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Self-reported asthma diagnosis and mental health: Findings from the Collaborative Psychiatric Epidemiology Surveys

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ABSTRACT

Historically, asthma has had a mixed association with mental health. More research is needed to examine the associations between asthma and specific psychiatric disorders, and whether these associations hold true across racial groups in the general population of the United States. Using the Collaborative Psychiatric Epidemiology Surveys, we examined the associations between lifetime asthma and specific DSM-IV psychiatric disorders, adjusting for sociodemographic characteristics and smoking status. We found that when looking at the entire sample, self-reported diagnosis of asthma was associated with greater odds of reporting mood disorders (AOR: 1.36; 95% CI: 1.05–1.74). Asthma was not significantly associated with total anxiety disorders (AOR 1.25; 95% CI: 0.98–1.60), though it was specifically associated with generalized anxiety disorder. Asthma was associated with greater odds of having alcohol use disorders (AOR: 1.71; 95% CI: 1.24–2.37), but was not associated with total eating disorders (AOR:1.36; 95% CI: 1.17–2.51) (though it was significantly associated with higher odds for binge eating disorder, but lower odds of reporting bulimia). The strength and the significance of the associations between asthma and psychiatric disorders varied when stratified by race, underscoring the importance of examining race as a potential explanation for the mixed findings observed previously in the literature.

1. Introduction

Asthma has been associated with poor mental health (Lu et al., 2018), which may reflect an interplay between the nervous and the immune systems, as recent evidence indicates that the systems might influence each other bidirectionally. The interactions between these two systems arise from communication via G protein-coupled cell surface receptors, receptor tyrosine kinases, cytokines, growth factors, and neuropeptides (Foster et al., 2017). Although this linkage is thought to be adaptive in many instances, it may also be maladaptive and possibly give rise to pathophysiology, as in the case of the airway inflammation seen in asthma (Foster et al., 2017). In connection with this, there have been several studies on the association between asthma and psychiatric disorders among adults in the United States; however, associations have not been entirely consistent. For example, some studies have shown that asthma is associated with mood disorders (Hurwitz and Morgenstern, 1999; Scott et al., 2007; Strine et al., 2008, 2004; Trojan et al., 2014; Von Behren et al., 2002), anxiety disorders (Goodwin et al., 2014; Goodwin and Eaton, 2003; Scott et al., 2007; Strine et al., 2008; Trojan et al., 2014), and alcohol use disorders (Scott et al., 2007), with a potential dose-response relationship between poor mental health and risk for asthma (Chun et al., 2008). However, other studies found no association between asthma and anxiety disorders (Goodwin et al., 2004), or alcohol/substance use disorders (Goodwin et al., 2003). One longitudinal study found that individuals with respiratory diseases had higher prevalence and persistence of depression or anxiety disorders; however, a history of respiratory diseases did not increase risk of reporting new cases of depression or anxiety disorders (Goodwin et al., 2014).

It is uncertain what underlies these mixed findings. It is possible that they may be due to methodological differences; however, the findings may also be partly attributable to the varying proportions of racial and ethnic minorities in the study samples. Given this, understanding the association between asthma and psychiatric disorders among different

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racial groups in the United States might be especially instructive not only because cross-country research has indicated that the prevalence of asthma may be comparatively high in the United States (Scott et al., 2007), but also because other research has suggested that there may be ethnic differences in both the occurrence of asthma (Arif et al., 2003; Rose et al., 2006) and mental disorders (Breslau et al., 2006). There are notable health disparities where the burden of asthma disproportionately impacts minority groups (especially Puerto Rican and non-Hispanic Black) and the socio-economically disadvantaged (Forno and Celedón, 2012).

Despite this, to our knowledge there has yet to be any analyses that racially stratify representative samples of adults from the general population of the United States in order to better understand the association between asthma and specific psychiatric diagnoses. For example, although Chun et al. (2008) used a large representative sample to examine the asthma-mental health association, they did not stratify by race or use a broad range of psychiatric diagnoses. Similarly, Goodwin et al. (2014) analyzed a representative sample of adults, but did not stratify by race. In this study, we analyzed data from three datasets of the U.S. population, which taken together offer perhaps the largest and most robust portrait of the variegated racial and ethnic landscape of the United States.

2. Methods

2.1. Sample

We analyzed data from the Collaborative Psychiatric Surveys (CPES), which comprises three cross-sectional household surveys: (1) the National Comorbidity Survey Replication (NCS-R; Kessler and Merikangas, 2004), (2) the National Latino and Asian American Study (NLAAS; Alegria et al., 2004), and (3) the National Survey of American Life (NSAL; Jackson et al., 2004). All of the surveys were conducted between 2001 and 2003. The surveys used a common core instrument, and similar multi-stage probability sampling strategies to achieve nationally representative samples of adults in the general population of the United States. The NCS-R is a nationally representative survey of 9282 adults (over the age of 17, predominantly White, reflecting the general population of the US), of which a subsample (n = 5692) completed a second part of the survey. The NLAAS is a nationally representative sample of Latino American (n = 2554) and Asian American (n = 2095) adults. The NSAL is a nationally representative sample of African American adults (n = 3570), with a Caribbean Black supplement (n = 1621); a smaller sample of White respondents (n = 891) were drawn from the same source neighborhoods. The sampling methodology of the CPES is described in detail elsewhere (Heeringa et al., 2004; Pennell et al., 2004). Because we were interested in whether the strength and associations between asthma and psychiatric disorders were modified across racial groups, we stratified by race and analyzed each racial group separately instead of merging all of the data and treating race as a covariate.

2.2. Measures

2.2.1. Self-reported asthma diagnosis (Independent variable)

Asthma was measured by the single dichotomous item: “Has a doctor or health professional ever diagnosed you with asthma?”

2.2.2. Psychiatric disorders (Dependent variable)

Past 12-month psychiatric disorders were based on the Word Mental Health -Composite International Diagnostic Interview (Kessler and Üstün, 2004), which is a fully structured lay interview to screen for diagnoses according to DSM-IV criteria. Past 12-month psychiatric disorders included: mood disorder (dysthymia, depressive episode, major depressive disorder, bipolar I, bipolar II), anxiety disorder (agoraphobia with and without panic disorder, generalized anxiety disorder, panic attacks, panic disorder, post-traumatic stress disorder, social phobia), substance use disorder (drug abuse and dependence), alcohol use disorder (alcohol abuse and dependence), and eating disorders (anorexia, binge eating, bulimia).

2.2.3. Covariates

Using previous studies as a guide (Chun et al., 2008; Goodwin et al., 2014), all models were adjusted for age (18–29, 30–44, 45–59, 60–100), sex (male, female), race/ethnicity, income (poor, near poor, non-poor according to the federal poverty line), education (less than high school, high school graduate, some college, college graduate and beyond), region of country (Northeast, Midwest, West, South). Tobacco use was defined using a dichotomous variable indicating current/former smoker vs. never.

2.3. Analyses

Multivariable logistic regression analysis models were used to examine the relation between self-reported diagnosis of asthma and psychiatric disorders adjusting for socio-demographic variables and tobacco use. Standard errors were estimated through design-based analyses that used the Taylor series linearization method to account for the complex multistage clustered design, with US metropolitan statistical areas or counties as the primary sampling units. Sampling weights were used for all statistical analyses to account for individual-level sampling factors (i.e. non-response and unequal probabilities of selection). All analyses were performed using STATA SE 13. Findings were presented as Odds Ratios (OR) with 95% Confidence Intervals.

3. Results

Overall, 11.52% of the weighted sample reported having ever received a diagnosis of asthma from a doctor or health provider. Blacks had the highest prevalence of asthma (13.23%), followed by Whites (11.93%), and then Latinos (8.98%). Asians had the lowest prevalence of asthma (7.37%) (see online Table S1). When looking at the entire sample, asthma was associated with greater odds of reporting mood disorders (major depressive disorder and dysthymia). Asthma was not significantly associated with total anxiety disorders, though it was specifically associated with generalized anxiety disorder. Asthma was associated with greater odds for alcohol use disorders (specifically alcohol abuse), but was not associated with total eating disorders (though it was associated with higher odds for binge eating disorder, but lower odds of reporting bulimia; Table 1).

Among Whites, asthma was only associated with alcohol use disorders (alcohol abuse), but not with any other psychiatric disorders. Among Latinos, asthma was associated with total mood disorders (major depressive disorder), total anxiety disorders (generalized anxiety disorder, ptsd, social phobia), and total alcohol use disorders, but not with substance use disorders or eating disorders. Among Blacks, asthma was significantly associated with total mood disorders (major depressive disorder, dysthymia), total anxiety disorders (panic disorder, generalized anxiety disorder), but not associated with substance use disorders, alcohol use disorders, or total eating disorders (except for a negative association with bulimia). Asthma was not significantly associated with any psychiatric disorders among Asian Americans (Table 1).

4. Discussion

This study provides an overview of the associations that exist between self-reported asthma diagnosis and various psychiatric disorders among adults in the United States. The novelty of this study is that we analyzed a large and racially diverse dataset, stratifying by race, while using strong measures of psychiatric disorders. Overall, asthma was associated with greater risk for all mood disorders, one type of anxiety disorder (generalized anxiety disorder), alcohol use disorder

Table 1
Associations between lifetime asthma and 12-month psychiatric disorders, stratified by race.

12-month DSM IV Psychiatric Disorders	Whites (N = 5049) AOR	95% CI	Asians (N = 2178) AOR	95% CI	Latinos (N = 3258) AOR	95% CI	Blacks (N = 5557) AOR	95% CI	Total (N = 16,227) AOR	95% CI
Total Mood Disorders	1.24	(0.89–1.72)	1.24	(0.57–2.68)	**1.67****	(1.13 - 2.45)	**1.79****	(1.26 - 2.54)	**1.36***	(1.05 - 1.74)
Major Depressive Disorder	1.28	(0.95 - 1.71)	1.15	(0.48 - 2.79)	**1.65***	(1.11 - 2.46)	**1.75****	(1.22 - 2.50)	**1.39****	(1.10 - 1.74)
Dysthymia	1.63	(0.81 - 3.29)	2.44	(0.47 - 12.69)	1.78	(0.78 - 4.06)	**4.05****	(2.46 - 6.67)	**1.92****	(1.17 - 3.13)
Total Anxiety Disorders	1.12	(0.81 - 1.54)	1.23	(0.59 - 2.56)	**1.88****	(1.26 - 2.81)	**1.49***	(1.08 - 2.05)	1.25	(0.98 - 1.60)
Agoraphobia	1.21	(0.66 - 2.24)	1.60	(1.60 - 1.60)	1.00	(0.44 - 2.30)	1.11	(0.67 - 1.86)	1.13	(0.72 - 1.78)
Agoraphobia with panic disorder	1.38	(0.58 - 3.26)	0.64	(0.06 - 6.62)	0.88	(0.26 - 3.04)	1.10	(0.53 - 2.27)	1.22	(0.65 - 2.27)
Generalized Anxiety Disorder	1.53	(0.93 - 2.53)	0.51	(0.06 - 4.15)	**2.72****	(1.28 - 5.81)	**1.73***	(0.98 - 3.07)	**1.57***	(1.03 - 2.39)
Panic Disorder	1.03	(0.60 - 1.76)	1.27	(0.66 - 2.46)	0.99	(0.50 - 1.97)	**2.26****	(1.40 - 3.62)	1.10	(0.73 - 1.65)
Post-traumatic stress disorder	1.07	(0.65 - 1.78)	1.55	(0.31 - 7.60)	**2.40****	(1.37 - 4.18)	1.61	(0.97 - 2.67)	1.31	(0.90 - 1.91)
Social phobia	0.86	(0.59 - 1.24)	1.62	(0.68 - 3.85)	**1.82****	(1.20 - 2.77)	1.11	(0.73 - 1.70)	1.00	(0.76 - 1.33)
Substance Use Disorders	1.23	(0.59 - 2.55)	-[a]	-[a]	1.13	(0.29 - 4.47)	0.95	(0.38 - 2.39)	1.19	(0.69 - 2.06)
Substance Dependence	1.68	(0.57 - 4.92)	-[a]	-[a]	3.39	(0.51 - 22.42)	1.01	(0.31 - 3.29)	1.63	(0.73 - 3.65)
Substance Abuse	0.98	(0.35 - 2.80)	-[a]	-[a]	0.29	(0.03 - 2.43)	0.87	(0.23 - 3.28)	0.94	(0.42 - 2.09)
Alcohol Use Disorders	**1.71***	(1.10 - 2.64)	-[a]	-[a]	**2.03***	(1.01 - 4.07)	1.51	(0.82 - 2.78)	**1.71****	(1.24 - 2.37)
Alcohol Dependence	1.62	(0.80 - 3.27)	-[a]	-[a]	2.29	(0.80 - 6.56)	1.55	(0.66 - 3.66)	1.63	(0.98 - 2.72)
Alcohol Abuse	**1.79***	(1.11 - 2.89)	-[a]	-[a]	1.67	(0.76 - 3.69)	1.36	(0.73 - 2.52)	**1.71****	(1.17 - 2.51)
Eating Disorders	1.35	(0.52 - 3.53)	-[a]	-[a]	1.31	(0.56 - 3.07)	0.78	(0.35 - 1.74)	1.36	(0.70 - 2.64)
Binge Eating Disorder	1.89	(0.72 - 4.95)	-[a]	-[a]	2.14	(0.76 - 6.05)	1.69	(0.79 - 3.64)	**2.05***	(1.01 - 4.15)
Bulimia	-[a]	-[a]	-[a]	-[a]	0.26	(0.06 - 1.17)	**0.11***	(0.01 - 0.93)	**0.11****	(0.03 - 0.35)

AOR: Adjusted Odds Ratio
All psychiatric disorders were examined in separate models, and were all adjusted for age (continuous), sex (male, female), income (poor, near poor, non-poor), education (less than high school, high school graduate, some college, college graduate and beyond), region of country (Northeast, Midwest, West, South), and tobacco use (current/former vs never).
Individuals who identified as 'Other Race' were not stratified, but were included in the total sample.
Sample sizes were allowed to vary according to complete cases. The analytic sample sizes reflect mood disorder as the outcome.
* $p < 0.05$;
** $p < 0.01$, indicated in bold
[a] Omitted due to small cell count

(specifically alcohol abuse), and eating disorders (greater risk for binge eating disorder, though lower risk for bulimia). Asthma was not significantly associated with substance use disorders, which is surprising given substance use (namely cannabis use) has been associated with respiratory symptoms (Taylor et al., 2000). The strength and the significance of the associations between asthma and psychiatric disorders appeared to vary depending on the specific psychiatric disorder and the racial group being examined. The findings of this study underscore the importance of examining race as a potential explanation for the mixed findings observed previously in the literature.

Our study showed that there were significant differences in the lifetime prevalence of asthma across racial groups, which aligns with studies that show growing disparities in asthma prevalence, with particularly high prevalence among Black Americans and certain Hispanic groups (e.g. Puerto Ricans; Bhan et al., 2015). One study found that when compared with Whites, Blacks had more severe symptoms of asthma, poorer quality of life, more difficulty to manage symptoms, and greater risk for emergency room visits (Haselkorn et al., 2008). This trend may implicate numerous environmental factors, such as poverty (Apter et al., 1999), community violence (Apter et al., 2010), barriers to quality treatment (Cazzola et al., 2018; Davidson et al., 2010), and lack of effective research and engagement (Kramer et al., 2016). It is also worth mentioning that asthma may be linked to air pollutants in inner cities (O' connor et al., 2008), and exposures to specific allergens (e.g. cockroach dust), which are more common in poor urban neighborhoods with crowded living quarters and old buildings (Leaderer et al., 2002). The threats and deprivations endemic in these environments have also known to give rise to psychiatric disorders.

Self-reported asthma diagnosis was not associated with any psychiatric disorders among Asian Americans, which may be due to power issues, given that Asians had the lowest prevalence of asthma and psychiatric disorders when compared with other racial groups. However, the absence of any associations could also suggest Asian Americans (or at least certain Asian American groups) may not face the same barriers to asthma and mental health treatments that Black and Latino Americans face. Among Whites, asthma was not associated with most psychiatric disorders except for alcohol use disorder. Prior studies showed that alcohol use has tended to have a mixed relation with asthma (Cuddy and Li, 2001; Shimoda et al., 1996), and our study raises the question of whether or not these mixed findings may be attributable to the racial composition of the samples.

It is important to at least mention that genetic (and epigenetic) susceptibility may also drive racial differences in asthma risk (Forno and Celedón, 2012; Nelson et al., 1997), and biological factors may result in heightened sensitivity to allergens (Lester et al., 2001). In one study, African Americans had a higher rate of skin test reactivity to cockroach allergen, while Hispanics had more skin reactivity overall, and Whites had lower levels of immunoglobulin E (an antibody that is produced by the body's immune system in response to allergens; (Lester et al., 2001). However, research has yet to map out how common genetic or biological factors might explain why asthma would be associated with greater risk for mood and anxiety disorders among Black and Latino Americans but not among other racial groups.

These findings should be interpreted in the light of several potential limitations. The cross-sectional nature of our data did not allow us to determine temporality or make any causal inferences. The asthma measure available in the CPES was only a single self-report item eliciting a history of receiving a diagnosis of asthma from a doctor or health professional, though there is some evidence that self-reported diagnoses and the doctor's actual diagnoses tend to correspond (Garin et al., 2015). Nonetheless, self-report items can be subject to recall bias and may be weaker than physiological measures or physician diagnoses drawn from medical records. The asthma measure also did not adequately capture the course or severity of asthma symptoms, which is important since one study found that more severe and persistent asthma significantly increased odds of mental health problems, while mild or remitted asthma did not (Goodwin et al., 2013). In contrast, another study suggested that even less severe forms of asthma may still be related to depression (Trojan et al., 2014). There were also no data on asthma treatment, and so we were unable to differentiate

untreated asthma versus asthma that has been successfully managed. We also were unable to examine some psychiatric disorders that have been known to be associated with asthma (e.g. Attention Deficit Hyperactivity Disorder; Cortese et al., 2018)). Further, we were unable to adjust for certain confounders, such as various forms of trauma, adversity, and stress (Apter et al., 2010), which might exacerbate asthma symptoms by intensifying the inflammatory response in the airway in reaction to irritants and infections (Chen and Miller, 2007); inflammation can also contribute to or exacerbate mental health problems (Berk et al., 2013; Raison et al., 2006; Trueba et al., 2016; Voorhees et al., 2013). It is also possible that exposure to childhood adversity and other stressors may explain at least some of the co-morbidity observed between asthma and mood/anxiety disorders (Goodwin et al., 2004). Finally, we should acknowledge that the racial categories used in this study masked within-group heterogeneity, as studies have shown that certain ethnic groups experience more pronounced burden of asthma and co-morbid psychiatric disorders than others (e.g. Puerto Ricans; Lara et al., 2006; Ledogar et al., 2000; Rose et al., 2006).

Our findings suggest that primary care physicians treating individuals for asthma should also administer patient education and brief mental health screeners when necessary, especially in developing culturally tailored systems of care for racial/ethnic populations (Curtis et al., 2012). Individuals who have asthma tend to have their first symptoms fairly early on in childhood, and so these individuals can be monitored for prodromal symptoms and can be referred preventive psychiatric treatments as needed. Further, our findings also suggest that providers treating people for psychiatric disorders can also interview for asthma and other allergic and respiratory diseases as an effort to advance integrated care.

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Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.psychres.2018.12.046.

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