for sociodemographic factors, most likely due to small sample sizes. Among the personality disorders in men, antisocial, dependent, schizoid, and avoidant personality disorders were all significantly associated with suicide attempts (adjusted odds ratios [AORs] ranging from 1.86 to 3.81) in models adjusting for sociodemographics, all other mental disorders, and number of depressive symptoms. Among the personality disorders in women, antisocial, paranoid, schizoid, and avoidant personality disorders were significantly associated with suicide attempts (AORs ranging from 1.43 to 2.71) in models adjusting for sociodemographics, all other mental disorders, and number of depressive symptoms. Any drug use disorder and increasing number of depressive symptoms were also significantly associated with suicide attempts in both men (Table 3) and women (Table 4) when sociodemographics, mental disorders, and number of depressive symptoms were all entered into the same model simultaneously. Even after adjusting for the effects of all anxiety, personality, and substance use disorders and number of depressive symptoms, comorbid panic disorder significantly increased the odds of suicide attempts in women (AOR = 1.78; 95% CI = 1.29 to 2.45).

Tables 3 and 4 also illustrate the PPV for each mental disorder correlate in predicting suicide attempts. The highest PPV was for dependent personality disorder in both men (PPV = 74.3%; 95% CI = 54.2 to 87.6) and women (PPV = 58.1%; 95% CI = 44.3 to 70.8). The vast majority of the mental disorders had PPVs of 20% or higher, wherein personality disorders as a grouping maintained the highest PPV values in both genders (PPVs ranging from 25.1% [95% CI = 19.3 to 31.9] for

^{*}p < .05, **p < .01.

Table 3. Mental Disorder Correlates Among Men With Major Depressive Disorder and Suicide Attempts				
Mental Disorder (N)	No Suicide Attempt ^a (N = 1255), N $(\%)^{b}$	Suicide Attempt $(N = 249), N (\%)^{b}$	Adjusted Odds Ratio ^{c,d} (95% CI)	Positive Predictive Value, ^e % (95% CI)
Anxiety disorders				
Panic disorder (150)	$112(8.3)^{\rm f}$	38 (15.6)	1.32 (0.70 to 2.49)	26.0 (18.2 to 35.8)
Agoraphobia (10)	7 (0.8)	3 (2.6)	4.66 (0.83 to 26.16)	38.9 (12.5 to 74.1)
Social phobia (183)	132 (11.0)	51 (21.5)	0.78 (0.42 to 1.46)	26.8 (19.5 to 35.7)
Specific phobia (239)	178 (14.6)	61 (27.9)	1.33 (0.77 to 2.28)	26.4 (19.3 to 34.8)
Generalized anxiety disorder (215)	149 (12.6)	66 (22.7)	1.24 (0.75 to 2.07)	25.3 (19.7 to 31.7)
Any anxiety disorder (539)	414 (33.4)	125 (51.8)		22.5 (18.4 to 27.2)
Personality disorders				
Antisocial (197)	122 (11.0)	75 (32.2)	1.86 (1.06 to 3.24)*	35.5 (27.6 to 44.3)
Dependent (31)	9 (0.7)	22 (11.2)	3.81 (1.14 to 12.73)*	74.3 (54.2 to 87.6)
Obsessive-compulsive (305)	236 (18.1)	69 (32.3)	0.65 (0.37 to 1.14)	25.1 (19.3 to 31.9)
Paranoid (209)	144 (10.7)	65 (26.6)	1.09 (0.61 to 1.95)	31.8 (23.9 to 40.9)
Schizoid (147)	98 (7.5)	49 (22.9)	2.26 (1.25 to 4.08)**	36.4 (26.3 to 47.9)
Histrionic (104)	64 (4.9)	40 (17.8)	2.02 (0.97 to 4.20)	40.5 (28.3 to 54.1)
Avoidant (125)	63 (5.2)	62 (24.5)	2.03 (1.07 to 3.85)*	47.0 (36.2 to 58.1)
Any personality disorder (587)	431 (33.7)	156 (67.3)		27.3 (22.5 to 32.6)
Substance use disorders				
Any drug use disorder (399)	287 (23.4)	112 (49.0)	1.72 (1.02 to 2.70)*	28.2 (22.5 to 34.6)
Any alcohol use disorder (881)	709 (56.8)	172 (70.4)	1.11 (0.72 to 1.73)	18.8 (15.8 to 22.3)
Nicotine dependence (545)	420 (34.4)	125 (53.3)	1.37 (0.95 to 1.99)	22.5 (18.4 to 27.2)
Any substance use disorder (1013)	814 (65.0)	199 (81.6)		19.0 (16.1 to 22.3)
Depression severity	× ,			
Number of depressive symptoms			1.13 (1.04 to 1.23)**	

^aReference group is individuals with major depressive disorder without suicide attempts.

^bNs are unweighted values; percentages are weighted values.

^cSimultaneously adjusted for sociodemographic variables (race/ethnicity, age, marital status, education, income, urbanicity, and region), mental disorders (panic disorder, agoraphobia, social phobia, specific phobia, generalized anxiety disorder, antisocial personality disorder, dependent personality disorder, obsessive-compulsive personality disorder, paranoid personality disorder, schizoid personality disorder, histrionic personality disorder, any drug use disorder, any alcohol use disorder, and nicotine dependence), and number of depressive symptoms.

^dBoldface type indicates significance.

ePositive predictive values are based on weighted Ns.

^fPercentages are to be interpreted as, for example, 8.3% of men with no suicide attempt had panic disorder.

*p < .05, **p < .01.

obsessive-compulsive disorder to 74.3% [95% CI = 54.2 to 87.6] for dependent personality disorder in men, and from 25.0% [95% CI = 21.1 to 29.3] for obsessive-compulsive disorder to 58.1% [95% CI = 44.3 to 70.8] for dependent personality disorder in women).

Table 5 reveals the associations between specific depressive symptoms and lifetime history of suicide attempts. Findings in both sexes illustrated similar trends in terms of those symptoms most strongly associated with suicide attempts. Interestingly, depressed mood, one of the core diagnostic criteria for establishing a diagnosis of MDD,42 was not associated with a history of suicide attempt in either men or women. The presence of anhedonia, conversely, was correlated with suicide attempt in both sexes (AORs of 4.34 and 2.13 for men and women, respectively) even after simultaneously adjusting for all depressive symptoms and sociodemographic factors. The depressive symptom most strongly associated with lifetime suicide attempt in both men and women was feelings of worthlessness (AOR = 5.48, 95% CI = 3.36 to 8.94 for men; AOR = 4.93, 95% CI = 3.56 to 6.84 for women). Excessive guilt was significantly associated with suicide attempts in men but not in women (AOR = 2.49; 95% CI = 1.62 to 3.84). A significant positive association between weight loss and suicide attempts was present in women (AOR = 1.49; 95% CI = 1.06 to 2.09), and a significant negative association between psychomotor retardation and suicide attempts was noted in men (AOR = 0.53; 95% CI = 0.35 to 0.82).

The PPV calculations in Table 5 reveal that each depressive symptom correlate offers between 16% and 24% accuracy in predicting an individual who has attempted or will attempt suicide. Feeling worthless was the symptom correlate that offered the highest PPV in both men and women at 23.6% (95% CI = 20.3 to 27.2) and 24.3% (95% CI = 22.2 to 26.6), respectively. This finding echoes the results illustrated by the logistic regression analyses, indicating that the strongest association exists between feelings of worthlessness and suicide attempts.

DISCUSSION

This exploratory study is the first to investigate the correlates of suicide attempts, including the full range of DSM-IV depressive symptoms, among individuals with MDD in a nationally representative sample. These preliminary findings serve to extend the body of literature on risk assessment in individuals with MDD by examining

	No Suicide Attempt ^a	Suicide Attempt	Adjusted Odds Ratio ^{c,d}	Positive Predictive Value ^e
Mental Disorder (N)	$(N = 3008), N (\%)^{b}$	$(N = 616), N (\%)^{b}$	(95% CI)	% (95% CI)
Anxiety disorders				
Panic disorder (467)	$324(11.4)^{f}$	143 (25.2)	1.78 (1.29 to 2.45)**	30.3 (25.7 to 35.4)
Agoraphobia (14)	13 (0.5)	1 (0.3)	0.19 (0.03 to 1.24)	10.8 (1.4 to 50.4)
Social phobia (444)	315 (12.3)	129 (21.9)	0.97 (0.67 to 1.40)	25.9 (21.4 to 31.1)
Specific phobia (857)	660 (23.5)	197 (33.3)	0.97 (0.72 to 1.30)	21.8 (18.4 to 25.6)
Generalized anxiety disorder (595)	445 (15.9)	150 (26.0)	1.12 (0.83 to 1.51)	24.3 (20.3 to 28.9)
Any anxiety disorder (1577)	1231 (44.1)	346 (58.2)		20.6 (18.2 to 23.2)
Personality disorders				
Antisocial (187)	91 (2.9)	96 (16.3)	2.71 (1.72 to 4.25)**	52.8 (43.9 to 61.5)
Dependent (76)	33 (1.0)	43 (7.0)	1.38 (0.60 to 3.13)	58.1 (44.3 to 70.8)
Obsessive-compulsive (594)	436 (16.0)	158 (27.1)	1.02 (0.72 to 1.43)	25.0 (21.1 to 29.3)
Paranoid (518)	319 (9.6)	199 (29.1)	1.43 (1.01 to 2.00)*	37.3 (32.4 to 42.6)
Schizoid (315)	193 (6.0)	122 (19.0)	1.71 (1.15 to 2.55)**	38.2 (31.6 to 45.3)
Histrionic (180)	109 (3.3)	71 (12.1)	1.46 (0.91 to 2.33)	41.9 (33.1 to 51.2)
Avoidant (284)	158 (5.4)	126 (20.3)	2.18 (1.40 to 3.41)**	42.6 (36.2 to 49.2)
Any personality disorder (1149)	793 (27.0)	356 (56.9)		29.2 (26.2 to 32.5)
Substance use disorders				
Any drug use disorder (509)	334 (11.3)	175 (29.0)	1.62 (1.15 to 2.29)**	33.5 (29.0 to 38.3)
Any alcohol use disorder (1136)	854 (30.3)	282 (46.9)	1.24 (0.95 to 1.63)	23.3 (20.6 to 26.3)
Nicotine dependence (991)	733 (27.1)	258 (43.5)	1.17 (0.89 to 1.55)	24.0 (20.9 to 27.3)
Any substance use disorder (1672)	1287 (46.1)	385 (64.4)		21.5 (19.4 to 23.9)
Depression severity				
Number of depressive symptoms			1.14 (1.08 to 1.21)**	

^aReference group is individuals with major depressive disorder without suicide attempts.

 ⁶Ns are unweighted values; percentages are weighted values.
^cSimultaneously adjusted for sociodemographic variables (race/ethnicity, age, marital status, education, income, urbanicity, and region), mental disorders (panic disorder, agoraphobia, social phobia, specific phobia, generalized anxiety disorder, antisocial personality disorder, dependent personality disorder, obsessive-compulsive personality disorder, paranoid personality disorder, schizoid personality disorder, histrionic personality disorder, and pumpher of demographic variables. disorder, avoidant personality disorder, any drug use disorder, any alcohol use disorder, and nicotine dependence), and number of depressive symptoms.

^dBoldface type indicates significance.

Positive predictive values are based on weighted Ns.

¹Percentages are to be interpreted as, for example, 11.4% of women with no suicide attempt had panic disorder. *p < .05, **p < .01.

Table 5. Depressive Symptom Correlates Among Men and Women With Major Depressive Disorder and Suicide Attempts^a

	I	Men	Women	
Depressive Symptom	Adjusted Odds Ratio ^{b,c} (95% CI)	Positive Predictive Value, ^d % (95% CI)	Adjusted Odds Ratio ^{b,c} (95% CI)	Positive Predictive Value, ^d % (95% CI)
Depressed mood	1.05 (0.47 to 2.34)	15.9 (13.6 to 18.4)	1.70 (0.87 to 3.34)	16.8 (15.4 to 18.3)
Anhedonia	4.34 (1.97 to 9.55)**	17.5 (15.1 to 20.2)	2.13 (1.37 to 3.29)**	17.9 (16.4 to 19.5)
Weight loss	1.15 (0.66 to 1.99)	18.9 (15.5 to 22.9)	1.49 (1.06 to 2.09)**	20.2 (17.8 to 22.7)
Decreased appetite	1.21 (0.67 to 2.19)	18.1 (15.0 to 21.7)	1.19 (0.83 to 1.71)	18.6 (16.8 to 20.7)
Weight gain	1.74 (0.96 to 3.17)	18.5 (14.0 to 24.0)	1.07 (0.77 to 1.47)	18.5 (15.9 to 21.4)
Increased appetite	0.58 (0.32 to 1.04)	16.6 (12.6 to 21.6)	1.28 (0.89 to 1.83)	17.8 (15.4 to 20.4)
Initial insomnia	1.55 (1.00 to 2.40)*	16.9 (14.1 to 20.1)	1.30 (0.94 to 1.80)	17.0 (15.3 to 18.9)
Early morning awakening	0.97 (0.61 to 1.54)	15.9 (13.0 to 19.4)	0.84 (0.62 to 1.14)	16.1 (14.3 to 18.1)
Hypersomnia	2.03 (1.30 to 3.16)**	22.7 (18.6 to 27.4)	1.48 (1.12 to 1.97)**	20.5 (18.5 to 22.6)
Excessive fatigue	0.85 (0.55 to 1.33)	16.2 (13.8 to 19.0)	0.77 (0.52 to 1.14)	16.3 (14.8 to 17.9)
Psychomotor retardation	0.53 (0.35 to 0.82)**	15.4 (11.7 to 19.9)	0.92 (0.70 to 1.20)	18.1 (15.7 to 20.8)
Psychomotor agitation	1.26 (0.80 to 1.96)	18.8 (15.2 to 22.9)	1.21 (0.89 to 1.66)	20.4 (17.9 to 23.1)
Restlessness	0.92 (0.61 to 1.41)	17.4 (14.4 to 20.9)	0.95 (0.67 to 1.35)	19.8 (17.7 to 22.1)
Feeling worthless	5.48 (3.36 to 8.94)**	23.6 (20.3 to 27.2)	4.93 (3.56 to 6.84)**	24.3 (22.2 to 26.6)
Excessive guilt	2.49 (1.62 to 3.84)**	21.3 (17.9 to 25.1)	0.95 (0.72 to 1.26)	19.5 (17.5 to 21.6)
Diminished concentration	0.68 (0.38 to 1.22)	15.8 (13.6 to 18.2)	1.38 (0.90 to 2.12)	17.4 (15.9 to 19.0)
Impaired decision-making	1.14 (0.67 to 1.94)	17.2 (14.6 to 20.1)	1.04 (0.71 to 1.53)	17.7 (16.0 to 19.5)

^aReference group is individuals with major depressive disorder without suicide attempts.

^bSimultaneously adjusted for sociodemographic variables (race/ethnicity, age, marital status, education, income, urbanicity, and region) and all depressive symptoms in the model.

^cBoldface type indicates significance.

^dPositive predictive values are based on weighted Ns.

*p < .05, **p < .01.

factors associated with suicide attempts in a general population sample, including subjects who have not necessarily presented for treatment. The use of PPVs in this study helps clinicians identify the comorbid mental disorders and specific depressive symptoms that are predictive of suicide attempts. Ideally, findings from this study will contribute to the better characterization of depressed persons at risk for suicide attempt.

An important finding from this study was the role of gender in suicide attempts among people with MDD. Gender is a factor potentially influencing the incidence of suicide attempts as well as influencing the correlates of suicide attempts. In the present study, depressed men and women did not differ in terms of lifetime prevalence of suicide attempts. This finding is supported by some studies^{5,7} but not by other studies that find higher rates of suicide attempts among depressed women.24,25 It should be noted that the patient sample in the studies by Sokero et al.^{5,7} was composed of all depressed patients seeking treatment in a region of Finland and, thus, may be more representative of the general population than the selected treatment-seeking patients in the latter studies. Perhaps women in treatment-seeking populations are more likely to attempt suicide. Our findings, showing no gender difference, may be partially explained by the fact that our sample was composed of depressed persons who had not necessarily sought treatment, a population that may consist of greater numbers of suicidal men. Previous studies have shown that men seek treatment for mental health reasons less often than women^{55,56}; therefore, it is conceivable that gender influences on rates of suicide attempts seen in other studies may be partially explained by how men and women differ in mental health service utilization.

We examined 2 categories of correlates by gender: mental disorder diagnoses and depressive symptoms. Thus, we were able to determine profiles of suicidal men and women that could be differentiated from their nonsuicidal counterparts. Interestingly, the presence of a lifetime suicide attempt was significantly associated with higher odds of anxiety disorders, personality disorders, substance use disorders, and greater depression severity in both men and women. This finding suggests a higher overall burden of comorbidity in suicide attempters.

Substance use disorders showed an interesting pattern of association with suicide attempts that was similar for both men and women. Alcohol and drug use disorders, as well as nicotine dependence, were each associated with suicide attempts in partially adjusted models that did not control for mental disorder comorbidity. This result corroborates several previous studies that have found relationships between suicide attempts and both alcohol disorders^{7–9,27,33} and nicotine dependence.^{6,26} However, in the fully adjusted multivariate model that controlled for all mental disorders, only drug use disorders remained significantly associated with suicide attempts. This finding suggests that while alcohol, drugs, and nicotine are all associated with suicide attempts, drug use disorders appear to account for a larger proportion of this relationship. Contrary to our findings, nicotine dependence has been shown to be strongly associated with suicide attempts in other studies, even after controlling for the effects of comorbid disorders.^{6,26} Other studies, on the other hand, support our finding, illustrating the relationship between nicotine dependence and suicidal behavior to be largely accounted for by mental disorders.⁵⁷ Further studies focusing on suicidal behavior among individuals who misuse substances are necessary to more clearly determine the nature of what seems to be a complex association.

Panic disorder was the only anxiety disorder significantly associated with suicide attempts independent of other disorders, and only in women. This result contradicts previous work³⁶ that does not support panic disorder as a potential risk factor for suicide in depressed subjects. The relationship between panic disorder and suicidal behavior has been a controversial topic. While several epidemiologic studies have found panic disorder to be significantly associated with a history of suicide attempts^{58,59} as well as incident suicide attempts,^{35,60} other studies have contended that the association is accounted for by comorbid depression and other mental disorders.61-66 This study suggests that panic disorder possibly increases the risk for suicide attempt in women beyond the risk attributable to MDD, even after adjusting for the effects of comorbid mental disorders.

Personality disorder comorbidity appears to predict suicide attempts in depressed persons more than anxiety and substance use disorders. Over 27% of men and almost one third of women with depression and a personality disorder attempted suicide at some point in their lives. Specific personality disorders showed associations with suicide attempts. Antisocial personality disorder was significantly associated with suicide attempts in both men and women. When we examined the PPV of antisocial personality disorder, it predicted suicide attempts in over half of women and in 36% of men. Several studies have documented an association between antisocial personality disorder and suicidal behavior,^{1,67,68} and our findings replicate these results.

The personality disorder with the highest association with lifetime suicide attempts in men was dependent personality disorder. In fact, dependent personality disorder was the mental disorder most strongly correlated with suicide attempts in the model composed of all Axis I and Axis II disorders, with an almost 4-fold increase in the odds of suicide attempt. Our results suggest that almost three quarters of depressed men with dependent personality disorder will attempt suicide during the course of their lifetime. It is possible that men who meet criteria for dependent personality disorder represent a very ill or poorly coping subgroup who are prone to suicide attempts. This finding is consistent with previous ones showing a "sensitive or brittle" personality among depressed men who later complete suicide.^{69,70} Given the findings of elevated rates of cluster C personality disorders among suicide completers,^{71,72} this topic may represent an important area of future research.

Another important finding from this study is that specific depressive symptoms are independently associated with suicide attempts. The strongest relationship in both men and women was with feelings of worthlessness, with an approximately 5-fold increase in individuals with a history of suicide attempts. This is a novel finding and highlights the importance of feelings of worthlessness in risk assessment, especially given their association with completed suicide.73 Anhedonia had the next strongest association in both men and women. Other symptoms associated with a history of suicide attempts in men included initial insomnia, hypersomnia, and excessive guilt. Depressed women with weight loss and hypersomnia had higher odds of suicide attempt. Psychomotor retardation appears protective against suicide attempts in men, perhaps because motoric slowing inhibits the initiation required to make a suicide attempt.

There appears to be a symptomatic trend among depressed individuals who have attempted suicide that distinguishes them from their nonsuicidal counterparts. People with anhedonia, hypersomnia, and feelings of worthlessness may be more at risk for suicide attempts. Furthermore, the heterogeneity within criteria (hypersomnia but not early-morning awakening is associated with suicide attempt, for example) questions the suitability of a single criterion comprising substantially different symptoms. If psychomotor retardation is associated with a lower odds of suicide attempt, it can be questioned whether it should be paired with psychomotor agitation, the latter being associated with increased rates of suicidal behavior.⁷⁴ Further studies examining the associations between specific depressive symptoms and suicidal behavior, or other related outcome measures, may help to identify clinically important depressive subgroups among the heterogeneous group that exists currently.

While several mental disorders and specific depressive symptoms are associated with suicide attempts in depressed persons, these results should be tempered by considering the limitations each correlate has in actually predicting a suicide attempt. For example, although feelings of worthlessness were associated with a 5-fold increase in risk for suicide attempt, only one quarter of depressed individuals endorsing feelings of worthlessness will attempt suicide during their lifetime. Clinicians may find PPVs more helpful when assessing risk for suicidal behavior. With the exception of personality disorders, all mental disorders and depressive symptoms examined in this study predicted the presence of a suicide attempt in less than one third of subjects.

The current study replicates findings from several previous studies regarding the relationship between sociodemographic characteristics and suicide attempts. Younger age^{5,19,20} and marital discord^{7–9,18} have been identified as potential risk factors for suicide attempts, and our study corroborates these results. An interesting finding was that Hispanics and Latinos were the only ethnic group significantly associated with suicide attempts. Additional studies would be helpful to elucidate the relationship between race and suicidal behavior, and specifically to confirm whether Hispanics and Latinos are indeed at higher risk than other ethnic groups.

There are several limitations that warrant discussion. The first relates to the cross-sectional design of the NESARC study. The diagnoses used in our study are lifetime diagnoses and as such, are potentially limited by retrospective recall bias. However, the test-retest reliability of most diagnoses in the NESARC was fair to good. The cross-sectional design also precludes determination of causality. Although several sociodemographic factors, mental disorders, and depressive symptoms were correlated with suicide attempts, we cannot infer that these are risk factors that predict future suicide attempts. We were unable to determine the age of individuals at the time of suicide attempt, thus the temporal association between suicide attempts and related correlates is unknown. Further studies using prospectively followed population samples are required to clarify the role of these factors in suicidal behavior.

The assessment of suicidal behavior is also a potential limitation. It does not allow for measurement of the lethality of the suicide attempt, which is important in the assessment of suicidal behavior.75,76 In this study, we were unable to examine the relationship between suicide attempts and suicide completion. There is evidence to suggest that suicide ideation, suicide attempts, and completed suicide represent a spectrum of behavior.^{77,78} However, other findings indicate that suicide completers represent a distinct subgroup from attempters.⁷⁹ While some longitudinal studies show suicide completion rates of 5% or less among previous attempters,^{80–83} other studies show higher rates.^{84,85} Despite these differences, suicide attempts remain among the strongest predictors of eventual completed suicide⁸⁶ and, therefore, represent an important focus in suicide prevention.

Another limitation of the current study concerns the assessment of personality disorders. Borderline, narcissistic, and schizotypal personality disorders were not assessed in the NESARC, and these have been shown to be associated with suicide attempts.^{87,88} Therefore, this study cannot address the potentially important subgroup of depressed persons with these personality disorders. Ideally, future epidemiologic studies will include these

In summary, individuals with MDD who attempt suicide have a greater mental illness burden and differ on several sociodemographic aspects compared with their nonsuicidal counterparts. They endorse a different pattern of depressive symptoms with higher rates of anhedonia and feelings of worthlessness. These findings will hopefully continue to refine the profile of those at risk for suicide attempt, with the ultimate goal being to improve suicide prevention efforts in depressed individuals.

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