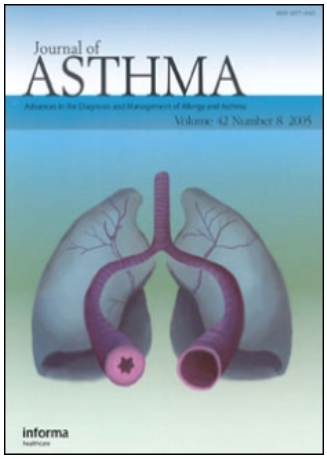

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Impact of Depression and Anxiety on Quality of Life, Health Behaviors, and Asthma Control Among Adults in the United States with Asthma, 2006

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ORIGINAL ARTICLE

Impact of Depression and Anxiety on Quality of Life, Health Behaviors, and Asthma Control Among Adults in the United States with Asthma, 2006

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Background. Psychological factors such as anxiety and depression are increasingly being recognized as influencing the onset and course of asthma. *Methods*. We obtained Patient Health Questionnaire 8 depression data from 41 states and territories using the 2006 Behavioral Risk Factor Surveillance System. Heath risk behaviors, social and emotional support, life satisfaction, disability, and four health-related quality-of-life (HRQOL) questions were available for all states and territories (n = 18,856 with asthma). Five additional HRQOL questions were asked in three states (n = 1345 persons with asthma), and questions assessing asthma control were available for nine states (n = 3943 persons with asthma). *Results*. Persons with asthma were significantly more likely than those without asthma to have current depression (19.4% vs. 7.7%), a lifetime diagnosis of depression (30.6% vs. 14.4%), and anxiety (23.5% vs. 10.2%). For most domains examined, there was a dose-response relationship between level of depression severity and mean number of days of impaired HRQOL in the past 30 days, as well as an increased prevalence of life dissatisfaction, inadequate social support, disability, and risk behaviors, such as smoking, physical inactivity, and obesity, among those with asthma. Moreover, depression and anxiety were associated with a decreased level of asthma control, including more visits to the doctor or emergency room, inability to do usual activities, and more days of symptoms compared to those without depression or anxiety. *Conclusion*. This research indicates that a multidimensional, integrative approach to health care should be considered when assessing patients with asthma.

Keywords depression, anxiety, asthma, quality of life, health risk behaviors

INTRODUCTION

In 2005, approximately 23.3 million U.S. adults had been told, at some point during their lifetime, that they had asthma (1). In 2004, 14.6 million persons visited a doctor's office or hospital outpatient department for asthma symptoms (2, 3), 1.8 million visited an emergency department for asthma symptoms (4), and 3780 died from asthma complications (5). Risk factors and triggers for adult asthma include, but are not limited to, younger age, female gender, Puerto Rican race, poverty, exposure air pollution, occupational exposure, spring season, allergens, atmospheric pressure, and genetic factors (6–11).

Psychological factors such as anxiety and depression are being increasingly recognized as influencing the onset and course of asthma (12–19). Psychiatric disorders such as anxiety and depression have been linked to more severe disease, poor asthma control, increased length of hospital stays, frequent visits to health care providers, increased use of steroid medication, noncompliance with medical regimens, and impaired health-related quality of life (14, 20–30). In light of the impact of psychiatric disorders on asthma morbidity and mortality, we examined the association between depression and anxiety and health-related quality of life (HRQOL), health behaviors, and asthma control among community-dwelling U.S. adults using the Behavioral Risk Surveillance Survey (BRFSS), an ongoing, state-based telephone survey conducted by random-digit dialing of noninstitutionalized U.S. adults.

METHODS

The BRFSS monitors the prevalence of key health- and safety-related behaviors and characteristics (31, 32). In 2006, trained interviewers in 38 states (Alabama, Alaska, Arkansas, California, Connecticut, Delaware, Florida, Georgia, Hawaii, Indiana, Iowa, Kansas, Louisiana, Maine, Maryland, Michigan, Minnesota, Mississippi, Missouri, Montana, Nebraska, Nevada, New Hampshire, New Mexico, North Dakota, Oklahoma, Oregon, Rhode Island, South Carolina, Tennessee, Texas, Utah, Vermont, Virginia, Washington, West Virginia, Wisconsin, and Wyoming), as well as Puerto Rico, the U.S. Virgin Islands, and the District of Columbia, administered identical questionnaires about depression and anxiety symptoms (Anxiety and Depression Module) over the telephone to an independent probability sample of adults aged 18 years and older. BRFSS methods, including the weighting procedure, are described elsewhere (33). All BRFSS questionnaires, data, and reports are available at www.cdc.gov/brfss.

We used the standardized and validated Patient Health Questionnaire 8 (PHQ-8) to examine depression and its severity in persons with current asthma (34). The PHQ-8 consists of eight criteria on which the *Diagnostic and Statistical*

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Manual of Mental Disorders, fourth edition (DSM-IV) diagnosis of depressive disorders is based (35). The PHQ-8 is half the length of many other depression measures and has comparable sensitivity and specificity (34). The ninth DSM-IV criterion was omitted because it assesses suicidal or self-injurious ideation, and adequate intervention could not be conducted over the telephone. Research indicates that the deletion of this question has only a minor effect on scoring because thoughts of self-harm are fairly uncommon in the general population (34). The PHQ has been used in both clinical (36–38) and population-based (39) settings, and in both self-administered (36–38) and telephone-administered (40) modes. Additionally, it has been shown to be effective for detecting depressive symptoms in various race/ethnicities (38, 41).

The response set was standardized to be similar to other BRFSS questions by asking the number of days in the past two weeks the person experienced a particular depressive symptom. For analytic purposes, the modified response set can be converted back to the original PHQ-8 response set: 0–1 day = "not at all," 2–6 days = "several days," 7–11 days = "more than half the days," and 12–14 days = "nearly every day," with points (0–3) assigned to each category**,** respectively. Item scores are summed for a total score of 0–24. A total score of 0–4 represents no significant depressive symptoms, a total score of 5–9 represents mild symptoms, 10–14 represents moderate symptoms, 15–19 represents moderately severe symptoms, and 20–24 represents severe symptoms (34). *Current depression* was defined as a PHQ-8 score of $\geq$10, which has an 88% sensitivity and specificity for major depression (42).

The remaining two questions of the module assess whether a health care professional has ever diagnosed the respondent with a depressive or anxiety disorder: "Has a doctor or other healthcare provider EVER told you that you have an anxiety disorder (including acute stress disorder, anxiety, generalized anxiety disorder, obsessive-compulsive disorder, panic attacks, panic disorder, phobia, post-traumatic stress disorder, or social anxiety disorder)?" and "Has a doctor or other healthcare provider EVER told you that you have a depressive disorder (including depression, major depression, dysthymia, or minor depression)?" Possible responses include "yes," "no," "don't know/not sure," and "refused."

The status of the respondent's asthma was evaluated with two questions: "Have you ever been told by a doctor, nurse, or other health professional that you had asthma?" and "Do you still have asthma?" Persons were considered to have current asthma if they answered "yes" to both questions. Persons were considered not to have current asthma if they answered "yes" to the first question and "no" to the second question or answered "no" to the first question.

We examined four HRQOL questions with demonstrated validity and reliability for population health surveillance (43–45). General health was assessed by asking respondents to rate their health on a scale from excellent to poor. We divided responses into two groups: excellent/very good/good and fair/poor. The remaining three questions asked the respondent to assess his or her own health in the previous 30 days: "How many days was your physical health, which includes physical illness or injury, not good?" (recent physical distress); "How many days was your mental health, which includes stress, depression, and problems with emotions, not good?" (recent mental distress); and "How many days did poor physical or mental health keep you from doing your usual activities, such as self-care, work, or recreation?" (recent activity limitations).

Additionally, a Healthy Days Symptoms Module was used in three states: Delaware, Hawaii, and Rhode Island. Questions in this module also referred to the previous 30 days: "How many days did you feel sad, blue, or depressed?" (recent depressive symptoms); "How many days did you feel worried, tense, or anxious?" (recent anxiety symptoms); "How many days have you felt you did not get enough rest or sleep?" (recent sleep insufficiency); "How many days did pain make it difficult to do your usual activities?" (recent pain); and "How many days have you felt very healthy and full of energy? (recent vitality)?" We calculated recent fatigue by subtracting the number of days of recent vitality from 30.

To examine important predictors of asthma after adjusting for potential confounders, we dichotomized HRQOL responses into 0–13 (infrequent) and 14–30 (frequent) unhealthy days in each domain, or, in the case of vitality, healthy days. This dichotomy has been used in previous research (46–48), where the term "frequent" represented the respondent's status for a substantial portion of the month.

The BRFSS respondents were also asked about their smoking habits, physical activity, height and weight, and alcohol consumption. Respondents were considered to be current smokers if they had smoked at least 100 cigarettes in their lifetime and reported being smokers at the time of the interview. Persons were considered to be physically inactive if they had not participated in any leisure-time physical activity or exercise during the past 30 days**.** Body mass index ($[BMI]^{\cdot}$ = weight [kg] divided by height [m^2]) was determined from self-reported height and weight. Persons were considered to be obese if their BMI was $\geq$30 kg/m^2. Consistent with the guidelines of the U.S. Department of Agriculture and the U.S. Department of Health and Human Services (49), heavy drinkers were defined as men who reported drinking more than two drinks per day and women who reported drinking more than one drink per day. Men were considered to be binge drinkers if they had had five or more drinks on one occasion in the past 30 days and women were considered to be binge drinkers if they had had four or more drinks on one occasion in the past 30 days.

Respondents were also asked about their satisfaction with life, perceived level of social and emotional support, and disability status. Life satisfaction was evaluated by asking the respondent, "In general, how satisfied are you with your life?" Possible responses were: very satisfied, satisfied, dissatisfied, and very dissatisfied. For analysis, we divided responses into two groups: very satisfied/satisfied and dissatisfied/very dissatisfied. The survey evaluated social and emotional support by asking the respondent: "How often do you get the social and emotional support that you need?" Possible responses included always, usually, sometimes, rarely, and never. We grouped the responses into two categories: always/usually/sometimes and rarely/never. Two yes/no questions assessed disability: "Are you limited in any way in any activities because of a physical, mental, or emotional problem?" and "Do you have a health problem that requires you to use special equipment such as a cane, a wheelchair, a special bed, or a special telephone?"

Additionally, an Adult Asthma History Module was conducted in nine states. To assess asthma control the following questions were asked: "During the past 12 months, have you had an episode of asthma or asthma attack?" (yes, no); "During the past 12 months, how many times did you visit an emergency room or urgent care center because of your asthma?" (0 visits, 1 visit, 2 visits, ≥3 visits); "Besides emergency room visits, during the past 12 months, how many times did you see a doctor, nurse, or other health professional for urgent treatment of worsening asthma symptoms?" (0 visits, 1 visit, 2 visits, ≥3 visits); "During the past 12 months, how many days were you unable to work or carry out your usual activities because of your asthma?" (0 days, 1 week, ≥2 weeks); "Symptoms of asthma include cough, wheezing, shortness of breath, chest tightness, and phlegm production when you do not have a cold or respiratory infection. During the past 30 days, how often did you have any symptoms of asthma?" (<1 per week; 1–2 per week; >2 per week; every day, not all the time; every day, all of the time); "During the past 30 days, how many days did symptoms of asthma make it difficult for you to stay asleep?" (0 days, 1–2 days, 3–4 days, 5 days, 6–10 days, >10 days); "During the past 30 days, how often did you take a prescription asthma medication to prevent an asthma attack from occurring?" (0 days, 1–14 days, 15–24 days, 25–30 days); and "During the past 30 days, how often did you use a prescription inhaler during an asthma attack to stop it?" (0 times, 1–4 times, 5–14 times, ≥15 times).

Data were available for 18,856 participants in the 38 states and the District of Columbia, Puerto Rico, and the Virgin Islands who currently had asthma. Among those, 10.1% of PHQ-8 scores were missing, 0.9% of participants did not respond either "yes" or "no" to the lifetime diagnosis of anxiety, and 0.8% did not respond either "yes" or "no" to the lifetime diagnosis of depression. Among those with current asthma, data for 1345 respondents were available from the Healthy Days Symptoms Module, and data for 3943 respondents were available from the Adult Asthma History Module. The median cooperation rate of BRFSS in 2006, the percentage of eligible respondents who completed the survey, was 74.5%. We estimated prevalence estimates, means, adjusted odds ratios (AORs) and 95% confidence intervals (95% CIs) in all analyses by using SUDAAN (Research Triangle, release 9.0.1, Research Triangle Park, North Carolina, USA) to account for the complex survey design. Five states—Connecticut, Kansas, Maryland, Nebraska, and Washington—collected the Anxiety and Depression Module on a subset of the state sample. Information on the weighting methodology and the weights to use for each of these states can be found at http://www.cdc.gov/brfss/technical_infodata/surveydata/2006/2006_dual.htm

RESULTS

Approximately 8.7% (95% CI: 8.4–9.0) of persons in the 38 states, the District of Columbia, Puerto Rico, and the U.S. Virgin Islands have current depression as assessed by the PHQ-8, 15.7% (95% CI: 15.4–16.1) have a lifetime diagnosis of depression, and 11.3% (95% CI: 11.0–11.6) have a lifetime diagnosis of anxiety. Approximately 8.1% (95% CI: 7.8–8.3) of adults in this population currently have asthma, ranging from a low of 4.5% (95% CI: 3.7–5.5) and 5.9% (5.3–6.6) in the Virgin Islands and Louisiana to a high of 10.3% (95% CI: 9.2–11.5) and 10.5% (95% CI: 9.4–11.8) in Connecticut and Rhode Island. Persons with asthma are significantly more likely than those without asthma to have current depression (19.4%, 95% CI: 18.0–20.9 vs. 7.7%, 95% CI: 7.4–8.0), a lifetime diagnosis of depression (30.6%, 95% CI: 29.2–32.1 vs. 14.4%, 95% CI: 14.1–14.7), and a lifetime diagnosis of anxiety (23.5%, 95% CI: 22.1–24.9 vs. 10.2%, 95% CI: 9.9–10.5).

Current Depression Among Persons with Asthma

After adjusting for sociodemographic characteristics, we found that among persons with asthma in the 41 states and territories, adults aged 65 years and older were less likely to have current depression than were those aged 18–24 years. Current depression was more prevalent among persons with less than a high school education than among those with at least a high school diploma (Table 1). Adults with asthma who were previously married were more likely than those who were currently married to have current depression, as were females compared with males, and those who were unemployed, retired, or unable to work compared to those who were employed.

Among adults with asthma, persons with current depression were significantly more likely than those without current depression to report more mean numbers of days in the past 30 days of physical distress, mental distress, activity limitations, depressive symptoms, anxiety symptoms, insufficient sleep, pain, and fatigue (Table 2). In fact, there was a dose-response relationship between depression severity and the mean number of days of physical distress, mental distress, depressive symptoms, fatigue, anxiety symptoms, and activity limitations (Figure 1).

After adjusting for sociodemographic characteristics, persons with asthma and current depression in the 41 states and territories were 4.7 times more likely than those with asthma and no current depression to report frequent (≥14 of the past 30 days) physical distress, 14.3 times more likely to report frequent mental distress, and 7 times more likely to report frequent activity limitations (Table 2). In the three states participating in the Healthy Days Symptoms Module, adults with asthma and current depression were 23.6 times more likely than those with asthma and no current depression to report frequent depressive symptoms, 9.8 times more likely to report frequent anxiety symptoms, 6.3 times more likely to report frequent insufficient sleep, 6 times more likely to report frequent pain, and 13.3 times more likely to report frequent fatigue. Moreover, after adjusting for sociodemographic characteristics, we found that adults with asthma and current depression in the 41 states and territories surveyed were 3.9 times more likely than adults with asthma and no current depression to report fair/poor general health, 13.4 times more likely to report being dissatisfied/very dissatisfied with life, 5.7 times more likely to report rarely or never receiving the social support they need, 2.6 times more likely to report that they require special equipment to do activities, and 4.4 times more likely to report that they are limited due to physical, mental, or emotional problems (Table 3, Figure 2). Adults with asthma and current depression were also significantly more likely than those with no current depression

TABLE 1.—Prevalence and adjusted odds for current depression, and lifetime diagnosis of depression and anxiety among adults with asthma aged ≥18 years or older by selected sociodemographic characteristics, 2006.

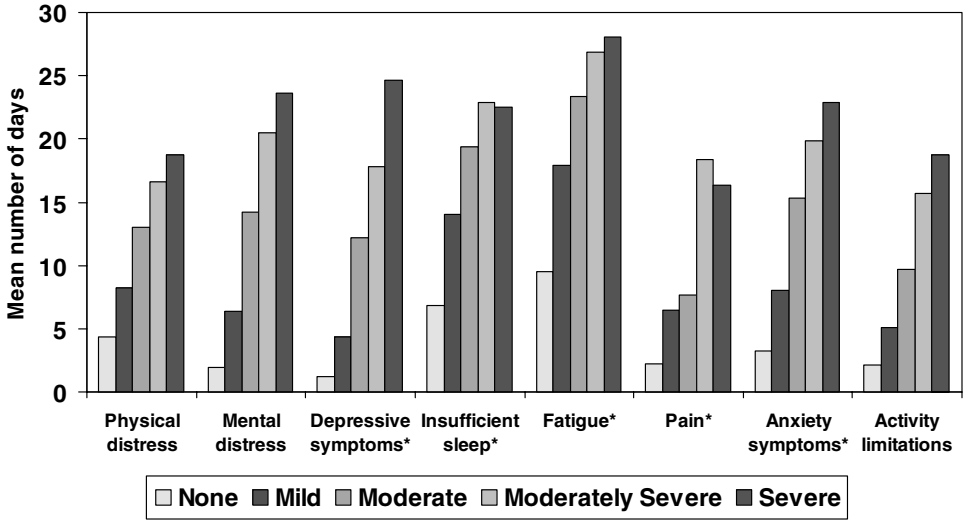
	Current depression		Lifetime diagnosis of depression		Lifetime diagnosis of anxiety	
	% (95% CI)	AOR (95% CI)[a]	% (95% CI)	AOR (95% CI)[a]	% (95% CI)	AOR (95% CI)[a]
Age group						
18–24	18.7 (14.0–24.4)	Referent	29.1 (23.7–35.2)	Referent	21.5 (16.8–27.1)	Referent
25–34	18.5 (15.6–21.7)	1.2 (0.8–2.0)	27.9 (24.8–31.2)	1.0 (0.7–1.5)	26.2 (22.9–29.7)	1.5 (1.0–2.2)
35–44	21.1 (17.9–24.7)	1.2 (0.7–1.9)	33.6 (30.2–37.1)	1.2 (0.8–1.8)	25.9 (22.7–29.4)	1.4 (0.9–2.1)
45–54	24.0 (21.2–27.1)	1.1 (0.7–1.8)	39.2 (36.3–42.3)	1.3 (0.9–1.9)	28.0 (25.2–31.0)	1.3 (0.9–1.9)
55–64	22.2 (18.8–26.1)	0.7 (0.4–1.2)	32.1 (29.4–34.9)	0.7 (0.5–1.1)	23.7 (20.9–26.8)	0.8 (0.5–1.2)
65–74	12.4 (10.0–15.2)	0.4 (0.2–0.6)	22.3 (19.6–25.4)	0.5 (0.3–0.7)	15.6 (13.4–18.2)	0.5 (0.3–0.8)
75+	6.8 (5.0–9.2)	0.2 (0.1–0.3)	15.3 (12.2–19.0)	0.3 (0.2–0.4)	11.8 (9.4–14.8)	0.4 (0.2–0.6)
Sex						
Male	14.9 (12.8–17.2)	Referent	21.1 (18.9–23.5)	Referent	17.4 (15.2–19.7)	Referent
Female	21.9 (20.1–23.7)	1.7 (1.4–2.1)	35.6 (33.8–37.5)	2.1 (1.8–2.5)	26.8 (25.1–28.6)	1.8 (1.5–2.1)
Race/ethnicity						
White, nH	18.1 (16.5–19.7)	Referent	31.5 (29.9–33.3)	Referent	24.0 (22.4–25.7)	Referent
Black, nH	21.4 (17.7–25.7)	0.8 (0.5–1.1)	21.4 (18.3–24.8)	0.4 (0.3–0.5)	18.4 (15.3–22.0)	0.5 (0.4–0.6)
Hispanic	21.5 (16.9–26.9)	1.0 (0.7–1.3)	31.0 (26.1–36.4)	0.9 (0.7–1.2)	21.0 (17.2–25.3)	0.7 (0.6–1.0)
Other, nH	27.0 (20.9–34.1)	1.2 (0.8–1.6)	33.2 (27.4–39.7)	0.8 (0.7–1.1)	29.1 (23.3–35.7)	1.0 (0.7–1.4)
Educational Status						
<High school	38.2 (33.2–43.4)	Referent	37.4 (33.3–41.6)	Referent	30.7 (26.6–35.1)	Referent
High school diploma	20.4 (18.1–22.9)	0.5 (0.4–0.6)	32.0 (29.2–35.0)	0.9 (0.7–1.2)	24.1 (21.6–26.7)	0.8 (0.6–1.0)
>=college	14.9 (13.2–16.7)	0.4 (0.3–0.5)	28.2 (26.5–30.1)	0.8 (0.7–1.1)	21.5 (19.8–23.3)	0.7 (0.6–0.9)
Marital status						
Married	14.6 (13.1–16.3)	Referent	26.2 (24.5–27.9)	Referent	19.7 (18.1–21.4)	Referent
Previously married	29.5 (26.6–32.6)	2.0 (1.6–2.5)	40.6 (38.0–43.3)	1.8 (1.5–2.2)	30.4 (28.0–32.9)	1.6 (1.3–1.9)
Never married	21.0 (17.6–25.0)	1.4 (1.0–1.8)	30.9 (27.2–35.0)	1.3 (1.0–1.7)	25.3 (21.7–29.3)	1.4 (1.1–1.8)
Employment status						
Employed	12.3 (10.7–14.0)	Referent	25.0 (23.2–26.9)	Referent	18.4 (16.7–20.2)	Referent
Unemployed	37.8 (31.4–44.7)	3.5 (2.5–4.9)	40.4 (34.3–46.9)	2.0 (1.4–2.7)	31.2 (26.0–37.0)	2.0 (1.5–2.6)
Retired	9.9 (8.4–11.7)	1.7 (1.2–2.2)	20.9 (18.6–23.3)	1.7 (1.3–2.1)	14.9 (13.1–16.8)	1.6 (1.3–2.1)
Unable to work	54.9 (50.7–59.1)	7.8 (6.1–9.9)	59.9 (55.9–63.8)	4.8 (3.9–5.9)	51.1 (47.2–55.0)	5.0 (4.0–6.1)
Homemaker, student	17.1 (12.7–22.7)	1.3 (0.8–1.9)	29.5 (24.5–35.0)	1.1 (0.8–1.5)	22.2 (17.6–27.5)	1.2 (0.8–1.6)

AOR, adjusted odds ratio; 95% CI, 95% confidence interval.
[a]Adjusted by age, sex, race/ethnicity, education level, marital status, and employment status.

TABLE 2.—Mean number of impaired health-related quality-of-life days, and percent and adjusted odds ratios of ≥14 impaired health-related quality of life days in the past 30 days, by current depression, and lifetime diagnosis of depression and anxiety among adults with asthma aged ≥18 years, 2006.

	Current depression		Lifetime diagnosis of depression		Lifetime diagnosis of anxiety	
	Yes	No	Yes	No	Yes	No
Questions asked in 38 states, DC, the Virgin Islands, and Puerto Rico						
Physical distress						
Mean (95% CI)	15.2 (14.3–16.2)	5.4 (4.8–5.9)	11.1 (10.5–11.8)	6.0 (5.4–6.6)	11.5 (10.7–12.4)	6.3 (5.7–6.8)
% (95% CI) ≥14 days	56.3 (52.2–60.3)	16.4 (14.5–18.4)	39.0 (36.3–41.8)	18.7 (16.6–21.0)	40.7 (37.3–44.1)	20.0 (18.1–22.0)
AOR (95% CI)[a]	4.7 (3.5–6.3)	Referent	1.9 (1.5–2.5)	Referent	1.9 (1.5–2.5)	Referent
Mental distress						
Mean (95% CI)	18.0 (17.0–19.0)	3.1 (2.9–3.4)	12.4 (11.7–13.2)	3.3 (3.1–3.6)	13.1 (12.2–14.0)	4.0 (3.7–4.2)
% (95% CI) ≥14 days	65.4 (61.5–69.0)	8.7 (7.7–9.7)	43.5 (40.7–46.3)	9.8 (8.7–11.2)	45.8 (42.3–49.2)	12.2 (11.1–13.4)
AOR (95% CI)[a]	14.3 (11.5–17.8)	Referent	5.6 (4.7–6.8)	Referent	4.5 (3.7–5.4)	Referent
Activity limitations						
Mean (95% CI)	13.3 (12.4–14.2)	2.9 (2.4–3.5)	8.7 (8.1–9.2)	3.6 (3.0–4.2)	9.4 (8.6–10.2)	3.8 (3.3–4.4)
% (95% CI) ≥14 days	48.9 (44.8–53.0)	8.5 (6.8–10.6)	30.8 (28.3–33.4)	11.1 (9.1–13.3)	33.5 (30.3–36.8)	12.0 (10.3–14.0)
AOR (95% CI)[a]	7.0 (5.0—-9.9)	Referent	2.3 (1.7–3.1)	Referent	2.4 (1.8–3.1)	Referent
Questions asked in Delaware, Hawaii, and Rhode Island						
Depressive symptoms						
Mean (95% CI)	15.0 (12.3–17.6)	1.9 (1.6–2.3)	11.3 (9.1–13.5)	2.1 (1.7–2.5)	10.4 (8.3–12.4)	2.8 (2.1–3.5)
% (95% CI) ≥14 days	54.0 (43.5–64.1)	4.0 (2.7–5.8)	38.3 (30.5–46.8)	5.3 (3.8–7.3)	37.5 (29.7–46.1)	7.1 (5.0–10.1)
AOR (95% CI)[a]	23.6 (11.6–47.9)	Referent	9.4 (5.5–15.9)	Referent	7.1 (4.2–12.2)	Referent
Anxiety symptoms						
Mean (95% CI)	17.2 (14.5–19.8)	4.4 (3.8–5.0)	13.7 (11.6–15.8)	4.6 (3.9–5.2)	13.8 (11.7–15.9)	5.0 (4.2–5.8)
% (95% CI) ≥14 days	62.5 (51.9–72.0)	12.0 (9.5–15.1)	49.3 (41.2–57.4)	12.6 (10.1–15.5)	48.2 (40.0–56.5)	14.7 (11.7–18.4)
AOR (95% CI)[a]	9.8 (5.8–16.5)	Referent	5.2 (3.4–7.9)	Referent	4.2 (2.7–6.6)	Referent
Insufficient sleep						
Mean (95% CI)	20.5 (18.3–22.6)	8.6 (7.8–9.5)	16.0 (14.2–17.8)	9.3 (8.4–10.2)	16.0 (14.0–18.1)	9.6 (8.7–10.5)
% (95% CI) ≥14 days	71.3 (59.3–80.8)	27.1 (23.4–31.1)	55.5 (47.2–63.4)	28.7 (24.9–33.0)	57.6 (49.3–65.5)	29.5 (25.6–33.7)
AOR (95% CI)[a]	6.3 (3.9–10.1)	Referent	2.8 (1.9–4.2)	Referent	2.6 (1.7–3.9)	Referent
Pain						
Mean (95% CI)	10.9 (8.5–13.3)	3.2 (2.7–3.8)	8.9 (7.2–10.7)	3.3 (2.8–3.9)	9.3 (7.5–11.2)	3.5 (3.0–4.1)
% (95% CI) ≥14 days	38.4 (29.8–47.7)	10.2 (8.3–12.6)	30.0 (24.0–36.8)	10.8 (8.7–13.2)	32.6 (25.9–40.1)	11.2 (9.2–13.5)
AOR (95% CI)[a]	6.0 (3.5–10.3)	Referent	3.1 (2.0–4.7)	Referent	2.9 (1.9–4.6)	Referent
Fatigue						
Mean (95% CI)	24.7 (23.4–26.0)	11.6 (10.8–12.4)	21.6 (20.1–23.1)	11.6 (10.7–12.5)	20.4 (18.6–22.2)	12.5 (11.5–13.4)
% (95% CI) ≥14 days	92.2 (85.8–95.8)	40.4 (36.4–44.6)	81.7 (75.0–87.0)	40.3 (36.1–44.6)	75.6 (67.0–82.5)	44.3 (40.0–48.6)
AOR (95% CI)[a]	13.3 (6.4–27.6)	Referent	5.3 (3.4–8.3)	Referent	3.2 (2.0–5.0)	Referent

AOR, adjusted odds ratio; 95% CI, 95% confidence interval.
[a]Adjusted by age, sex, race/ethnicity, education level, marital status, and employment status.



*Includes data from Delaware, Hawaii, and Rhode Island.

FIGURE 1.—Mean number of days in the past 30 days of impaired health-related quality of life among persons with asthma by depression severity.

to smoke (AOR = 1.8), to be physically inactive (AOR = 2.0), and to be obese (AOR = 1.7) (Table 4, Figure 3).

Among the nine states that participated in the Adult Asthma History Module, adults with asthma and current depression were 2.1 times more likely than those without current depression to have had an asthma attack in the previous 30 days (Table 5). Persons who visited the emergency room ≥3 times in the previous 12 months (vs. 0 times) were 4.3 times more likely to have current depression, those who visited a doctors office ≥3 times in the previous 12 months (vs. 0 times) were 1.9 times more likely to have current depression, and those who were unable to work or carry out usual activities ≥2 weeks in the past year (vs. 0 days) were 2.5 times more likely to have current depression. Moreover, adults who had symptoms of asthma every day, all the time in the past 30 days (vs. no symptoms) were 6.4 times more likely to have current depression, those that had difficulty sleeping for >10 days in the past 30 days (compared to 0 days) were 6.5 times more likely to have current depression, those that took medicine for ≥15 days in the past 30 (vs. no medicine) were 1.6 times more likely to have current depression, and those who used an inhaler ≥30 times in the past 30 days (vs. no inhaler use) were 2.5 times more likely to have current depression.

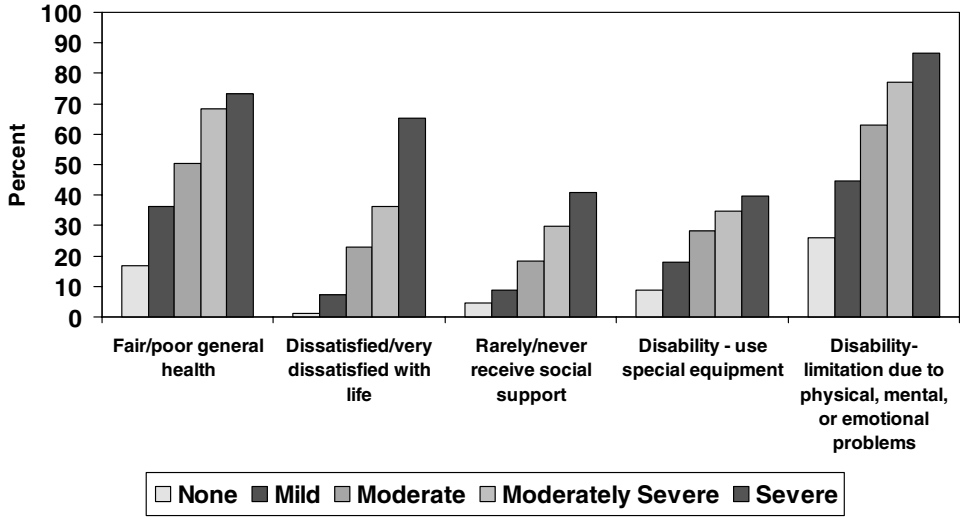
Lifetime Diagnosis of Depression among Those with Asthma

After adjusting for sociodemographic characteristics, we found that, among persons with asthma, those aged 65 years and older were less likely than those aged 18–24 years to have a lifetime diagnosis of depression, as were black non-Hispanics compared with white non-Hispanics (Table 1). In

TABLE 3.—Prevalence and adjusted odds of fair/poor general health, dissatisfaction with life, perceived inadequate social and emotional support, and disability by current depression, and lifetime diagnosis of depression and anxiety among adults with asthma aged ≥18 years, 2006.

	Current depression		Lifetime diagnosis of depression		Lifetime diagnosis of anxiety	
	Yes	No	Yes	No	Yes	No
Fair/poor general health						
% (95% CI)	60.4 (56.2–64.6)	20.1 (20.7–23.5)	46.2 (43.5–48.9)	24.6 (23.1–26.2)	47.4 (44.1–50.7)	26.1 (24.6–27.6)
AOR (95% CI)[a]	3.9 (3.1–5.0)	Referent	2.2 (1.8–2.6)	Referent	2.1 (1.7–2.5)	Referent
Dissatisfied/ very dissatisfied with life						
% (95% CI)	35.5 (31.5–39.6)	2.9 (2.4–3.5)	21.4 (18.9–24.1)	4.2 (3.5–4.9)	23.2 (20.1–26.6)	5.2 (4.5–5.9)
AOR (95% CI)[a]	13.4 (10.0–17.8)	Referent	4.4 (3.4–5.6)	Referent	3.7 (2.9–4.8)	Referent
Rarely/never received social and emotional support						
% (95% CI)	26.4 (22.3–30.9)	5.6 (4.9–6.3)	15.9 (13.5–18.6)	7.6 (6.6–8.7)	17.8 (14.7–21.5)	7.7 (6.9–8.6)
AOR (95% CI)[a]	5.7 (4.2–7.8)	Referent	2.0 (1.5–2.7)	Referent	2.3 (1.7–3.1)	Referent
Disability Require special equipment						
% (95% CI)	32.4 (28.5–36.7)	11.4 (10.4–12.5)	24.7 (22.3–27.3)	12.8 (11.6–14.1)	26.6 (23.5–30.0)	13.2 (12.2–14.4)
AOR (95% CI)[a]	2.6 (1.9–3.5)	Referent	1.8 (1.4–2.2)	Referent	1.9 (1.5–2.5)	Referent
Limitation due to physical, mental, or emotional problems						
% (95% CI)	72.1 (68.0–75.9)	31.0 (29.4–32.7)	59.0 (56.3–61.7)	31.5 (29.7–33.3)	61.0 (57.7–64.3)	33.4 (31.7–35.1)
AOR (95% CI)[a]	4.4 (3.5–5.5)	Referent	2.6 (2.2-3.0)	Referent	2.5 (2.1–3.0)	Referent

AOR, adjusted odds ratio; 95% CI, 95% confidence interval.
[a]Adjusted by age, sex, race/ethnicity, education level, marital status, and employment status.



Includes 38 states, the District of Columbia, Puerto Rico, and the Virgin Islands.

FIGURE 2.—Prevalence of fair/poor general health, dissatisfaction with life, inadequate social support, and disability among persons with asthma by depression severity.

addition, females were more likely to have a lifetime diagnosis of depression than males, as were those who were previously married compared with those who were married, and those who were unemployed, retired, and unable to work compared to those who were employed.

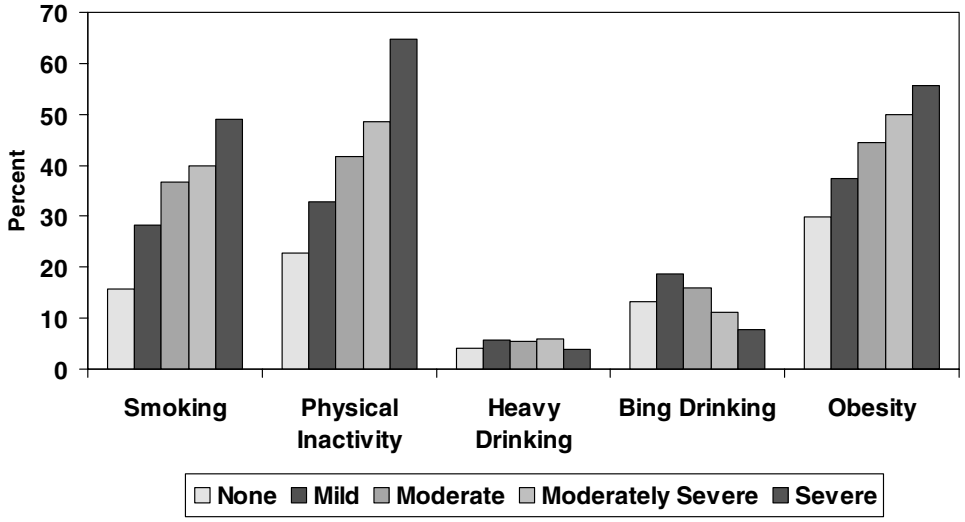
Among adults with asthma, persons with a lifetime diagnosis of depression were significantly more likely than those without a lifetime diagnosis of depression to report more mean numbers of days in the past 30 days of physical distress, mental distress, activity limitations, depressive symptoms, anxiety symptoms, insufficient sleep, pain, and fatigue (Table 2).

After adjusting for sociodemographic characteristics, we found that persons with asthma and a lifetime diagnosis of depression in the 41 states and territories surveyed were 1.9 times more likely than those with asthma and no lifetime diagnosis of depression to report frequent (≥14 of the past 30 days) physical distress, 5.6 times more likely to report frequent mental distress, and 2.3 times more likely to report frequent activity limitations (Table 2). In the three states participating in the Healthy Days Symptoms Module, adults with asthma and a lifetime diagnosis of depression were 9.4 times more likely than those with asthma and no lifetime depression diagnosis to report frequent depressive symptoms, 5.2 times more likely to report frequent anxiety symptoms, 2.8 times more likely to report frequent insufficient sleep, 3.1 times more likely to report frequent pain, and 5.3 times more likely to report frequent fatigue. Moreover, after adjusting for sociodemographic characteristics, we found that adults with asthma and a lifetime diagnosis of depression in the 41 states and territories surveyed were 2.2 times more likely than adults with asthma and no lifetime depression

TABLE 4.—Prevalence and adjusted odds ratios of health risk behaviors by current depression, and lifetime diagnosis of depression and anxiety among adults with asthma aged ≥18 years, 2006.

	Current depression		Lifetime diagnosis of depression		Lifetime diagnosis of anxiety	
	Yes	No	Yes	No	Yes	No
Smoking						
% (95% CI)	40.1 (36.1–44.1)	19.2 (17.8–20.7)	35.6 (32.9–38.4)	18.4 (17.0–19.9)	36.7 (33.5–40.0)	19.7 (18.3–21.2)
AOR (95% CI)[a]	1.8 (1.4–2.3)	Referent	1.9 (1.6–2.3)	Referent	1.8 (1.4–2.1)	Referent
Obesity						
% (95% CI)	48.4 (44.3–52.5)	31.8 (30.2–33.6)	43.5 (40.8–46.3)	31.8 (30.0–33.6)	40.5 (37.3–43.8)	33.7 (32.0–35.5)
AOR (95% CI)[a]	1.7 (1.4–2.1)	Referent	1.5 (1.3–1.8)	Referent	1.2 (1.0–1.4)	Referent
Heavy drinking						
% (95% CI)	5.3 (3.8–7.4)	4.6 (3.9–5.4)	4.9 (3.9–6.1)	4.6 (3.8–5.5)	6.6 (4.9–8.8)	4.1 (3.5–4.8)
AOR (95% CI)[a]	1.5 (0.9–2.3)	Referent	1.2 (0.8–1.7)	Referent	2.0 (1.3–2.9)	Referent
Binge drinking						
% (95% CI)	12.8 (9.6–17.0)	14.8 (13.4–16.3)	13.2 (11.0–15.8)	14.2 (12.8–15.8)	15.2 (12.4–18.4)	13.5 (12.2–15.0)
AOR (95% CI)[a]	1.0 (0.7–1.5)	Referent	1.1 (0.9–1.4)	Referent	1.4 (1.0–1.8)	Referent
Physical inactivity						
% (95% CI)	48.3 (44.2–52.4)	25.7 (23.7–27.7)	37.4 (34.9–40.0)	28.2 (26.1–30.4)	34.7 (31.9–37.7)	29.8 (27.9–31.9)
AOR (95% CI)[a]	2.0 (1.6–2.4)	referent	1.2 (1.0–1.4)	Referent	0.9 (0.8–1.1)	Referent

AOR, adjusted odds ratio; 95% CI, 95% confidence interval.
[a]Adjusted by age, sex, race/ethnicity, education level, marital status, and employment status.



Includes 38 states, the District of Columbia, Puerto Rico, and the Virgin Islands.

FIGURE 3.—Prevalence of adverse health behaviors and obesity by depression severity among persons with asthma.

diagnosis to report fair/poor general health, 4.4 times more likely to report being dissatisfied/very dissatisfied with life, 2.0 times more likely to report rarely or never receiving the social support they need, 1.8 times more likely to report that they require special equipment to do activities, and 2.6 times more likely to report that they are limited due to physical, mental, or emotional problems (Table 3). Adults with asthma and a lifetime diagnosis of depression were also significantly more likely than those with no lifetime depression diagnosis to smoke (AOR = 1.9) and to be obese (AOR = 1.5) (Table 4).

Among the nine states that participated in the Adult Asthma History Module, adults with asthma and a lifetime diagnosis of depression were 1.6 times more likely to than those without a lifetime diagnosis of depression to have had an asthma attack in the previous 30 days (Table 5). A lifetime diagnosis of depression was 2.1 times more likely in persons who visited the emergency room ≥3 times in the previous 12 months (vs. 0 times), 1.6 times more likely in those who visited a doctor's office ≥3 times in the previous 12 months (vs. 0 times), 2.0 times more likely in those who were unable to work or carry out usual activities ≥2 weeks in the past year (vs. 0 days), 2.5 times more likely in those who had difficulty sleeping >10 days in the past 30 days due to asthma symptoms (vs. 0 days), and 2.0 times more likely in those who had symptoms of asthma every day, all the time, in the past 30 days (vs. no symptoms).

Lifetime Diagnosis of Anxiety

After adjusting for sociodemographic characteristics, we found that persons with asthma aged 65 years and older were significantly less likely than those aged 18–24 years to have a lifetime diagnosis of anxiety, as were black non-Hispanics compared with white non-Hispanics (Table 1). Females were significantly more likely than males to have a lifetime diagnosis of anxiety as were those previously married or never married compared with those married, those who were unemployed, retired, or unable to work compared with those who were employed, and those with less than a high school education compared to those with at least some college education.

Among adults with asthma, persons with a lifetime diagnosis of anxiety were significantly more likely than those without a lifetime diagnosis to report more mean numbers of days of physical distress, mental distress, activity limitations, depressive symptoms, anxiety symptoms, insufficient sleep, pain, and fatigue in the past 30 days (Table 2).

After adjusting for sociodemographic characteristics, we found that persons with asthma and a lifetime diagnosis of anxiety in the 41 states and territories surveyed were 1.9 times more likely than those with asthma and no lifetime diagnosis of anxiety to report frequent (≥14 of the past 30 days) physical distress, 4.5 times more likely to report frequent mental distress, and 2.4 times more likely to report frequent activity limitations (Table 2). In the three states participating in the Healthy Days Symptoms Module, adults with asthma and a lifetime diagnosis of anxiety were 7.1 times more likely than those with asthma and no lifetime anxiety diagnosis to report frequent depressive symptoms, 4.2 times more likely to report frequent anxiety symptoms, 2.6 times more likely to report frequent insufficient sleep, 2.9 times more likely to report frequent pain, and 3.2 times more likely to report frequent fatigue. Moreover, after adjusting for sociodemographic characteristics, we found that adults with asthma and a lifetime diagnosis of anxiety in the 41 states and territories were 2.1 times more likely than adults with asthma and no lifetime anxiety diagnosis to report fair/poor general health, 3.7 times more likely to report being dissatisfied/very dissatisfied with life, 2.3 times more likely to report rarely or never receiving the social support they need, 1.9 times more likely to report that they require special equipment to do activities, and 2.5 times more likely to report that they are limited due to physical, mental, or emotional problems (Table 3). Adults

TABLE 5.—Asthma severity by current depression, and lifetime diagnosis of depression and anxiety among adults with asthma aged ≥18 years, 2006.

	Current depression			Lifetime diagnosis of depression			Lifetime diagnosis of anxiety		
	Yes % (95% CI)	No % (95% CI)	AOR (95% CI)*	Yes % (95% CI)	No % (95% CI)	AOR (95% CI)*	Yes % (95% CI)	No % (95% CI)	AOR (95% CI)[a]
Asthma attack in past 30 days									
Yes	67.8 (62.8–72.5)	49.4 (46.7–52.1)	2.1 (1.6–2.7)	63.0 (59.4–66.4)	48.6 (45.8–51.4)	1.6 (1.3–2.0)	64.5 (60.3–68.5)	49.4 (46.8–52.0)	1.6 (1.3–2.0)
Visited ER in past 12 months for asthma									
0 visits	68.0 (63.0–72.7)	84.5 (82.5–86.4)	Referent	76.1 (72.9–79.1)	83.1 (80.9–85.1)	Referent	73.4 (69.3–77.1)	83.2 (81.2–85.1)	Referent
1 visit	11.8 (9.0–15.2)	8.2 (6.8–9.9)	1.4 (0.9–2.1)	10.8 (8.6–13.6)	8.2 (6.8–9.9)	1.3 (0.9–1.9)	11.9 (9.2–15.2)	8.0 (6.7–9.5)	1.5 (1.0–2.2)
2 visits	7.8 (5.3–11.5)	4.4 (3.4–5.6)	1.7 (0.9–3.1)	5.7 (4.3–7.4)	5.1 (3.9–6.6)	1.0 (0.7–1.6)	6.6 (4.9–8.8)	4.8 (3.7–6.2)	1.3 (0.9–2.0)
≥ 3 visits	12.4 (9.2–16.5)	2.8 (2.1–3.8)	4.3 (2.5–7.5)	7.4 (5.9–9.3)	3.6 (2.8–4.6)	2.1 (1.4–3.2)	8.1 (5.9–11.1)	4.0 (3.2–5.0)	1.9 (1.2–3.1)
Visited doctor for symptoms of asthma in past 12 months									
0 visits	59.2 (54.3–64.0)	73.4 (71.0–75.7)	Referent	64.5 (61.1–67.8)	72.8 (70.3–75.3)	Referent	63.3 (59.3–67.1)	72.6 (70.2–74.9)	Referent
1 visit	11.9 (9.3–14.9)	12.0 (10.4–13.9)	1.1 (0.8–1.5)	12.3 (10.3–14.6)	12.1 (10.4–14.1)	1.0 (0.8–1.4)	13.2 (10.8–15.9)	11.8 (10.2–13.6)	1.2 (0.9–1.6)
2 visits	11.5 (8.5–15.4)	6.3 (5.2–7.6)	1.6 (1.0–2.6)	8.4 (6.7–10.5)	6.6 (5.4–8.2)	1.2 (0.8–1.8)	7.9 (6.2–10.1)	7.0 (5.8–8.6)	1.0 (0.7–1.5)
≥ 3 visits	17.4 (14.1–21.2)	8.3 (6.9–9.8)	1.9 (1.3–2.8)	14.8 (12.5–17.4)	8.4 (7.0–10.1)	1.6 (1.2–2.1)	15.6 (13.0–18.7)	8.6 (7.3–10.2)	1.7 (1.3–2.3)
Unable to workor carry out usual activities some days in past 12 months due to asthma									
0 days	55.7 (50.3–60.9)	72.6 (70.1–75.0)	Referent	60.4 (56.6–64.2)	73.2 (70.6–75.6)	Referent	60.3 (55.8–64.6)	72.0 (69.5–74.4)	Referent
1 week	22.7 (18.3–27.8)	18.4 (16.2–20.7)	1.4 (1.0–2.0)	21.4 (18.1–25.0)	17.6 (15.5–20.0)	1.4 (1.1–1.9)	21.8 (18.0–26.1)	18.2 (16.1–20.4)	1.3 (1.0–1.8)
≥ 2 weeks	21.6 (17.9–25.9)	9.1 (7.7–10.6)	2.5 (1.8–3.5)	18.2 (15.7–21.1)	9.2 (7.8–10.8)	2.0 (1.5–2.7)	17.9 (15.2–21.1)	9.9 (8.5–11.5)	1.8 (1.4–2.4)
Symptoms of asthma in past 30 days									
None	14.5 (11.4–18.1)	29.8 (27.4–32.4)	Referent	18.6 (15.9–21.7)	29.9 (27.4–32.6)	Referent	20.2 (16.7–24.1)	28.4 (26.1–30.8)	Referent
<1 per week	15.3 (11.5–20.2)	27.0 (24.7–29.5)	1.1 (0.7–1.6)	19.5 (16.8–22.5)	27.0 (24.5–29.7)	1.1 (0.8–1.5)	18.6 (15.5–22.2)	26.5 (24.1–29.0)	1.0 (0.7–1.4)
1–2 per week	21.7 (17.9–26.0)	21.4 (19.2–23.8)	1.8 (1.2–2.6)	25.2 (21.9–28.8)	19.6 (17.6–21.8)	1.9 (1.4–2.6)	23.6 (20.2–27.5)	20.6 (18.6–22.9)	1.5 (1.1–2.0)
>2 per week	18.9 (14.9–23.8)	8.3 (6.9–10.0)	4.1 (2.6–6.4)	13.7 (11.3–16.4)	8.8 (7.3–10.6)	2.1 (1.4–3.1)	14.7 (11.8–18.2)	9.2 (7.7–11.0)	1.8 (1.2–2.7)
Every day, not all time	18.6 (15.3–22.5)	10.5 (9.1–12.2)	3.0 (2.1–4.4)	15.9 (13.5–18.8)	10.4 (9.0–12.1)	2.2 (1.6–3.1)	15.1 (12.4–18.1)	11.2 (9.7–12.8)	1.7 (1.2–2.4)
Every day, all time	11.0 (8.5–14.2)	3.0 (2.3–3.8)	6.4 (3.7–11.1)	7.1 (5.7–8.8)	4.3 (3.4–5.4)	2.0 (1.4–3.0)	7.8 (6.2–9.9)	4.2 (3.4–5.2)	2.1 (1.4–3.3)
Symptoms of asthma make it difficult to sleep in past 30 days									
0 days	27.9 (22.7–33.9)	56.3 (53.1–59.5)	Referent	40.0 (36.0–44.2)	53.4 (50.0–56.7)	Referent	36.8 (32.2–41.7)	53.3 (50.1–56.4)	Referent
1–2 days	19.2 (15.3–23.8)	23.6 (20.8–26.6)	1.5 (1.0–2.2)	20.9 (17.5–24.8)	22.8 (20.0–25.9)	1.1 (0.8–1.5)	21.0 (17.2–25.4)	22.6 (19.9–25.5)	1.2 (0.9–1.7)
3–10 days	29.1 (24.5–34.1)	14.6 (12.6–17.0)	3.4 (2.3–4.9)	22.3 (19.3–25.7)	17.1 (14.8–19.7)	1.5 (1.1–2.0)	24.4 (20.8–28.3)	17.0 (14.8–19.4)	1.8 (1.3–2.4)
>10 days	23.9 (19.5–28.8)	5.5 (4.4–6.9)	6.5 (4.2–10.2)	16.7 (14.1–19.7)	6.8 (5.3–8.6)	2.5 (1.7–3.6)	17.8 (14.8–21.3)	7.2 (5.8–8.9)	2.8 (1.9–4.1)
How often take medication in past 30 days									
0 days	34.0 (29.6–38.8)	44.1 (41.4–46.8)	Referent	37.4 (33.8–41.1)	43.9 (41.1–46.7)	Referent	39.1 (34.9–43.4)	42.3 (39.7–44.9)	Referent
1–14 days	21.4 (17.6–25.8)	22.6 (20.3–25.1)	1.0 (0.7–1.5)	23.2 (19.9–26.8)	22.5 (20.2–25.0)	1.1 (0.8–1.4)	21.1 (17.7–25.0)	23.3 (21.0–25.7)	0.9 (0.6–1.2)
≥ 15 days	44.5 (39.5–49.7)	33.3 (31.0–35.7)	1.6 (1.2–2.1)	39.5 (36.1–43.0)	33.6 (31.1–36.2)	1.2 (1.0–1.6)	39.8 (35.8–44.0)	34.5 (32.1–36.9)	1.1 (0.8–1.4)
How often used inhaler in past 30 days									
0 times	39.3 (34.3–44.5)	54.0 (51.3–56.7)	Referent	44.0 (40.3–47.8)	53.3 (50.5–56.1)	Referent	41.6 (37.4–46.0)	53.1 (50.4–55.7)	Referent
1–4 times	26.0 (21.7–30.8)	28.8 (26.4–31.4)	1.1 (0.8–1.5)	27.9 (24.6–31.5)	28.1 (25.7–30.7)	1.1 (0.9–1.4)	27.8 (24.0–31.9)	28.4 (26.0–30.8)	1.1 (0.9–1.5)
5–14 times	12.9 (9.9–16.6)	7.5 (6.3–9.0)	2.0 (1.4–3.0)	11.0 (8.9–13.5)	7.7 (6.4–9.3)	1.3 (0.9–1.9)	12.2 (9.8–15.2)	7.5 (6.2–8.9)	1.6 (1.1–2.4)
15–29 times	7.6 (5.5–10.5)	3.7 (2.9–4.7)	2.2 (1.3–3.7)	6.4 (4.9–8.3)	3.9 (3.1–4.9)	1.7 (1.1–2.7)	6.1 (4.5–8.1)	4.3 (3.5–5.4)	1.4 (0.9–2.2)
30+ times	14.2 (11.5–17.5)	5.9 (5.0–7.1)	2.5 (1.7–3.7)	10.7 (8.9–12.9)	7.0 (5.9–8.3)	1.4 (1.0–2.0)	12.3 (10.1–14.9)	6.8 (5.8–8.1)	1.8 (1.3–2.5)

AOR, adjusted odds ratio; 95% CI, 95% confidence interval.

[a]Adjusted by age, sex, race/ethnicity, education level, marital status, and employment status.

with asthma and a lifetime diagnosis of anxiety were also significantly more likely than those with no lifetime anxiety diagnosis to smoke (AOR = 1.8) and drink heavily (AOR = 2.0) (Table 4).

Among the nine states that participated in the Adult Asthma History Module, adults with asthma and a lifetime diagnosis of anxiety were 1.6 times more likely than those without this diagnosis to have had an asthma attack in the previous 30 days (Table 5). A lifetime diagnosis of anxiety was 1.9 times more likely in persons who visited the emergency room ≥3 times in the previous 12 months (vs. 0 times), 1.7 times more likely in those who visited a doctors office ≥3 times in the previous 12 months (vs. 0 times), 1.8 time more likely those who were unable to work or carry out usual activities ≥2 weeks in the past year (vs. 0 days), 2.1 times more likely in those who had symptoms of asthma every day, all the time, in the past 30 days (vs. no symptoms), 2.8 times more likely in those who had difficulty sleeping due to asthma symptoms >10 days in the past 30 days (versus 0 days), and 1.8 times more likely in those who used an inhaler ≥30 times in the past 30 days.

Discussion

Several important results emerge from our large U.S.-population-based study examining the associations between depression and anxiety and HRQOL, health behaviors, and asthma control among adults with asthma. First, we found that a lifetime diagnosis of depression or anxiety among persons with asthma was associated with an increased level of impaired HRQOL and risk behaviors, and a decreased level of asthma control as compared with those with asthma and no depression or anxiety. Second, we found a dose-response relationship between depression severity and mean number of days of impaired HRQOL in the past 30 days in most domains examined as well as between depression severity and the prevalence of fair/poor general health; life dissatisfaction; inadequate social support; disability; and risk behaviors such as smoking, physical inactivity, and obesity. Third, we found that persons with current depression and/or a lifetime diagnosis of anxiety or depression were more likely to report decreased asthma control, including more health care and emergency room visits for asthma symptoms; more activity limitations, such as work absenteeism; more frequent symptoms; and increased us of medications as compared to persons with asthma without current depression or a lifetime diagnosis of anxiety or depression.

This research gives further credence to the association between depression and asthma. It also emphasizes the important associations between depression severity and impaired HRQOL. According to a recent study (50), depression is related to impaired HRQOL, intake of corticosteroids, and hospitalizations among persons with asthma even after controlling for comorbid anxiety disorders. According to the Medical Outcomes Study, depression and chronic diseases actually have an additive adverse effect on functional status and well-being (51, 52). Moreover, asthma patients with more depressive symptoms report worse HRQOL than do persons with similar disease activity and fewer depressive symptoms (24). Current research suggests that depression actually affects certain asthma symptoms, such as dyspnea, awakening at night with asthma symptoms, and morning symptoms (25). Depression also has a negative effect on cognitive functioning and energy and motivation, and invokes hopelessness and isolation from family and friends, which can affect asthma management (25, 53, 54).

We also found an increased prevalence of a lifetime diagnosis of anxiety among persons with asthma. Current research suggests that some anxiety disorders are more common among persons with asthma than those without asthma. According to two studies conducted by Goodwin and colleagues who used the Epidemiologic Catchment Area Study and the Midlife Development in the United States Survey, U.S. adults with asthma are at increased risk of panic attacks compared to those without asthma (18, 55). Other studies have found increased prevalence of social phobia, generalized anxiety disorder, agoraphobia, and post-traumatic stress disorder among persons with asthma (16, 56–58). Notably, research indicates a bidirectional dose-response relationship between asthma and panic attacks (12). Anxiety may also affect asthma management by influencing symptom perception, increasing requests for medication and treatment, and increasing frequency of emergency room visits and rehospitalization rates (12, 59). There are limited data on the impact of anxiety on HRQOL among persons with asthma (60). This study adds to the literature by indicating that a lifetime diagnosis of anxiety is significantly associated with impaired HRQOL among adults with asthma on all mental- and physical health domains examined.

Our study has several limitations. First, the rates in this study could potentially be underestimated because BRFSS potentially excludes people of low socioeconomic status, those with severely impaired physical or mental health, and those who are institutionalized or hospitalized. Second, eliminating the question about suicidal ideation and self-harm may disproportionately underestimate the prevalence of depression among persons with asthma, as preliminary evidence suggests an association between asthma and an increased likelihood of suicidal ideation and suicide attempts among adults (61). Third, depression data were available for 38 states as well as the District of Columbia, Puerto Rico, and the U.S. Virgin Islands, data for five of the HRQOL domains were available for three states, and asthma disease severity data was available for nine states. Therefore, our results may not be representative of the entire country. Fourth, persons with depression and anxiety may over-report impaired HRQOL and somatic symptoms, thereby inflating these relationships (26, 62). Fifth, because current depression status is missing for 10.1% of the population, it is likely that we are underestimating the burden of depression in these 41 states and territories. Finally, we cannot infer a causal relationship between anxiety, depression, HRQOL, adverse health behaviors, and asthma severity, although our cross-sectional data support our conclusion that these characteristics are associated.

The PHQ-8 is a well-validated, brief, self-reported, diagnostic, and severity measure for depression and has been successfully implemented over the telephone (40). Moreover, research supports the construct validity of the PHQ-8 in population-based settings to recognize major depression as well as subthreshold levels of depression (39). However, the diagnosis of major depression requires a physician diagnosis and proper follow-up.

CONCLUSIONS

As achieving optimal levels of asthma control relies extensively on behavioral factors that may be influenced by negative mood states, it is important to study the prevalence and impact of negative mood states on asthma morbidity. This research elucidates the increased impairments in quality of life and prevalence of adverse health behaviors as depression severity increases. The results of our research clearly indicate that depression and anxiety adversely effect asthma control and indicate a multidimensional approach to health care should be taken with asthma patients. Because depression and anxiety are common among persons with asthma, it might be useful to include screening tools, such as the PHQ-8, when evaluating patients with asthma (63).

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