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Gender Differences in Anxiety Disorders: Prevalence, Course of Illness, Comorbidity and Burden of Illness

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Abstract

Women have consistently higher prevalence rates of anxiety disorders, but less is known about how gender affects age of onset, chronicity, comorbidity, and burden of illness. Gender differences in DSM-IV anxiety disorders were examined in a large sample of adults ($N = 20,013$) in the United States using data from the Collaborative Psychiatric Epidemiology Studies (CPES). The lifetime and 12-month male:female prevalence ratios of any anxiety disorder were 1:1.7 and 1:1.79, respectively. Women had higher rates of lifetime diagnosis for each of the anxiety disorders examined, except for social anxiety disorder which showed no gender difference in prevalence. No gender differences were observed in the age of onset and chronicity of the illness. However, women with a lifetime diagnosis of an anxiety disorder were more likely than men to also be diagnosed with another anxiety disorder, bulimia nervosa, and major depressive disorder. Furthermore, anxiety disorders were associated with a greater illness burden in women than in men, particularly among European American women and to some extent also among Hispanic women. These results suggest that anxiety disorders are not only more prevalent but also more disabling in women than in men.

Keywords

Sex; Gender; Anxiety; Prevalence; Comorbidity

Anxiety disorders are the most common class of mental disorders, affecting nearly 1 in 5 adults in the U.S. (Kessler et al., 2005). One of the most widely documented findings in psychiatric epidemiology is that women are significantly more likely than men to develop an anxiety disorder throughout the lifespan (Angst & Dobler-Mikola, 1985; Bruce et al., 2005;

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Regier et al., 1990). The National Comorbidity Survey (NCS; conducted from 1990 to 1992) found that lifetime prevalence rates for any anxiety disorder were 30.5% for women and 19.2% for men (Kessler et al., 1994). Prevalence rates were also higher in women than men for each anxiety disorder examined, including panic disorder (PD; 5.0% vs. 2.0%), agoraphobia (AG; 7.0% vs. 3.5%), specific phobia (15.7% vs. 6.7%), social anxiety disorder (SAD; 15.5% vs. 11.1%), generalized anxiety disorder (GAD; 6.6% vs. 3.6%; Kessler et al., 1994), and posttraumatic stress disorder (PTSD; 10.4% vs. 5.0%; Kessler, et al., 1995). Although prevalence estimates for obsessive compulsive disorder (OCD) were not included in the NCS data, lifetime prevalence estimates for this disorder based on the Epidemiological Catchment Area study were also higher in women than in men (3.1% vs. 2.0%; Breslau et al., 2000).

Despite the large and consistent gender effects that have been documented in the prevalence rates of anxiety disorders, considerably less is known about how gender affects basic epidemiological parameters such as age of onset, duration of illness, and patterns of comorbidity. Very few epidemiological studies have examined gender effects in these parameters across anxiety disorders. Exceptions include one study that examined gender differences in 1-month prevalence rates of DSM-III anxiety disorders across age groups using ECA data (Regier et al., 1990) and another study that examined gender differences in the development of comorbid mood disorders across DSM-III-R anxiety disorders using NCS data (Parker & Hadzi-Pavlovic, 2001). Other studies that have examined gender effects in epidemiological parameters across anxiety disorders are restricted in age (adolescents: Wu et al., 2010; older adults: Beekman et al., 1998; Schaub & Linden, 2000). Updated, nationally representative epidemiological data examining gender effects in sociodemographic and clinical correlates of DSM-IV anxiety disorders are needed.

Most epidemiological research examining gender effects has focused on specific anxiety disorders. For example, several studies have documented significant gender differences in the socio-demographic correlates, trauma types, onset, and comorbidity of PTSD across countries (Breslau et al., 1997; Darves-Bornoz et al., 2008; Hapke et al., 2006; Jeon et al., 2007; Rosenman, 2002; Yasan et al., 2009; Zlotnick et al., 2006). Similar gender differences in epidemiological parameters have also been found within OCD (Grabe et al., 2000; Grant et al., 2010; Kolada et al., 1994; Mohammadi et al., 2004), PD (Eaton et al., 1994; Krystal et al., 1992), GAD (Hunt et al., 2002; Vesga-López et al., 2008) and SAD (Beesdo et al., 2007). In addition, several studies have documented gender differences among clinical samples of individuals with anxiety disorders (e.g., all anxiety disorders: Scheibe & Albus, 1992; Yonkers et al., 2003, PD: Clayton et al., 2006; OCD: Bogetto et al., 1999; Torresan et al., 2009, SAD: Turk et al., 1998; Yonkers et al., 2003).

Taken together, the aforementioned studies provide essential information on the gender effects within specific anxiety disorders and on the pattern of gender differences across anxiety disorders among clinical samples. Unfortunately, many of these studies only examine gender effects in only one or two parameters, such as comorbidity with depression, or age differences in prevalence across genders. In addition, it is well-established that race/ethnicity plays an important role in the endorsement of psychopathology (Asnaani, Richey, Dimaitre, Hinton, & Hofmann, 2010), such that Asian Americans consistently endorse psychological symptoms at a lower rate than individuals of other races, and European Americans typically endorse anxiety symptoms at the highest rate. Further, several studies indicate that prevalence rates of psychological disorders are nuanced by an interaction between gender and racial group membership (e.g. depression: Bracken & Reintjes, 2010; substance use: Ames et al., 2010). Thus, despite evidence that race/ethnicity and gender influence the prevalence of anxiety disorders, epidemiological research, to date, has paid little attention to the possible interplay between gender and race in the endorsement of

psychopathology. Furthermore, because diagnostic criteria and sampling procedures vary considerably across studies, it is difficult to integrate a detailed yet coherent picture of the overall pattern of gender effects across anxiety disorders. While much has been learned about the etiology of anxiety disorders among men and women seeking treatment, research relying on clinical samples is of limited utility because clinical samples differ from individuals in the community in important ways, including the degree of associated dysfunction and the rates of comorbidity (Caron & Rutter, 1991; Huppert et al., 2005). Thus, to better understand the public health consequences of anxiety disorders in men and women, there is a need for rigorous and detailed information about the impact of gender on the epidemiology of anxiety disorders.

Identifying gender differences in epidemiological parameters is critical to our understanding of the preponderance of anxiety disorders among women. Clinically, this information may help promote recognition and effective treatment of anxiety disorders and comorbid disorders. From an epidemiological perspective, understanding gender effects in anxiety disorders may shed light on basic etiologic mechanisms that are expressed differently due to gender-specific biological and environmental risk factors. Further, examining how race/ethnicity interacts with gender will further refine our understanding of how gender effects the manifestation of anxiety disorders.

The NIMH Collaborative Psychiatric Epidemiology Surveys (CPES) were initiated in recognition of the need for contemporary data on the distributions and correlates of mental disorders among the general population. The CPES offers the most recent epidemiological information on mental disorders and is one of the largest, most racially/ethnically comprehensive studies currently available. Using CPES data, the current study provides a baseline from which clinicians and researchers can further understand and monitor gender effects in anxiety disorders. The specific aims of this study were: 1) to present new epidemiological data on the national prevalence of DSM-IV anxiety disorders stratified by gender; 2) to assess gender differences in the onset, course and patterns of comorbidity in anxiety disorders, 3) to examine rates of physical and occupational impairment associated with anxiety disorders across genders, and 4) to explore whether race/ethnicity interacts with gender in a way that significantly impacts the findings.

Method

Participants

Data were drawn from the CPES, which is an integration of three national surveys of mental health in residents of the United States: the National Comorbidity Survey Replication, the National Study of American Life, and the National Latino and Asian American Study of Mental Health. Data were collected between May 2002 and November 2003. The CPES has been described in detail elsewhere (Heeringa et al., 2004), but an abbreviated description of each of the constituent datasets is discussed here.

National Comorbidity Survey Replication (NCS-R)

The NCS-R sample included adults (≥ 18 -years-old), residing in households in the contiguous U.S. Individuals who were institutionalized, living on military bases, or were non-English speaking were excluded. A four-stage national area probability sample framework was used to obtain data for the NCS-R, which was designed to be a cross-sectional replication of the original 1993 National Comorbidity Survey (NCS; Kessler et al., 1994; Kessler & Merikangas, 2004). The NCS-R screening interview was completed by 11,222 households, resulting in an initial 98% response rate. Interviews were conducted in

person with 9,282 respondents (47.4% male; 52.6% female) with the mean age of 44.73 years ($SD = 17.5$), and a response rate of 70.9% (Kessler & Merikangas, 2004).

National Study of American Life (NSAL)

The NSAL is an integrated household probability sample survey of 3,570 African Americans, 1,006 non-Hispanic European Americans, and 1,623 African American adults of Caribbean descent. The total sample included 6,199 participants and the response rate was 71.5% (Heeringa et al., 2004). This survey was added to the CPES in order to obtain information from a larger sample of Afro-Caribbean adults, due to a lack of representation of this group in the NCS-R. The inclusion and exclusion criteria for the NSAL and the sampling procedures used were identical to the NCS-R as described above.

National Latino and Asian American Study of Mental Health (NLAAS)

The NLAAS is a nationally representative survey of Latino and Asian Americans adults (≥ 18 -years-old) in the coterminous U.S., Alaska, and Hawaii. The sample included individuals whose primary language was English, Spanish, or one of three Asian languages (Chinese, Vietnamese, or Tagalog). This was the only survey in the CPES that used trained bilingual interviewers to conduct the survey in one of these five languages. The sampling procedures and exclusion criteria were the same as for the NCS-R and the NSAL, with additional supplements for adults of Puerto Rican, Cuban, Chinese, Filipino, and Vietnamese origin. The Latino sample ($n = 2,554$) consisted of four ethnic subgroups determined by respondents' self-reported ethnicity: Cuban, Puerto Rican, Mexican and other; the final weighted response rate for the Latino sample was 75.5% (Alegría et al., 2007). The Asian sample consisted of individuals identifying as Chinese, Filipino, Vietnamese or other Asian ancestry ($n = 2,095$); the combined weighted response rate for the Asian sample was 65.6% (Abe-Kim et al., 2007).

Procedure

The sampling procedure for all three surveys included four stages: 1) core sampling, in which primary sampling units (metropolitan statistical areas or county units) and secondary sampling units (continuous groupings of census blocks) were selected with probability proportionate to size; 2) high-density supplemental sampling to over-sample census block groups with 5% or greater density of target ancestry/racial groups; 3) screening of a random selection of housing units (using a pre-determined sampling rate) within each designated sampling unit to determine satisfaction of study eligibility criteria, followed by random selection of one respondent from each household for the study interview; and 4) second respondent sampling to recruit participants from households in which one eligible member had already been interviewed (Alegría et al., 2007; Heeringa et al., 2004). Weighting correlations were developed to take into account the joint probabilities for selection under the 4 components of the sample design (Abe-Kim et al., 2007).

In all three surveys, study procedures were explained to participants and written informed consent was obtained from the respondents in English (NCS-R and NSAL), or their preferred language (NLAAS; Alegría et al., 2007). Trained interviewers conducted face-to-face interviews with all participants in the core and high-density samples as described in stages one and two above, except when a telephone interview was conducted with the respondent. To ensure quality control in each survey, participants were re-contacted at random to validate the data. An initial \$50 incentive was later increased to \$150 to reduce non-response (Abe-Kim et al., 2007).

Measures

The World Mental Health Survey Initiative Version of the World Health Organization Composite International Interview (WMH-CIDI) was the primary instrument used to evaluate psychiatric disorder prevalence (Alegria et al., 2007). The WMH-CIDI is a fully structured lay-administered diagnostic interview that generates DSM-IV diagnoses. Diagnoses made using earlier versions of the English and Spanish CIDI have been found to be consistent with diagnoses made independently by trained clinical interviewers (Rubio-Stipec et al., 1999; Wittchen, 1994). In the present study, we focused on lifetime and past year prevalence rates for all anxiety disorders assessed in the combined dataset: social anxiety disorder (SAD), generalized anxiety disorder (GAD), panic disorder (PD), agoraphobia without history of panic disorder (AG), specific phobia, and post-traumatic disorder (PTSD).

Statistical Analysis

The complex samples module of SPSS 17.0 was used for all analyses in order to adequately account for the weighted data structure as described above. Given the focus on gender comparisons, logistic regressions (odds ratios with 95% confidence intervals) were conducted for prevalence of lifetime and past year DSM-IV anxiety diagnoses in women as compared to men. There were significant gender differences on the following demographic variables: age, race, education, and annual household income; these variables were included as covariates in the final analyses. Secondary analyses examined gender effects in the most frequent comorbid diagnoses among those with at least one anxiety disorder (i.e., mood disorders, substance use disorders, eating disorders, adult attention deficit disorder, and intermittent explosive disorder). Gender effects in impairment associated with anxiety disorder status were also examined by analyzing differences in (1) employment status and (2) medical treatment seeking.

Finally, a tertiary set of analyses were conducted to examine the interaction between gender and race on the prevalence of anxiety disorders. Thus all analyses described above were repeated with three independent variables (IVs) entered into the model: gender, race, and a gender by race interaction term. The interaction term was derived from the constituent categorical variables of race and gender such that all subjects were coded from 1–8 to represent each possible gender by race combination (e.g. MaleAsian, FemaleHispanic, etc). For consistency with the other analyses, a logistic regression framework was adopted while controlling for age, education, and annual household income.

Results

Demographic Characteristics

As shown in Table 1, the total sample ($N = 20,013$) examined in this study consisted of 11,463 women and 8,550 men. The women examined in this study were older ($M = 43.74$ vs. 42.90, $F = 12.54$, $p < 0.001$) and had a significantly higher proportion of African Americans (34.4% vs. 26.9%, $\chi^2 = 136.08$, $p < 0.001$) than their male counterparts. The male cohort, on the other hand, had a significantly higher proportion of Asian Americans (12.7% vs. 10.5%) and European Americans (40.4% vs. 36.1%), had obtained a significantly higher level of education (25.2% vs. 22.4% were college graduates or more, $\chi^2 = 23.51$, $p < 0.001$), and reported a higher mean annual household income (\$57,061 vs. \$45,330, $F = 263.06$, $p < 0.001$). Since each of these demographic variables were significantly different between gender groups, all the analyses were run with these variables as covariates in the logistic regression analyses in order to account for these differences across men and women.

Prevalence Rates

We examined lifetime and past-year occurrence of DSM-IV anxiety disorders (including SAD, GAD, PD, AG, specific phobia, and PTSD) across gender. Secondary analyses investigated the lifetime and past-year rates of comorbid disorders among those with at least one anxiety disorder in each of those time frames. We examined rates of comorbid mood disorders (i.e., major depressive disorder [MDD], bipolar 1 and 2 disorders, and dysthymia), substance use disorders (alcohol/drug abuse and dependence), eating disorders (anorexia nervosa [AN], bulimia nervosa [BN], and binge eating disorder [BED]), and other disorders (i.e., attention deficit/hyperactivity disorder [ADHD] and intermittent explosive disorder [IED]) within each gender group. Because the CPES did not assess prevalence of OCD, we were not able to examine gender effects in this disorder. All available anxiety disorders were used to create an “any anxiety disorder” classification that included all participants meeting criteria for one or more anxiety disorders for both lifetime and past-year time periods.

Table 2 shows the lifetime rates of anxiety disorders when controlling for racial group, age, education, and socioeconomic status. Logistic regressions revealed that even when controlling for demographic variables, women were significantly more likely to meet diagnostic criteria for all the anxiety disorders surveyed with the exception of SAD, for which rates were similar to men. All gender effects remained significant when using a Bonferroni correction to adjust for alpha inflation ($p < 0.05/20 = 0.0025$). These effects were unchanged by adding the gender by race interaction variable in the tertiary analyses, indicating that the pattern of gender effects across all disorders was not significantly different across racial groups.

Table 2 also displays the odds ratios for past-year anxiety when controlling for the demographic covariates. As shown, women were significantly more likely to meet criteria for all anxiety disorders with the exception of AG. All of these differences remained significant after the Bonferroni correction, except for the gender difference in SAD. There was no significant interaction between gender and race for past-year anxiety.

Ages of Onset

The mean ages of onset across the entire sample ranged from 8.7 years (for specific phobia) to 26.6 years (for GAD). One-way ANOVAs indicated that there were no significant differences between men and women in the average age of onset for any of the anxiety disorders surveyed. Although there were no significant differences between men and women in age of onset within each racial category, there was a significant interaction between gender and race such that the age of onset for SAD was significantly lower (mean age = 11.4 years) among European American men than among African American women (mean age = 13.8 years).

Chronicity

For each anxiety disorder, we examined persistence by looking at rates of past year disorder among those with a lifetime incidence of that disorder across gender. Women with a lifetime incidence of any anxiety disorder were significantly more likely than men to also meet criteria for an anxiety disorder over the past year (OR [95% CI] = 1.30 [1.05 – 1.62], $p = 0.018$). In addition, women with a lifetime incidence of specific phobia were significantly more likely than men to also meet criteria for the disorder over the past year (OR [95% CI] = 1.72 [1.222 – 2.413], $p = 0.002$). There were no other significant gender differences in anxiety disorder persistence, and the interaction between gender and race was not significant.

Comorbidity

Logistic regressions were used to test for gender effects in comorbidity among participants with a lifetime incidence of an anxiety disorder (see Table 3), controlling for demographic covariates. Compared to men, women with an anxiety disorder were significantly more likely to be diagnosed with MDD or BN over their lifetime, but were less likely to be diagnosed with a substance use disorder, ADHD, or IED. Furthermore, a significantly higher proportion of women (44.8%) with a lifetime incidence of an anxiety disorder met criteria for an additional anxiety disorder than men (34.2%; shown in Table 3). There were no significant interactions between gender and race in the prevalence of comorbid anxiety or mood disorders among individuals with a lifetime incidence of anxiety. There was a significant interaction between gender and race in BN, such that anxious Hispanic men were more likely to be diagnosed with the disorder (3 out of 83, or 3.6%) than anxious Hispanic women (3 out of 144, or 2.1%; OR [95% CI] = 59.10 [5.03 – 694.65], $p < 0.001$). Comorbid prevalence of the other eating disorders (AN and BED) was unchanged by the interaction term. It should be noted, however, that the N s in each gender by race category for the eating disorders were very small, and therefore any significant differences found in these tertiary analyses for this particular class of disorders should be interpreted with caution.

Also shown in Table 3, men with a past-year incidence of an anxiety disorder were more likely than women to be diagnosed with all substance use disorders, with the exception of drug dependence, which did not differ between the genders. There were no other significant differences between anxious women and men in the prevalence of comorbid disorders in the past year. In addition, there were no significant interactions between race and gender in rates of comorbid conditions among individuals with past-year anxiety.

Burden of Illness

The burden associated with anxiety disorders was assessed by examining the number of doctors' visits over the past year (for general medical issues or specifically for emotional/substance use issues) and the number of days missed from work over the past 30 days. Individuals with a past-year diagnosis of an anxiety disorder were compared to the non-anxious cohort within each gender. Anxious women reported significantly more visits to the ER, urgent care, and doctors compared to women without an anxiety disorder over the past year (1.04 visits/year vs. 0.59 visits/year, $F = 31.36$, $p < 0.001$) and missed significantly more days from work over the past 30 days (2.25 days/month vs. 1.27 days/month, $F = 21.47$, $p < 0.001$). There were no differences between anxious and non-anxious women in the number of visits to a professional for emotional/substance use issues in the past year. Similarly, anxious men reported significantly more visits to the ER, urgent care, and doctors than men without an anxiety disorder (0.71 visits/year vs. 0.49 visits/year, $F = 12.194$, $p < 0.001$). In addition, anxious men had more visits to a professional for emotional/substance use issues in the past year than non-anxious men (3.32 visits/year vs. 2.06 visits/year, $F = 4.76$, $p = 0.030$). There were no differences between men with and without anxiety over the past year in terms of number of days missed from work in the past month. Analysis of the effects of anxiety disorder status across genders showed that anxious women were more likely to seek services from the ER, urgent care, or doctors than anxious men (1.04 visits/month vs. 0.71 visits/month, $F = 5.61$, $p = 0.018$), but were equally likely to visit a professional for emotional/substance abuse issues in the past year, and missed a similar number of days from work in the past month.

Gender by race analyses revealed that anxious European American women are more affected by their illness than non-anxious European American women as suggested by significant group differences in the number of days missed from work (2.04 days/month vs. 1.06 days/month, $F = 18.46$, $p < 0.001$), number of ER/medical visits (1.02 visits/month vs.

0.53 visits/month, $F = 23.57, p < .001$) and number of visits to a specialist in emotional dysfunction/substance use (3.01 visits/month vs. 2.26 visits/month, $F = 5.80, p = 0.016$). In addition, anxious European American men had a significantly greater frequency of ER/medical visits than non-anxious European American men (0.73 visits/month vs. 0.48 visits/month, $F = 10.70, p = 0.001$). Similar results were observed when comparing anxious Hispanic women and non-anxious Hispanic women (1.14 visits/month vs. 0.59 visits/month, $F = 6.32, p = 0.012$).

Discussion

Consistent with previous epidemiological research, we found a preponderance of women among almost all anxiety disorders examined. One in three women met criteria for an anxiety disorder during her lifetime, compared to 22% of men. Overall, the lifetime and past year rates were approximately 1.5 to 2 times as common among women, with the greatest differences in PTSD, GAD, and PD. The pattern of gender differences across the anxiety disorders is consistent with data from the NCS survey of DSM-III-R disorders (Kessler et al., 1994), with some variation in the prevalence rates for certain disorders.

The lifetime prevalence of PTSD (8.5% for women vs. 3.4% for men) was slightly lower than the NCS rates (10.4% vs. 5%; Kessler et al., 1995) and lower than rates reported in the Detroit Area Study (17.7% vs. 9.8%; Breslau et al., 2004). The lower prevalence of PTSD in our study is somewhat surprising given evidence that DSM-IV criteria tend to yield higher estimates than DSM-III-R criteria, which were used in the comparison studies (Breslau & Kessler, 2001). The lifetime prevalence of PD (7.1% for women vs. 4% for men) was higher than reported in the NCS (5% vs. 2%) and the NESARC (6.7% vs. 3.3%; Grant et al., 2006), possibly due to the oversampling in CPES of ethnic minority populations who are known to endorse panic disorder in higher rates (Asnaani, Gutner, Hinton, & Hofmann, 2009). The lifetime prevalence of AG (3.1% for women vs. 1.7% for men) is considerably lower than rates reported by the NCS (7% vs. 3.5%), although the NCS data likely overestimated rates of AG by misclassifying individuals with specific phobia (Wittchen et al., 1998). Alternately, the lower rates found in the present study could reflect the use of updated methodologies. Indeed, the prevalence of AG was more in line with European epidemiological research (1.1% vs. 0.6%; Alonso et al., 2004) that also used DSM-IV criteria and the renewed version of the CIDI.

SAD was the only anxiety disorder that did not show significant gender differences in the lifetime rates. The prevalence rates for SAD in this study (10.3% for women vs. 8.7% for men) were lower than in previous reports (15.5% vs. 11.1%; Kessler et al., 1994), but the pattern of gender differences is similar. The past-year prevalence rate of SAD was significantly greater among women than men; these rates (6.5% for women vs. 4.8% for men) were also lower than previous reports (9.1% vs. 6.6%; Kessler et al., 1994). The lower rates found in the present study may be due to sample composition of the CPES, in that European Americans more often report anxiety symptoms than individuals from minority groups (e.g., Asnaani et al., 2010).

We found no gender effects in the mean age of onset for any of the DSM-IV anxiety disorders examined. This is consistent with previous epidemiological research on PD (Kessler, Chui et al., 2006), GAD (Angst et al., 2009; Vesga-López et al., 2008), AG, specific phobia, and SAD (Bourdon et al., 1988), but inconsistent with some clinical studies reporting an earlier onset of GAD in women than in men (Simon et al., 2006; Steiner et al., 2005; Yonkers et al., 2003). GAD may have a more continuous course among treatment seeking samples than among individuals in the community, who may have fewer comorbid disorders or lower symptom severity on average. In our data, the hazard rate ratio for anxiety

disorders in men and women did not differ significantly with age, suggesting that women are at greater risk for developing an anxiety disorder across the lifespan. From a developmental perspective, therefore, men and women appear to follow a similar trajectory in terms of the onset of anxiety disorders, but women assume this trajectory at a significantly greater rate.

The persistence of anxiety disorders also did not differ across genders. This has been a relatively neglected question in the epidemiologic literature on gender and anxiety even though gender role theories strongly imply that the maintenance of anxiety disorders should be greater for women than men (see Craske, 1999; McLean & Anderson, 2009). In PTSD, the available data suggest that women have a more chronic course than men (Breslau et al., 1998; Kessler et al., 1995). Epidemiological data on gender effects in the course of other anxiety disorders is not available, and data from clinical samples is mixed. For example, some studies showed that relapse rates for PD are higher in women than men (Yonkers et al., 1998; Yonkers et al., 2003), but other research has found no evidence that gender impacts the onset or remission of GAD, PD, or SAD (Yonkers et al., 2003). In this study, persistence was examined by comparing rates of past year disorder among those with a lifetime incidence of that disorder. The cross-sectional design of the CPES is not ideal for examining chronicity or age of onset and further consideration through longitudinal approaches is needed.

Regarding comorbid diagnoses, women with a lifetime diagnosis of an anxiety disorder were significantly more likely than men to be diagnosed with another anxiety disorder, BN, and MDD, all of which are disorders known to predominately affect women. High levels of comorbidity between anxiety and depressive disorders have been supported consistently in previous studies (e.g., Kessler et al., 1996, Kessler et al., 2005). The preponderance of women with both anxiety and depressive disorders hints at possible gender effects in higher-order risk factors such as negative affectivity, which is strongly linked to both disorders (Norton et al., 2005) and is more often observed among girls (Steiner et al., 2002) and adult women across cultures (Lynn & Martin, 1997; Costa et al., 2001). Furthermore, several studies have found that a similar risk factor, neuroticism, is more closely linked to anxiety and depression in women than men (Jardine et al., 1984; King et al., 1991). This suggests that latent gender-dimorphic temperamental factors play a key role in consequent gender differences both in anxiety and depression. Temperamental factors are thought to be further moderated by gender socialization processes that prescribe gender-specific expectations for the expression of anxiety and the acceptable means of coping with anxiety (see McLean & Anderson, 2009). In other words, genetic vulnerabilities gradually evolve into fully articulated traits through complex, bidirectional interactions with environmental factors. The nature of this genetic diathesis, including how gender affects heritability and expression, is not well understood (see Neale & Kendler, 1995, Roy et al., 1995).

In contrast to the pattern of comorbid internalizing disorders, men with a lifetime diagnosis of an anxiety disorder were significantly more likely to be diagnosed with comorbid ADHD, IED, and all of the substance use disorders. Previous reports have documented that IED and ADHD are each highly comorbid with anxiety disorders and more prevalent in men than women (IED: Kessler, Coccaro et al., 2006; ADHD: Gershon, 2002). Gender effects in substance use among individuals with anxiety disorders have been documented in previous epidemiological (Bolton et al., 2006; Robinson et al., 2009) and clinical studies (PD: Cox et al., 1993; PTSD: Tarrier & Sommerfield, 2003). Hallam (1978) proposed a self-medication hypothesis in which men cope with anxiety through substance use, whereas women cope through agoraphobic avoidance. This hypothesis has been supported by research showing that men are more likely to view alcohol as an effective strategy for coping with anxiety (Cox et al., 1993). Studies examining comorbidity either within episodes or across the lifetime should take into account the large gender effects in base-rates. Future research

should move beyond documenting differential patterns of comorbidity across genders to examine how gender affects the sequential relationships between anxiety and co-occurring disorders.

Our findings support the conclusion that anxiety disorders represent a significant source of disability, especially for women. Anxiety disorders were associated with more missed work days in the past month for women, but not men. This could be due to greater comorbidity of anxiety disorders among women, greater social acceptability of work absenteeism for women, or a combination of both. Both men and women with an anxiety disorder were more frequent users of all health care services assessed compared to those without an anxiety disorder. This is consistent with previous work demonstrating that anxiety disorders are associated with disproportionately high rates of medical health care service use (Wang et al., 2005). In fact, an analysis by Greenberg et al. (1999) showed that more than half of the cost linked to anxiety disorders is attributable to nonpsychiatric medical expenditures. The results of this study indicated that the majority of these costs are related to the morbidity of anxiety disorders in women.

Men, but not women, were more likely to visit a professional for either an emotional or substance use issue in the past year if they had an anxiety disorder, possibly due to differential access to appropriate services. In an analysis of the NCS-R data, Wang et al. (2005) found that although women with a DSM-IV disorder were more likely than men to seek health care treatment, among those who did seek treatment, women were less likely than men to receive mental health care services. As the authors suggested, primary care physicians may be more willing to manage women's mental health problems themselves, and are more inclined to refer men to a mental health specialist. Alternatively, it may be that an anxiety disorder motivates men to seek mental health care more so than women (Albizu-Garcia et al., 2001), possibly due to the relatively greater consistency of anxiety with a feminine gender role than a traditional masculine gender role (Bem, 1981; for a discussion see McLean & Anderson, 2009).

The results of this ethnically diverse epidemiological study showed that the preponderance of women with anxiety compared to men is relatively consistent across racial groups. However, race/ethnicity did affect the pattern of gender differences in a small number parameters examined, especially the burden of illness. The finding that anxious individuals endorsed greater dysfunction and greater service use than non-anxious individuals was only true European American men (number of ER/medical visits per month), European American women (all three indices of burden), and Hispanic women (number of ER/medical visits per month). Thus, the association between anxiety disorders and greater dysfunction and health care utilization is only true for certain groups, particularly European American women. These findings are consistent with a previous work showing that European Americans are more likely to seek treatment for an anxiety disorder than African Americans, even when controlling for SES-related variables and disorder severity (Keyes, et al., 2008). However, a unique contribution of our study is the finding that anxiety disorder status is related to burden of illness differently across men and women from different racial groups, with anxious European American women representing a particularly dysfunctional and high health care service-utilizing group.

In sum, the present study provides an overview of the gender effects in DSM-IV anxiety disorders from the largest, most ethnically representative survey of the U.S. population to date. Women were more likely than men to meet criteria for all anxiety disorders examined, with the exception of SAD, which was equally prevalent across genders. There were no differences between men and women with regard to the age of onset and the estimated chronicity of anxiety disorders. Significant gender effects were observed in the patterns of

comorbidity and in the dysfunction associated with having an anxiety disorder, which together underscore the importance of gender to the epidemiology of anxiety.

Limitations of this study include the cross-sectional design which precludes causal analysis of reported associations, and the reliance on retrospective assessment which may be error-prone due to recall bias. Our analysis has assumed that the WMH-CIDI criteria capture endorsement of the disorders studied with similar accuracy in men and women. However, reporting biases may not be equally distributed across genders; the experimental evidence that men tend to underreport anxiety relative to women is mixed (Egloff & Schmukle, 2004; McLean & Hope, 2010; Pierce & Kirkpatrick, 1992). However, we cannot rule out the possibility that the observed differences between men and women are somewhat influenced by gender-related differences in the conceptualization and reporting of symptoms. Finally, we did not assess whether professional treatment was sought for anxiety or for some other mental health problem, and we did not examine the type of treatment sought. We recommend for future research to explore strategies aimed at reducing the gender-linked economic costs and to examine the reasons why race/ethnicity moderate the association between gender and anxiety disorders.

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Table 1

Sociodemographic Characteristics of the Sample

Characteristic	Men (<i>n</i> = 8,550)	Women (<i>n</i> = 11,463)	χ^2 (df)	<i>p</i>
	%	%		
Race/ethnicity				
European American	40.4 _a	36.1 _b	136.08	0.00
African American	26.9 _a	34.4 _b		
Hispanic	18.7	17.6		
Asian	12.7 _a	10.5 _b		
Age (Years)				
18–29	24.2	23.4	20.61	0.00
30–44	34.3	33.6		
45–64	29.6	29.0		
65+	11.9 _a	14.1 _b		
Household Income (\$)				
0–19,999	22.0 _a	33.9 _b	359.19	0.00
20,000–34,999	17.5 _a	19.4		
35,000–69,999	31.9 _a	26.2 _b		
70,000+	28.6 _a	20.5 _b		
Education				
<High School	20.1	20.4	23.51	0.00
High School	29.3	30.0		
Some College	25.4	27.2		
College+	25.2 _a	22.4 _b		

Note: The table shows percentages with corresponding chi square (χ^2) values. Different subscripts indicate significant post-hoc group differences at $p < 0.05$.

Table 2
Lifetime and 12-month Prevalence Rates of Anxiety Disorders Across Gender

Disorder	12-month						Lifetime	
	Women		Men		OR [95% CI]		Women	Men
	%	%	%	%	%	%	%	
PD	4.5	2.2	1.69 [1.29, 2.22]*	7.1	4.0	1.70 [1.40, 2.07]*		
AG	1.9	1.1	ns	3.1	1.7	1.46 [1.07, 1.99]*		
GAD	4.1	2.1	1.74 [1.37, 2.22]*	7.7	4.1	1.83 [1.52, 2.18]*		
SAD	6.5	4.8	1.24 [1.04, 1.48]	10.3	8.7	ns		
Spec	12.0	5.5	2.27 [1.83, 2.81]*	16.1	9.0	1.96 [1.63, 2.36]*		
PTSD	4.3	1.7	2.57 [1.96, 3.36]*	8.5	3.4	2.69 [2.18, 3.31]*		
Any Anxiety	22.7	13.0	1.79 [1.53, 2.10]*	33.3	22.0	1.70 [1.48, 1.97]*		

Note: The table shows odds ratios and 95% confidence intervals in women compared to men; ns: not significant at $p < .05$. Covariates included in the regressions were SES, education level, age, and race.
* significant after a Bonferroni correction of $0.05/20 = 0.0025$. PD = panic disorder; AG = agoraphobia; GAD = generalized anxiety disorder; SAD = social anxiety disorder; Spec = specific phobia; PTSD = post-traumatic stress disorder.

Table 3

Lifetime and 12-Month Prevalence Rates of Comorbid Disorders Among Individuals Diagnosed with an Anxiety Disorder (Past Year $n = 1,703$; Lifetime $n = 2,626$)

Disorder	12-Month						Lifetime	
	Women		Men		OR [95% CI]		Women	Men
	%	%	%	%		%	%	
Mood Disorders								
MDD	23.7	19.1	<i>ns</i>	38.3	30.0	1.38 [1.11, 1.73]		
Dys	11.2	8.9	<i>ns</i>	12.9	10.6	<i>ns</i>		
BIP I	2.4	3.3	<i>ns</i>	3.0	3.3	<i>ns</i>		
BIP II	3.3	3.9	<i>ns</i>	3.4	3.2	<i>ns</i>		
Substance Use Disorders								
Alc Ab	4.3	8.2	0.54 [0.32, 0.91]	15.0	33.2	0.32 [0.25, 0.40]		
Alc Dep	2.9	4.8	0.52 [0.27, 0.99]	7.9	16.7	0.34 [0.25, 0.46]		
Drg Ab	1.4	4.5	0.24 [0.11, 0.52]	10.0	21.8	0.35 [0.26, 0.47]		
Drg Dep	1.0	2.2	<i>ns</i>	4.9	9.3	0.45 [0.31, 0.67]		
Eating Disorders								
AN	0.0	0.0	<i>ns</i>	0.6	0.2	<i>ns</i>		
BN	1.0	0.0	<i>ns</i>	2.2	0.5	5.49 [1.88, 16.04]		
BED	2.0	1.3	<i>ns</i>	2.7	2.3	<i>ns</i>		
Other								
ADHD	6.9	7.6	<i>ns</i>	7.8	11.1	0.47 [0.33, 0.68]		
IED	9.4	12.5	<i>ns</i>	11.6	19.3	0.48 [0.36, 0.64]		
Anxiety Disorder								
Any Additional	37.3	27.9	<i>ns</i>	44.8	34.2	1.41 [1.14, 1.75]		

Note: The table shows odds ratios and 95% confidence intervals in women compared to men; *ns*: not significant at $p < .05$. Covariates included in the regressions were SES, education level, age, and race. MDD = major depressive disorder; BIP I = bipolar I; BIP II = bipolar 2; AN = anorexia nervosa; BN = bulimia nervosa; BED = binge eating disorder; ADHD = attention deficit/hyperactivity disorder; IED = intermittent explosive disorder.