Published in final edited form as:
Ann Allergy Asthma Immunol. 2008 May ; 100(5): 439–446.

Asthma and suicidal ideation with and without suicide attempts among adults in the United States: what is the role of cigarette smoking and mental disorders?

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Abstract

Background—Evidence of a respiratory diseases and suicidal ideation and suicide attempts link exists. To improve our understanding of the mechanism underlying these links, there is a need for examination of the relationship between specific respiratory disease, such as asthma, and suicidal ideation and behavior. In addition, studies need to examine many common risk factors that may play a role in the association between asthma and suicidal ideation and suicide behavior.

Objective—To examine the association between asthma and suicidal ideation with and without attempts among adults in the United States, specifically investigating the role of cigarette smoking, nicotine dependence, depression, anxiety, and alcohol abuse.

Methods—Data on 5,692 individuals 18 years and older were drawn from the US National Comorbidity Survey Replication. Descriptive and multivariate logistic regression analyses were conducted to examine the study objectives.

Results—The estimates of lifetime prevalence for suicidal ideation without and with attempts and asthma were 8.7%, 4.2%, and 12.0%, respectively. Being a woman, a current smoker, depressed, anxious, an alcohol abuser, or nicotine dependent increased the likelihood of suicidal ideation with attempts and asthma. Asthma was significantly ($P < .001$) associated with suicidal ideation with but not without attempts. Adjustment for smoking, nicotine dependence, age, sex, and race/ethnicity decreased the association between asthma and suicidal ideation with attempts by 16%. Similarly, adjustment for depression, panic disorder, and alcohol abuse led to a 12.4% decrease in this relationship. Despite these adjustments, independently or combined, a statistically significant ($P = .02$) association remained between asthma and suicidal ideation with attempts.

Conclusions—Cigarette smoking and concurrent mental health conditions may independently account for significant proportions of the association between asthma and suicidal ideation with

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Disclosures: Authors have nothing to disclose.

The views and opinions expressed herein are those of the authors and should not be taken to represent the views of any of the sponsoring organizations, agencies, or the US government.

attempts. More research is needed to further elucidate the mechanism of the remaining association between asthma and suicide attempts. Modification of smoking behaviors and effective treatment of depression, anxiety, alcohol abuse, and possibly asthma are important suicide prevention strategies.

INTRODUCTION

Interest in the relationships between respiratory diseases and suicidal behaviors has been growing, with evidence of associations from 3 sources: (1) primary care data have consistently shown links between asthma, chronic obstructive pulmonary disease, and other respiratory problems and suicidal ideation and behavior[1–7]; (2) psychiatric data reported links between respiratory illness and suicide attempts[2,8,9]; and (3) community-based studies[1,3] observed strong links between respiratory diseases and suicide ideation and attempts compared with other physical disorders, including heart disease and cancer.

Despite evidence of a link between respiratory diseases and suicidal ideation and suicide attempts, several questions remain. The use of broad measures of respiratory disease has limited the ability to discern the effect of specific mental disorders. Few studies have examined the relationship between a specific respiratory disease, such as asthma, and suicidal ideation or behavior because of limitations in available nationally representative data.[5] Many common risk factors that may play a role in the association between asthma and suicidal ideation or behavior have not been examined. For instance, there is evidence of an association between cigarette smoking and suicidal behavior[10] and between cigarette use and adult-onset asthma.[11] Exposure to secondhand tobacco smoke is a risk factor for adult-onset asthma[12] and childhood-onset asthma.[13] In addition, links among anxiety, depression, and suicidal behavior are well documented.[14,15] Also, asthma and mental disorders are both disproportionately common among women and low socioeconomic status groups, suggesting the role of sociodemographic factors.[15,16] Therefore, it is conceivable that cigarette smoking and/or nicotine dependence may be important in the relationship between suicidal behavior and asthma, but, to our knowledge, this has not been examined.

The goal of this study is to begin to fill these gaps by examining the following: (1) the association between asthma and suicidal ideation with and without attempts, (2) the degree to which the asthma–suicidal ideation with and without attempts relationships are because of common sociodemographic characteristics, and (3) the role of depression, anxiety, alcohol abuse, cigarette smoking, and nicotine dependence in these relationships.

METHODS

Study Sample

Data from the National Comorbidity Survey Replication (NCS-R), a nationally representative sample (N = 9,882) of English-speaking individuals 18 years and older living in US households between February 2001 and April 2003,[17] were used. Part 1 of the survey, comprising the core diagnostic evaluation, was administered to all respondents, whereas part 2 was administered to those meeting the lifetime criteria for a part 1 disorder and a probability sample of other respondents.[18] Suicidality, the outcome of interest, was a component of part 1, but asthma, the exposure of interest, was evaluated in part 2. This study included individuals 18 years and older who completed both parts 1 and 2 (N = 5,692). The data were weighted to adjust for the sampling scheme of the survey. Ad hoc analyses were conducted to better understand the relationship between asthma and suicidality. Information on age at asthma diagnosis and age at most recent suicidal ideation or suicide attempt in the NCS-R was used to identify the length of time between asthma diagnosis and suicidal ideation or suicide attempt.

Outcome of Interest

The NCS-R inquired about the individual's history of seriously thinking about committing suicide. Those reporting such histories were asked whether they had ever attempted suicide. Individuals who reported suicidal ideation but no suicide attempts were categorized as positive for suicidal ideation without attempt. Respondents with both suicidal ideation and suicide attempts were classified as positive for suicidal ideation with attempt. Individuals with no history of seriously thinking about committing suicide were classified as controls. Categorization of controls, suicidal ideation without attempt, and suicidal ideation with attempt is intended to reflect increasing severity of the outcome.

Main Independent Variable

The question "Did a doctor or other health professional ever tell you that you had asthma?" was used to ascertain asthma status. Affirmative responses classified asthmatic patients, and negative responses classified nonasthmatic patients.

Other Independent Variables

Age, sex, marital status, and race/ethnicity were examined as sociodemographic covariates. Lifetime depression, anxiety, alcohol abuse, and nicotine dependence, as evaluated using the disorder-specific components of the Composite International Diagnostic Interview, were examined as potential covariates based on previous findings of their significant associations with suicide.[1–10,14,15,19,20] Smoking status was examined as a potential confounder given the association between smoking and suicidal behaviors and between smoking and asthma.[5,8]

Statistical Analysis

A commercially available software program (SPSS, version 14.0, for Windows) was used for all analyses.[21] Frequency distributions and measures of central tendency were conducted to characterize the study sample. χ^2 and simple logistic regression analyses were conducted to compare individuals based on asthma status and suicidal ideation with or without attempts on sociodemographic, smoking, and mental health factors. The relationships between asthma and suicidal ideation without and with attempts were examined using multiple logistic regression analyses. Analyses were evaluated using the 2-tailed $P = .05$ level of statistical significance.

RESULTS

The average age of the sample was 45 years (SD, 17.88 years). There were 53.0% women and 47.0% men. Most were non-Hispanic whites (72.8%), and 55.9% were married or in common-law relationships.

Prevalence and Correlates of Suicidal Ideation With and Without Suicide Attempts

Lifetime prevalences of suicidal ideation without attempts and suicidal ideation with attempts were 8.7% and 4.2%, respectively. They occurred more frequently in women than men (Table 1). There were no statistically significant differences across race/ethnicity. Current smokers had the highest prevalence of suicidal ideation without and with suicide attempts. Depression, panic disorder, alcohol dependence or abuse, and nicotine dependence were significantly related to suicidal ideation without and with attempts.

Prevalence and Correlates of Asthma

Approximately 12% of the sample had a history of asthma. Sex and race/ethnic differences in the prevalence of asthma were observed, with women compared with men and with blacks compared with non-Hispanic whites being more likely to have asthma (Table 2). Current smokers had a higher odds of asthma compared with nonsmokers (crude odds ratio [OR_c],

1.32; 95% confidence interval [CI], 1.09–1.60). Nicotine dependence, alcohol abuse, and depression, but not panic disorder ($P > .05$), were associated with asthma.

Relationship Between Asthma and Suicidal Ideation With and Without Attempts

A statistically significant association was found between asthma and suicidal ideation with attempts (OR_C, 1.98; 95% CI, 1.42–2.76) but not suicidal ideation without attempts (OR_C, 1.09; 95% CI, 0.81–1.45). Models 2 through 5 in Table 3 showed that regardless of the variables controlled for, the relationship between asthma and suicidal ideation without attempts was not statistically significant.

Models 2 through 5 in Table 4 illustrated independent and statistically significant relationships between asthma and suicidal ideation with attempts even with adjustments for age, sex, and race/ethnicity, which resulted in a 6.1% reduction in the likelihood for suicidal ideation with attempts (Table 4, model 2). Additional adjustment for smoking and nicotine dependence (Table 4, model 3) resulted in a 16% decrease in the association. This indicated that a significant proportion of the association between asthma and suicidal ideation with attempts can be accounted for by smoking and nicotine dependence. Current and former smokers had 2.91- and 1.63-fold increased risk of suicidal ideation with attempts, respectively, compared with never smokers, after accounting for differences in age, sex, race/ethnicity, and nicotine dependence. Adjustment for depression, panic disorder, and alcohol dependence or abuse resulted in a 12.4% decrease in the odds ratio of suicidal ideation with attempts for asthmatic patients compared with nonasthmatic patients (Table 4, model 4). Adjustment for sociodemographic, smoking, and mental health factors (Table 4, model 5) caused minimal change beyond that observed when each category of indicators was adjusted independently. Depression, anxiety, and alcohol abuse had large, independent, and statistically significant associations with suicidal ideation with attempts.

Ad hoc analyses showed that of 71 subjects with asthma and suicidal ideation with attempts, 43 had their asthma diagnosis before their suicide attempt and 28 had their asthma diagnosis after the reported age of their suicide attempt. Of the 43 with an asthma diagnosis before the suicide attempt, most were diagnosed as having asthma in childhood (age, 0–12 years: 26 [60.5%]); 10 (23.3%) had their diagnosis in adolescence (age, 13–18 years). Univariate analyses showed a statistically significant association between asthma and suicide attempt, but the numbers were too small for multivariate analyses. Of the 28 subjects with an asthma diagnosis after their suicide attempt, 21 (75.0%) had their asthma diagnosis in adulthood (age, 25–49 years) and 5 (17.9%) were diagnosed at 50 years and older. A statistically significant association between asthma and suicide attempt was also observed for this group, but the numbers were too small for multivariate analyses.

DISCUSSION

This study examined the associations between asthma and suicidal ideation with and without attempts in adults 18 years and older in the United States. To our knowledge, this is the first study to examine these relationships using a nationally representative sample of adults. The results are consistent with and extend previous literature in this area. First, the results showed a significant link between asthma and suicidal ideation with attempts but not suicidal ideation without attempts. Second, the data failed to support the idea that common sociodemographic factors explained these links. Third, although concurrent mental disorders, smoking, and nicotine dependence accounted for some of the association between asthma and suicidal ideation with attempts, an independent and statistically significant association remained even after controlling for these factors.

These findings are consistent with the general suicide literature and those who have found links between respiratory diseases, including but not specific to asthma, and suicidal behavior among adults in the United States using community-based samples[5] and clinical samples.[19] For example, the higher rates of suicidal ideation without and with attempts observed in women vs men are likely related to reports that women are more likely to use self-poisoning and overdose methods, whereas men tend to use more irreversible suicide attempt methods.[22]

The results contribute to our knowledge of the asthma-suicidality link by providing the first available information, to our knowledge, that asthma is associated with suicidal ideation with attempts but does not seem to be linked with suicidal ideation without attempts, as reported in previous studies[5,8,20] on suicidal ideation and suicide attempts. The reason for what seems to be discrepant results, relative to suicidal ideation without attempts, is possibly because of differences in the data sources used and difference in the categorization of the outcome. Previous studies have not examined asthma and suicidal ideation with and without attempts using a nationally representative sample, as done in the present study, and, therefore, the findings might not necessarily be discrepant. Also, to the degree that representative samples have examined the link between asthma and suicidal ideation with and without attempts, they often failed to examine distinct suicidal ideation groups by the removal of individuals with a suicide attempt to create groups with increasing severity. This suggests that asthma may be associated with the more severe form of suicidal behavior (ie, suicide attempts) but not with the milder forms of suicidal thoughts without attempts. Researchers[8] have speculated that the relationship between asthma and suicidal behaviors is possibly because of ensuing mood and anxiety that results from disability and discomfort associated with asthma, which can be a lifelong disease. Individuals might have frequent thoughts of death with increasing severity solely because they have a potentially life-threatening illness. If this holds true, significant associations between asthma and suicidal ideation with and without attempts should be observed in the present study, as reported by Goodwin and Eaton[5] in their follow-up study using data from the Epidemiological Catchment Area study. These findings partially supported this hypothesis by observing a statistically significant association between asthma and suicidal ideation with attempts. Crandall and colleagues[19] did not find a statistically significant risk for suicide in their follow-up study of individuals with a history of asthma who presented to the emergency department with suicidal behavior. However, the study was based on nonconcurrent emergency department visits in a single urban city, which limited the generalizability of the results.[19] Future studies on this issue can help to enhance our understanding of the mechanism by which asthma is associated with suicidal ideation with attempts but not suicidal ideation without attempts, as observed in the present study; suicidal ideation with and without attempts, as observed in our ad hoc analyses; and suicidal ideation, suicide attempt, and suicide, as reported by Goodwin and Eaton[5]; but not with suicide, as observed by Crandall and colleagues.[19]

The results provided new evidence suggesting that the link between asthma and suicidal behavior is not because of common sociodemographic characteristics. Asthma and depression, the strongest risk factor for a suicide attempt, are both associated with common demographic characteristics, especially in childhood-onset asthma, such as racial minority status, lower household income, and urban residence. As such, it is conceivable that these factors were responsible for this observed association. Our results showed that although common demographics seem to be responsible for some of the strength of this link, the relationship persists even after adjustment.

To the best of our knowledge, these results are the first to investigate the potential role of cigarette use and nicotine dependence in the association between asthma and suicidal behavior, which is important to examine because cigarette use and nicotine dependence have been linked with both asthma[11–13] and suicidal behavior.[10] It is plausible that smoking was responsible

for the observed association between asthma and suicidal ideation with attempts. The 16% change in the association between asthma and suicidal ideation with attempts on adjustment for smoking and nicotine dependence indicated that some of the observed risk can be explained by the independent links between smoking and asthma and between smoking and suicidal ideation with attempts, as proposed. Because the association between asthma and suicidal ideation with attempts remained after adjustment for these factors, the role of other factors is suggested. The 18% decrease in the association between asthma and suicidal ideation with attempts on control for depression, anxiety, and alcohol dependence or abuse indicated that some of the observed risk was because of the difference between asthmatic and nonasthmatic patients in terms of these factors and the independent link between these factors and suicide attempt. A statistically significant association still remained, indicating the role of other factors not examined herein. Adjustment for depression, panic, alcohol dependence or abuse, smoking, and demographic characteristics did not fully explain the association between asthma and suicidal ideation with attempts (as indicated by the remaining statistical significance of asthma), thereby suggesting other mechanisms at work.

Future studies need to examine various other common risk factors to enhance understanding of the mechanism underlying the link between asthma and suicidal behaviors. Prospective studies[7,13] beginning early in life (given the onset of many cases of asthma in early childhood) would be useful in examining this association throughout development and in exploring the potential role of other family, genetic, and environmental factors. For instance, it has been suggested that the link between asthma and mental disorders, such as suicide attempt, could be due to early life exposure to risk factors that tend to co-occur, such as depression and nicotine dependence,[23] which may also co-occur among parents, both prenatally[24] and postnatally. Specifically, it may be that individuals with a parental history of depression, anxiety, and/or suicidal behavior also have a parental history of cigarette smoking and nicotine dependence, which heightens the offspring's risk for both suicidal behaviors and asthma later in life. This mechanism could not be investigated herein given the use of cross-sectional data, which also limited our ability to elucidate the directionality of the relationship between asthma and suicidal ideation with and without attempts.

In interpreting the results, one needs to bear in mind that information on study variables was self-reported. Asthma status was self-reported, with no validation by review of hospital or physician records or objective respiratory measures, which could affect the validity of the results. Therefore, one needs to think about whether the study measure accurately classified asthmatic patients vs nonasthmatic patients. However, we can have confidence in the results obtained because the lack of objective validation of asthma status would affect both the suicide attempters and nonattempters equally, which would lead to an underestimate of the true risk. Another issue of concern is that information on asthma was collected in part 2 of the NCS-R study, which was based on responses in part 1 and specifically on those meeting the lifetime criteria for a part 1 disorder and a probability sample of other respondents who did not. As such, there was an oversampling of individuals with part 1 disorders, which might account for the lack of statistically significant association between asthma and suicidal ideation without attempts. The NCS-R excluded individuals who died by suicide, which prevented the ascertainment of whether the observed effects were a result of asthmatic patients being more likely to attempt or use less severe methods compared with nonasthmatic patients, who might be using more lethal methods, leading to their death.

Lack of information on the recency of asthma symptoms limits our ability to determine the direction of causality. Even if the onset of asthma occurred before the onset of suicidal ideation or attempt, lack of timing information prevents us from determining if other intermediate factors not examined herein could account for the relationship observed. It is, therefore, imperative to conduct studies with longitudinal data, preferably using nationally representative

samples and including information on the mechanisms of injury, onset and recency of asthma, suicidal ideation, and suicide attempts to disentangle these relationships.

Acknowledgments

Funding Sources: This study was supported by grants K23-MH64736 (Dr Goodwin) and MH47447 (Dr Eaton) from the National Institute of Mental Health; and by grant R01-DA20896 from the National Institute on Drug Abuse (Dr Goodwin). Dr Clarke received a Canadian Institute for Health Research Postdoctoral Fellowship Award (200602MFE-159564 to 115967) and a Population Health Fellowship Award from the Department of Psychiatry, University of Toronto. The US NCS-R is supported by grant U01-MH60220 from the National Institute of Mental Health; the National Institute on Drug Abuse; the Substance Abuse and Mental Health Services Administration; grant 044708 from the Robert Wood Johnson Foundation; and the John W. Alden Trust.

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Table 1

Sociodemographic and Clinical Correlates of Suicidal Ideation Without and With Suicide Attempts[a]

Variable	Data for suicidal ideation without suicide attempts			Data for suicidal ideation with suicide attempts		
	No[b]	Yes[b]	*P* value	No[b]	Yes[b]	*P* value
Age group, y						
18–24	85.9	14.1	.001	91.6	8.4	.001
25–44	87.9	12.1		92.8	7.2	
45–64	88.1	11.9		94.8	5.2	
≥65	95.0	5.0		99.1	0.9	
Sex						
Female	87.9	12.1	.02	92.8	7.2	.001
Male	90.1	9.9		96.1	3.9	
Race/ethnicity						
Non-Hispanic white	88.5	11.5	.07	94.5	5.5	.14
Black	90.2	9.8		95.5	4.5	
Hispanic	92.1	7.9		92.9	7.1	
Other	86.5	13.5		91.6	8.4	
Smoking status						
Never smoker	90.4	9.6	.001	96.6	3.4	.001
Former smoker	90.0	10.0		95.1	4.9	
Current smoker	84.8	15.2		88.9	11.1	
Nicotine dependence[c]						
Yes	80.9	19.1	.001	83.9	16.1	.001
No	89.6	10.4		95.2	4.8	
Major depression[c]						
Yes	69.9	30.1	.001	70.4	29.6	.001
No	90.4	9.6		96.3	3.8	
Panic disorder[c]						
Yes	73.5	26.5	.001	74.4	25.3	.001
No	89.6	10.4		95.2	4.8	
Alcohol abuse or dependence[c]						
Yes	76.8	23.2	.001	82.3	17.7	.001

Variable	Data for suicidal ideation without suicide attempts			Data for suicidal ideation with suicide attempts		
	No[b]	Yes[b]	*P* value	No[b]	Yes[b]	*P* value
No	90.6	9.4		96.0	4.0	

[a] χ^2 Test were used.

[b] Data are given as percentage of subjects. Row percentages for each category may not total 100 because of rounding.

[c] Based on lifetime estimates.

Table 2

Sociodemographic and Clinical Correlates of Asthma[a]

Variable	Ever diagnosed with asthma[b]		*P* value
	No	Yes	
Age group, y			
18–24	84.1	15.9	<.001
25–44	89.4	10.6	
45–64	87.2	12.8	
≥65	92.0	8.0	
Sex			
Female	86.9	13.1	<.001
Male	90.0	10.0	
Race/ethnicity			
Non-Hispanic white	88.4	11.6	.002
Black	84.8	15.2	
Hispanic	90.8	9.2	
Other	91.7	8.3	
Smoking status			
Never smoker	89.4	10.6	.02
Former smoker	88.3	11.7	
Current smoker	86.4	13.6	
Nicotine dependence			
Yes	78.5	21.5	<.001
No	89.3	10.7	
Major depression			
Yes	84.1	15.9	.001
No	88.8	11.2	
Panic disorder			
Yes	85.6	14.4	.14
No	88.5	11.5	
Alcohol abuse or dependence			
Yes	85.0	15.0	.002
No	88.9	11.1	
Suicidal ideation without suicide attempts			
Yes	87.9	12.1	.54
No	88.8	11.2	
Suicidal ideation with suicide attempts			
Yes	80.2	19.8	<.001
No	88.8	11.2	

[a] χ^2 Analyses were used.

[b] Data are given as percentage of subjects. Row percentages may not total 100 because of rounding.

Table 3

Crude and Adjusted Association Between Asthma and Suicidal Ideation Without Suicide Attempts Among US Adults 18 Years and Older[a]

Suicidal ideation without attempts (yes vs no)	Model 1	Model 2	Model 3	Model 4	Model 5
Asthma[b]	1.09 (0.81–1.45)	1.01 (0.75–1.35)	0.93 (0.69–1.25)	0.93 (0.68–1.25)	0.90 (0.68–1.25)
Age group, y					
18–24	NA	1.30 (0.99–1.72)	1.31 (0.99–1.74)	1.45 (1.09–1.93)	1.44 (1.07–1.93)
25–44	NA	1.07 (0.85–1.33)	1.05 (0.85–1.33)	1.03 (0.82–1.30)	1.02 (0.81–1.29)
45–64	NA	1 (Reference)	1 (Reference)	1 (Reference)	1 (Reference)
≥65	NA	0.38 (0.27–0.54)	0.40 (0.28–0.57)	0.51 (0.35–0.73)	0.52 (0.36–0.74)
Female sex	NA	1.29 (1.07–1.56)	1.35 (1.11–1.63)	1.31 (1.06–1.60)	1.31 (1.07–1.93)
Race/ethnicity					
Non-Hispanic white	NA	1 (Reference)	1 (Reference)	1 (Reference)	1 (Reference)
Black	NA	0.58 (0.41–0.84)	0.60 (0.42–0.87)	0.62 (0.42–0.90)	0.63 (0.43–0.91)
Hispanic	NA	0.76 (0.56–1.03)	0.79 (0.58–1.08)	0.89 (0.65–1.22)	0.89 (0.65–1.22)
Other	NA	1.01 (0.63–1.61)	1.02 (0.64–1.63)	1.02 (0.62–1.67)	1.01 (0.62–1.66)
Smoking status					
Never smoker	NA	NA	1 (Reference)	NA	1 (Reference)
Current smoker	NA	NA	1.52 (1.21–1.91)	NA	1.24 (0.97–1.59)
Former smoker	NA	NA	1.08 (0.83–1.40)	NA	1.00 (0.77–1.31)
Lifetime nicotine dependence (yes)	NA	NA	1.72 (1.26–2.36)	NA	1.24 (0.89–1.73)
Lifetime major depression (yes)	NA	NA	NA	3.67 (2.96–4.54)	3.62 (2.92–4.48)
Lifetime panic disorder (yes)	NA	NA	NA	2.13 (1.47–3.09)	2.08 (1.44–3.02)
Lifetime alcohol abuse (yes)	NA	NA	NA	2.48 (1.93–3.18)	2.25 (1.73–2.93)
−2 Log likelihood[c]	3,112.99 (1)	3,048.88 (8)	3,017.63 (11)	2,824.00 (11)	2,817.95 (14)

Abbreviation: NA, data not applicable.

[a] Data are given as odds ratio (95% confidence interval). The data source was the National Comorbidity Survey Replication. Model 1 was unadjusted; 2, adjusted for age, sex, and race/ethnicity; 3, additionally adjusted for smoking and nicotine dependence; 4, additionally adjusted for depression, panic disorder, and alcohol dependence or abuse; and 5, additionally adjusted for sociodemographic, smoking, and mental health factors.

[b] When panic attacks and generalized anxiety were included in model 5 instead of panic disorder, the risk estimates for asthma on suicide attempt were as follows: odds ratio, 0.90 (95% confidence interval, 0.66–1.22) and 0.90 (95% confidence interval, 0.66–1.21), respectively.

[c] Degrees of freedom are given in parentheses.

Table 4

Crude and Adjusted Association Between Asthma and Suicidal Ideation With Suicide Attempts Among US Adults 18 Years and Older[a]

Suicidal ideation with attempts (yes vs no)	Model 1	Model 2	Model 3	Model 4	Model 5
Asthma[b]	1.98 (1.42–2.76)	1.86 (1.32–2.61)	1.56 (1.09–2.11)	1.63 (1.13–2.34)	1.53 (1.06–2.21)
Age group, y					
18–24	NA	1.71 (1.17–2.52)	1.79 (1.21–2.67)	1.91 (1.27–2.87)	1.96 (1.29–2.97)
25–44	NA	1.48 (1.08–2.03)	1.44 (1.04–1.99)	1.39 (0.99–1.93)	1.37 (0.98–1.92)
45–64	NA	1 (Reference)	1 (Reference)	1 (Reference)	1 (Reference)
≥65	NA	0.17 (0.08–0.37)	0.19 (0.09–0.41)	0.27 (0.12–0.59)	0.28 (0.13–0.61)
Female sex	NA	2.70 (1.56–2.76)	2.22 (1.67–2.96)	2.25 (1.66–3.07)	2.26 (1.65–2.97)
Race/ethnicity					
Non-Hispanic white	NA	1 (Reference)	1 (Reference)	1 (Reference)	1 (Reference)
Black	NA	1.08 (0.72–1.61)	1.23 (0.81–1.85)	1.19 (0.78–1.82)	1.30 (0.84–1.99)
Hispanic	NA	0.65 (0.41–1.02)	0.78 (0.49–1.23)	0.84 (0.52–1.36)	0.90 (0.56–1.45)
Other	NA	1.25 (0.68–2.29)	1.23 (0.66–2.29)	1.19 (0.62–2.29)	1.15 (0.59–2.24)
Smoking status					
Never smoker	NA	NA	1 (Reference)	NA	1 (Reference)
Current smoker	NA	NA	2.91 (2.10–4.04)	NA	2.04 (1.44–2.90)
Former smoker	NA	NA	1.63 (1.10–2.42)	NA	1.36 (0.90–2.05)
Lifetime nicotine dependence (yes)	NA	NA	2.43 (1.68–3.51)	NA	1.60 (1.07–2.37)
Lifetime major depression (yes)	NA	NA	NA	3.84 (2.86–5.15)	3.63 (2.69–4.88)
Lifetime panic disorder (yes)	NA	NA	NA	3.42 (2.26–5.16)	3.24 (2.14–4.91)
Lifetime alcohol abuse (yes)	NA	NA	NA	4.08 (2.96–5.62)	3.04 (2.17–4.27)
−2 Log likelihood[c]	1,816.47 (1)	1,723.19 (8)	1,636.65 (11)	1,505.01 (11)	1,477.66 (14)

Abbreviation: NA, data not applicable.

[a] Data are given as odds ratio (95% confidence interval). The data source was the National Comorbidity Survey Replication. Model 1 was unadjusted; 2, adjusted for age, sex, and race/ethnicity; 3, additionally adjusted for smoking and nicotine dependence; 4, additionally adjusted for depression, panic disorder, and alcohol dependence or abuse; and 5, additionally adjusted for sociodemographic, smoking, and mental health factors.

[b] When panic attacks and generalized anxiety were included in model 5 instead of panic disorder, the risk estimates for asthma on suicide attempt were as follows: odds ratio, 1.52 (95% confidence interval, 1.05–2.19) and 1.48 (95% confidence interval, 1.02–2.14), respectively.

[c] Degrees of freedom are given in parentheses.