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Prevalence of neurasthenia, comorbidity, and association with impairment among a nationally representative sample of US adults

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Abstract

Purpose—There are no current psychiatric epidemiological studies examining prevalence estimates of neurasthenia across different racial and ethnic groups in the US. This study compares prevalence rates of *International Classification of Diseases* (ICD-10) lifetime and 12-month neurasthenia across racial/ethnic groups in the US (Asians, African Americans, Latinos, and non-Latino Whites) and by levels of acculturation. We examine comorbidity of neurasthenia with DSM-IV psychiatric disorders and the association between neurasthenia and impairment.

Methods—We used a pooled sample ($N = 10,118$) from two nationally representative household surveys of adults ages 18 years and older: the National Comorbidity Survey-Replication (NCS-R) and the National Latino and Asian American Study (NLAAS).

Results—Among the total sample, the adjusted prevalence rates of lifetime and 12-month neurasthenia with exclusionary criteria were 2.22 and 1.19%. The adjusted prevalence rates for lifetime and 12-month neurasthenia without exclusionary criteria were 4.89 and 2.80%. There were significant racial/ethnic group differences in prevalence for both lifetime and past-year neurasthenia, with Asians reporting significantly lower prevalence of neurasthenia than their non-Latino White counterparts. Less acculturated individuals were at a decreased risk for lifetime and past-year neurasthenia. Lifetime neurasthenia was associated with increased odds of meeting lifetime criteria for any depressive, any anxiety, and any substance use disorder. Respondents with

lifetime or past-year neurasthenia had significantly greater levels of impairment compared to those without neurasthenia.

Conclusion—Neurasthenia is a prevalent condition deserving further research attention given its comorbidity with other psychiatric disorders and its association with functional impairment.

Keywords

Neurasthenia; Impairment; Comorbidity; Psychiatric disorders; Acculturation

Introduction

The nosological criteria for neurasthenia have been arduously debated within the psychiatric epidemiological literature [1–3], without arriving at a consensus on whether it is an important diagnostic entity [4, 5] or agreement on its clinical significance [6–8]. Presently the *Diagnostic and Statistical Manual of Mental Disorders*, 4th edition (DSM-IV) [9] classifies neurasthenia as a subtype of undifferentiated somatoform disorders [6], whereas the *International Classification of Disease* [ICD-10; 10] currently considers neurasthenia as a separate disorder [11]. According to the World Health Organization (WHO), the reported prevalence of “pure” neurasthenia, as defined by the ICD-10, is 1.7% [11].

Although a number of studies have examined neurasthenia across different cultures [12], most studies have focused exclusively on Asian populations [13–16] or populations outside of the US [6, 17–22], with a few exceptions. For example, Zheng and colleagues [16] in their epidemiologic study of Chinese Americans in Los Angeles, California, found the prevalence rate of ICD-10 past-year neurasthenia to be 3.61%, a rate higher than that found for depression or anxiety disorders. Although this study provided preliminary evidence for the existence of neurasthenia among Chinese Americans in the US, a common drawback of the study was the absence of comparisons with other racial/ethnic groups. Neurasthenia, as with many other diagnoses, is argued to be a socially shaped illness [23]. Examining the racial/ethnic patterning of neurasthenia within the US context—where growing numbers of Asian and other racial/ethnic minority and non-minority groups reside, and where the construct has been thought to have “disappeared” [4, 23]—presents an opportunity to identify whether neurasthenia, as defined by the ICD-10, is commonly found across racial/ethnic groups that are known to differ on a number of sociocultural factors.

The study of psychiatric disorders among immigrants has burgeoned as an important area of research given the recent influx of immigrants across a number of nations, and because the migratory experience and settlement in a new cultural context may place immigrants at an increased risk of psychiatric morbidity. In the US, where a large and growing number of immigrants reside, the immigrant context becomes important for explaining possible differences in prevalence of neurasthenia, since culture may shape the presentation of symptoms and course of illness [24]. Thus, at a time when unprecedented transnational migration has emerged as having significant implications for population health [25], examining the extent to which proxies of acculturation are associated with disorders beyond those most commonly examined (e.g., depression, anxiety), remains a significant yet understudied area of scientific inquiry.

High rates of comorbidity have been found among many psychiatric disorders, although prior studies have shown that neurasthenia, compared to other ICD-10 disorders, presents the highest percentage of comorbidity (i.e., 71%) [12]. Neurasthenia tends to co-occur primarily with depressive and anxiety disorders [11, 12]. Thus, the ICD-10 precludes a diagnosis of neurasthenia in the presence of affective disorders, panic disorder, or generalized anxiety disorder [6, 8]. Moreover, scholars such as Schwartz [26] have argued that neurasthenia differs from depression, in that neurasthenia causes distress on its own. For example, Ormel et al. [12] found that neurasthenia was one of the psychiatric disorders most strongly associated with disability, with 53% of individuals with neurasthenia reporting occupational role dysfunction, 61% reporting physical disability, and an average of 8.5 disability days in the past month. However, despite neurasthenia's chronic nature and association with impairment [6, 11, 19], very few studies have gone beyond examining its prevalence and comorbidity.

In this paper, we extend prior research on “culture-bound syndromes” by first examining the prevalence of ICD-10 neurasthenia across a population-based sample of different racial and ethnic groups in the US, and whether prevalence rates differ across racial/ethnic groups. Second, we pay particular attention to sociocultural context by investigating the association of neurasthenia with different measures of acculturation. Third, given neurasthenia's comorbid nature, we evaluate its co-occurrence with DSM-IV psychiatric disorders. Lastly, we examine the association between lifetime and 12-month neurasthenia and functional impairment.

Methods

Sample

Data were drawn from two nationally representative household surveys: the National Comorbidity Survey-Replication (NCS-R) [27] and the National Latino and Asian American Study (NLAAS) [28]. These two national surveys are part of the Collaborative Psychiatric Epidemiology Surveys (CPES), which consists of three combined nationally representative surveys (i.e., National Comorbidity Survey-Replication, National Study of American Life, and the National Latino and Asian American Study). The NSAL is not included in this analysis since neurasthenia was not assessed in their diagnostic battery. The sample design of these studies is only briefly described in this paper (for more details see [29] and [30]). In brief, a four-stage nationally area probability sample was employed for both studies: (1) primary stage sampling of US Metropolitan Statistical Areas (MSAs) and counties; (2) area segments; (3) housing units; and (4) eligible respondents. The two studies share a common sampling strategy, allowing combining of the datasets as though they were a single nationally representative study [29].

The NCS-R is a nationally representative sample of English-speaking adults aged 18 or older living in the non-institutionalized civilian household population (including students living in campus group housing who had permanent household addresses) of the coterminous United States (See [27] for a detailed description of this survey). The final weighted response rate was 70.9%. The NLAAS is a nationally stratified area probability sample of non-institutionalized Asian and Latino persons, 18 years of age and older living in

the coterminous United States (See [28] for a detailed description of this survey). The overall weighted response rate for main respondents in the NLAAS was 75.7% (77.6% for Latinos, 69% for Asians).

Procedure

Data collection for the NCS-R took place between 2001 and 2003, whereas data for the NLAAS were collected between 2002 and 2003. The primary mode of data collection for both surveys was by in-person interviewing at the respondent's home. Although the data collection mode was the same across both studies, the NLAAS differed in respect to the additional languages in which the interviews were conducted for those respondents who chose to be interviewed in a language other than in English (i.e., Spanish, Vietnamese, Tagalog, and Chinese; see [31] for more details on the development of the NLAAS instruments). The University of Michigan, Harvard School of Medicine, the Cambridge Health Alliance, and the University of Washington's Institutional Review Board Committees approved all recruitment, consent, and interviewing procedures for both studies.

Measures

Psychiatric disorders—Psychiatric disorders were assessed using the *World Mental Health Composite International Diagnostic Interview* (WMH-CIDI) [32]. The WMH-CIDI is a fully-structured psychiatric diagnostic instrument that is used cross-culturally. It allows for disorders based on the ICD-10 [10]. The ICD-10 was used to evaluate prevalence rates of neurasthenia. We report both past-year and lifetime prevalence rates of neurasthenia. Criteria for meeting a diagnosis of neurasthenia using the ICD-10 include: (a) either, persistent and distressing complaints of feelings of exhaustion after minor mental effort or persistent and distressing complaints of feelings of fatigue after minor physical effort; (b) accompanied by at least one of the following symptoms: muscular aches or pains; dizziness; tension headaches; sleep disturbance; inability to relax; and irritability; (c) inability to recover through rest, relaxation or entertainment; (d) duration is at least 3 months; and (e) the disorder does not occur in the presence of organic emotionally labile disorder, postencephalitic syndrome, postconcussional syndrome, mood (affective disorders), panic disorder, or generalized anxiety disorder. Given that neurasthenia has shown to have high comorbidity [19], especially with anxiety and depressive disorders [6, 33], the present study assessed the co-occurrence of neurasthenia with three diagnostic categories: depressive disorders (dysthymia, major depressive disorder), anxiety disorders (agoraphobia, social phobia, generalized anxiety disorder, posttraumatic stress disorder, panic disorder), as well as substance use disorders (alcohol abuse, alcohol dependence, drug abuse, and drug dependence). We used past-year and lifetime comorbidity of neurasthenia with the 12-month and lifetime criteria of the aforementioned psychiatric disorders.

Acculturation—Measures used to assess acculturation included the following variables. *Generation status* was coded as, first-generation (respondent was born in a foreign country); second-generation (respondent is US-born with one parent being US-born); or third-generation (respondent and his/her both parents are US-born). *English proficiency* was assessed by asking the respondent to rank his or her ability to speak, read, and write in the English language. The participant responded to these questions as either "Poor", "Fair",

“Good”, or “Excellent.” Responses to these items were summed and then recoded into two categories: (1) Poor/Fair and (2) Good/Excellent. *Language of interview*: Respondents were allowed to have their interview conducted in any of the following languages: English, Spanish, Tagalog, Vietnamese, Chinese (Mandarin or Cantonese). Given the numerous languages present between the NLAAS and NCS-R together, we dichotomized them into “English” language and “non-English” language.

Impairment—To measure disability and functioning, we used the World Health Organization Disability Assessment Schedule (WHODAS II), a standardized questionnaire grounded within the WHO’s International Classification of Functioning, Disability and Health (WHO-ICF) [34]. The WHODAS comprises 36 items falling into five domains: understanding-communicating (cognition), moving-getting around (mobility), self-care, getting along with others (social functioning), and life activities (role functioning). We also assessed days out of role due to neurasthenia. Five WHODAS domain scores are obtained by summing the items within each domain, expressed in a percentage from 0 (best status) to 100 (worst), and monthly days out of role due to neurasthenia is expressed from 0 (best) to 30 (worst). A summary score can also be obtained by summing all items on the measure. For purposes of our study, we focus on the five WHODAS domain scores and days out of role as separate indicators of functioning.

Data analysis

Cross-tabulations were conducted to obtain the distribution of sociodemographic characteristics and to obtain lifetime and past-year prevalence rates of neurasthenia (with and without exclusion criteria) for the total sample and by race/ethnicity and by acculturation measures. In all further analyses, we do not break the sample down by race/ethnicity given the small sample sizes. Thus, all other analyses employed the pooled sample. Multivariable logistic regressions were also conducted to examine the association of neurasthenia with acculturation measures, adjusting for sex and age. Next, we report the co-occurring rates of DSM-IV psychiatric disorders for those with lifetime and past-year neurasthenia (without exclusion criteria) and for those without diagnosis of neurasthenia. Multivariable logistic regressions examining the comorbidity odds for neurasthenia with mental disorders were also conducted, adjusting for sociodemographic factors. Lastly, we examined whether there were differences on impairment domains among those meeting and not meeting lifetime neurasthenia criteria, as well as for those meeting and not meeting past-year neurasthenia criteria. All inferential procedures accounted for the complex survey design and were conducted using STATA statistical software version 10.1 [35]. Survey weights were used for all estimation procedures.

Results

Sociodemographic characteristics

Table 1 examines sociodemographic characteristics among the total sample and across racial/ethnic groups. In general, most survey respondents were married (57.94%), employed (64.37%), and between the ages 18 and 49 (62.45%). Over three-fourths of the sample had a high school degree or higher (82.17%). There were significant differences across racial and

ethnic groups on all sociodemographic characteristics. Specifically, Latinos had the highest proportion of individuals in the 18–34 years age bracket. Further, Latino and African American respondents had a greater proportion of individuals with 11 years of education or lower, whereas Asians reported higher levels of education. Likewise, Latinos and African Americans had lower greater proportions of respondents in the \$0–14,999 or \$15,000–34,999 income brackets, whereas Asians had higher proportion of respondents in the \$75,000 income bracket. Moreover, Whites had the lowest proportion of respondents in the never married category, whereas African Americans reported had lower proportions of persons who were married. Finally, African American respondents had lower proportions of persons who were employed.

Past-year and lifetime neurasthenia prevalence estimates

Table 2 shows the unadjusted and adjusted prevalence rates of lifetime and past-year neurasthenia (with and without exclusionary criteria) for the total sample and by racial/ethnic group. Among the total sample, the age and gender adjusted prevalence rates for lifetime neurasthenia and past 12-month neurasthenia with exclusionary criteria were 2.22 and 1.19%, respectively. The age and gender adjusted prevalence rates for lifetime neurasthenia and past 12-month neurasthenia without exclusionary criteria were 4.89 and 2.80%, respectively. There was a significant difference across the racial/ethnic groups in prevalence rate of lifetime and past-year neurasthenia with and without exclusionary criteria in the adjusted models. Post hoc analyses applying the Benjamini and Hochberg False Discovery Rate for multiple testing correction revealed a statistically significant difference in unadjusted and adjusted prevalence rates of lifetime neurasthenia (with and without exclusionary criteria) between non-Latino Whites and Asians, with Whites having higher prevalence rates than Asians. Likewise, Asians differed significantly from non-Latino Whites on unadjusted and adjusted past 12-month neurasthenia without exclusion criteria.

Neurasthenia and acculturation

Table 3 reports the prevalence rate of lifetime and past-12 month neurasthenia with and without exclusionary criteria by acculturation measures for the total sample. Multivariable logistic regressions were also conducted to report the associations between acculturation measures and lifetime and past-year neurasthenia, adjusting for age and gender. Results showed that first-generation (i.e., foreign-born) respondents were significantly less likely to meet criteria for lifetime and past-year neurasthenia (using exclusionary criteria) when compared to third-generation respondents. Moreover, those in the “Good/Excellent” English proficiency category compared to those in the “Poor/Fair” category, and those whose interview was in a non-English language compared to English interview respondents, were significantly more likely to meet criteria for lifetime and past-year neurasthenia (with and without exclusionary criteria).

Neurasthenia with co-occurring psychiatric disorders

Table 4 shows the co-occurring prevalence rates of DSM-IV psychiatric disorders for those meeting lifetime and past-year criteria for neurasthenia (without exclusion criteria), and those not meeting criteria for neurasthenia among the pooled sample. Among the aggregate psychiatric disorders, lifetime neurasthenia co-occurred highest with any lifetime depressive

disorder (58.6%) and any lifetime anxiety disorder (58.0%). Past-year neurasthenia, on the other hand, co-occurred highest with any past-year anxiety disorder (51.7%) and any past-year depressive disorder (44.2%). Table 4 also shows the adjusted effects of lifetime and past-year neurasthenia on DSM-IV lifetime and past-year psychiatric disorders. Results showed that those with lifetime neurasthenia were significantly more likely to meet criteria for any lifetime depressive disorder, any lifetime anxiety disorder, and any lifetime substance disorder. Respondents meeting criteria for past-year neurasthenia were significantly more likely to meet criteria for any past-year depressive disorder and any past-year anxiety disorder.

Neurasthenia and impairment

Table 5 reports the association between lifetime and past-year neurasthenia (with exclusionary criteria) and functional impairment among the total sample. Results showed that those meeting criteria for lifetime and past-year neurasthenia had significantly greater levels of impairment on all five WHODAS domains than those not meeting criteria for lifetime or past 12-month neurasthenia. Neurasthenia was most strongly associated with role functioning, with respondents meeting criteria for lifetime and past-year criteria for neurasthenia having a mean percentage score of 33.94 and 49.38 (out of 100), respectively, for severity of impairment on this domain. Significant differences were noted between those meeting and those not meeting criteria for lifetime and past-year neurasthenia across all five WHODAS domains. No significant differences were found for days out of role due to neurasthenia.

Discussion

The vast majority of studies examining neurasthenia have included pooled samples across countries [12], chronic pain patients [5], and patients who had already received earlier evaluation of having greater levels of neurasthenic symptoms [22], with most of these studies having been conducted outside of the US [21, 36, 37]. Consequently, it is difficult to compare estimates from prior studies with ours. Nonetheless, we find that neurasthenia is prevalent among persons in the US. Although we found a relatively lower prevalence of neurasthenia among our total sample when compared to other studies [16], we find a higher prevalence compared to that found for the US city included in the WHO study (i.e., >1% in Seattle) [11]. Besides cross-cultural considerations (which we discuss in later sections), these discrepancies might be explained by significant methodological and sampling differences across studies.

Racial/ethnic patterning of neurasthenia

Although seemingly paradoxical, non-Latino Whites evidenced the highest prevalence of lifetime neurasthenia (with and without exclusion criteria) compared to Asians, whom have been more likely to be diagnosed with neurasthenia [37]. Neither Latinos nor African Americans differed from non-Latino Whites on adjusted lifetime neurasthenia with exclusionary criteria. Several potential explanations could account for why our findings are in contrast to what would be expected based on prior studies. First, the ICD-10 neurasthenia diagnostic criteria's of prominent fatigue or weakness after mental or minimal physical

effort is not parallel to that found in the *Chinese Classification of Mental Disorders*, 2nd Edition (CCMD-2), the diagnostic system commonly used with populations in China/Asia to diagnose neurasthenia and which does not require fatigue or weakness to be core symptoms for diagnosis [38, 39]. As such, Lee [38] argues that fatigue, as represented in the ICD-10, is a Western conceptualization of neurasthenia that may lead to committing a category fallacy, given that such a conceptualization may misrepresent the variegated symptoms found among Chinese persons with neurasthenia. This may possibly account for the lower prevalence of neurasthenia among Asians in our study.

At the same time, an alternative explanation for the lower prevalence of neurasthenia found among Asians could be tied to the health selectivity of migrants [40]. For example, migrants from more distant countries—as in the case of Asian immigrants compared to Latino immigrants—should exhibit healthier profiles. According to the argument proposed by Jasso et al. [40] on initial health selectivity, migrants from more distant places (e.g., Asians migrating to the US) should be healthier than those who stay behind in their home countries, given the costs (including both monetary and non-monetary factors) associated with migrating long distances. This argument has also been used to explain the lower prevalence of other psychiatric disorders (e.g., depressive and anxiety disorders) found among Asians in the CPES and other US survey samples (e.g., National Epidemiological Survey of Alcoholism and Related Conditions) when compared to Whites and other ethnic minority groups [41–43]. Further, although positive health selection can also be noted among Latino immigrants, the magnitude of it is smaller than that for Asians [40]. To this end, our data suggest that the health selection effect for Asians may also partially account for the lower prevalence of neurasthenia noted among this group in our sample. More generally, differences across racial/ethnic groups, particularly those between non-Latino Whites and Asians, may be explained by factors such as linguistically-mediated nuances in terms of the way in which the illness experience is interpreted by racial/ethnic groups, recall bias, and response bias (i.e., denial of symptoms).

Acculturation and neurasthenia

We found that less acculturated respondents (i.e., foreign-born persons, non-English language interview respondents, and those who self-reported “poor/fair” English language proficiency) were at a decreased risk for meeting diagnosis of lifetime and past-year neurasthenia when compared to their more acculturated counterparts. Our findings are in parallel with those of Guarnaccia and colleagues’ [44], which found that among Latinos in the US, markers of greater acculturation (e.g., US-born, greater proportion of life spent in the US, mostly English-speaking) were associated with greater reports of *ataque de nervios* (“attack of nerves”), a DSM-IV designated culture-bound syndrome [9]. Generally, however, our findings corroborate with the “immigrant paradox” typically found in the psychiatric epidemiologic literature, which finds that among all racial/ethnic groups, less acculturated individuals have decreased odds of psychiatric disorders [45]. In the US, several scholars have noted that these “paradoxical” findings may be partly explained by greater exposure to social vulnerabilities (e.g., discrimination) experienced by those who have lived in the US for a longer period of time [44–46].

Comorbidity patterns of neurasthenia

Canino and Alegría [47] note that despite that, prevalence of many common psychiatric disorders vary across cultures, particularly due to the types of instruments and definitions used to assess them, there exist very little variations across cultures about comorbid patterns. We found this to be the case in our study; that is, despite differences in prevalence rates, substantial comorbidity of neurasthenia with DSM-IV psychiatric disorders was noted. Our findings are consistent with those from the WHO study [11], which not only found neurasthenia to co-occur highly with depressive and anxiety disorders, but also with harmful alcohol use. Indeed, chronic fatigue, a core symptom of ICD-10 neurasthenia, as well as irritability, inability to relax, and sleeping problems, are central features of mood and anxiety disorders [9, 38]. Thus, not surprisingly, we find a higher prevalence of neurasthenia when we allow those meeting DSM-IV Axis I disorders to be included if they also met ICD-10 criteria for neurasthenia, suggesting that the exclusion criteria might underestimate the actual prevalence of neurasthenia. As such, given the typical overlap found between neurasthenia and depressive and anxiety disorders [6, 33], several studies tried to differentiate neurasthenia from them [1, 5].

Functional impairment

Our finding that meeting criteria for neurasthenia (either lifetime or past-year) is associated with impairment is supported by prior studies, which show persons meeting diagnosis for neurasthenia present high levels of impairment across different domains [6, 48]. Paralleling Merikangas and Angsts' [6] conclusions, our data suggest that neurasthenia can inhibit routine activities, such that role functioning and mobility were the two most common impairment domains associated with neurasthenia. It is also not surprising that we found neurasthenia was strongly associated with impairment, given the high rate of comorbidity found among our sample, for which prior scholars have suggested partly account for the increasing rates of disability [12, 19]. Although we cannot ascertain whether the other comorbid conditions accounted for impairment in our study, our findings suggest that further study of the interrelationship between neurasthenia, comorbidity, and impairment is warranted.

Limitations to the study

As with any research study, ours is not without limitations. First, in our study we only included ICD-10 neurasthenia, which limits our ability to compare prevalence estimates using different diagnostic systems. Despite the applicability of the ICD-10 for cross-cultural use, heterogeneity in manifestation of particular symptoms can lead to differences in prevalence rates across cultures; consequently, making comparisons more difficult [4, 14]. Although outside of the scope of our study, we did not examine the proportion of ICD-10 neurasthenia symptoms endorsed by race/ethnicity. This may have provided further insight as to whether the higher prevalence noted among Whites compared to Asians was partly due to greater likelihood of Whites endorsing persistent fatigue more so than Asians. The implications are that key features of particular psychiatric disorders might be more prevalent in some groups than in others, although this does not necessarily symbolize greater prevalence of that disorder [47]. Likewise, further research is needed to examine the

concordance of neurasthenia spectrum disorders (e.g., ICD-10 neurasthenia, CFS, CCMD-2 and CCMD-3 neurasthenia) across non-clinical, population-based samples across cultural contexts [cf. 21, 23]. Findings regarding Latinos and African Americans should also be taken with caution, given that ICD-10 neurasthenia has not been validated among these groups.

Additionally, although prior research employing Asian samples has mostly focused on Chinese persons, in our study, we did not breakdown the Asian sample, possibly biasing our estimates. However, this did not appear to be the case, since we re-analyzed the data stratified by Asian subgroup and found prevalence estimates in our study did not appear to be biased (data not shown). Moreover, although our study is one of the few to examine neurasthenia's association with acculturation, we employed "crude" measures of acculturation (i.e., born in the US, English language proficiency), which do not necessarily capture the multidimensional and complex process that is acculturation [49]. Nonetheless, the measures used have shown high internal consistency with other acculturation measures, and have also been widely used in other epidemiological surveys [cf. 49].

Implications and conclusion

The difference in prevalence rates of neurasthenia between racial/ethnic groups presents a couple of challenges. First, determining whether differences across and between racial/ethnic groups reflect "real" or artefactual factors remains an area needing further investigation [23]. For example, Kawanishi [50] warns against making any firm conclusions about specific pathology being more prevalent in one culture than another, since prevalence of certain mental disorders may be dependent on the social group, cultural context, and diagnostic system used [4, 23, 38]. Likewise, as Lee [51] argued, the "disappearance" of culture-bound syndromes is related to changing sociocultural conditions, including economic and political factors and changes in managed care and pharmaceutical forces, to name a few. Indeed, chronic fatigue syndrome (CFS), also a controversial illness which has been argued to be a variant of neurasthenia [4, 21] has become increasingly diagnosed in the US [52, 53], whereas neurasthenia is virtually no longer diagnosed in the US context [51].

Furthermore, comorbidity of neurasthenia with other psychiatric disorders may present a challenge for both clinical practice and health services research. For example, recognition of neurasthenia by primary care physicians is typically greater when there is comorbidity with other psychiatric disorders [11]; yet generally, when patients present with psychiatric comorbidity it is often associated with a significantly more difficult patient-doctor relation [54], particularly when presenting with somatoform disorders [55]. Interestingly, data from the WHO study [11] showed that recognition of pure and comorbid neurasthenia was very high in US primary care sites (i.e., in Seattle; 83 and 74.60%, respectively) compared to other centers worldwide, although presently in the US, neurasthenia has virtually disappeared from clinical practice [11]. This has implications for diagnosis and treatment of individuals who may present with symptoms of neurasthenia, but may otherwise be misdiagnosed as having depression, anxiety, or CFS. Lastly, there is no question that neurasthenia, similar to common psychiatric disorders, presents a public health concern,

since persons with neurasthenia seem to be at an increased risk of not being able to function optimally in society.

Overall, our findings make an important contribution to the psychiatric epidemiology literature, and may have broader implications for health services research. Significantly, our study is timely given the attention being paid to the classification of somatoform disorders and comorbidity, as well as on the role of culture and social factors on the epidemiology of such disorders [23, 56–58].

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Table 1
Distribution of sociodemographic characteristics for the total sample and by racial and ethnic groups (Weighted)

	Total sample (n = 10,118)		non-Latino Whites (n = 4,180)		Latinos (n = 3,081)		Asians (n = 2,178)		African Americans (n = 679)		p-value
	n	%	n	%	n	%	n	%	n	%	
Sex											0.0100
Male	4,426	47.55	1,802	47.59	1,340	51.67	1,035	47.38	249	42.97	
Female	5,692	52.45	2,378	52.41	1,741	48.33	1,143	52.62	430	57.03	
Age (years)											<0.0001
18–34	3,727	31.90	1,293	27.64	1,343	48.50	838	39.56	253	38.62	
35–49	3,269	30.55	1,333	30.21	962	30.36	746	32.60	228	32.09	
50–64	2,033	20.87	942	22.71	523	13.33	428	17.89	140	18.15	
65 or older	1,089	16.69	612	19.43	253	7.80	166	9.94	58	11.14	
Education (years)											<0.0001
11 or less	2,103	17.83	514	13.24	1,127	42.83	318	14.73	144	22.01	
12	2,632	31.08	1,238	31.69	796	27.29	380	17.26	218	36.62	
13–15	2,754	27.58	1,271	28.86	715	19.84	554	25.31	214	28.52	
16 or more	2,629	23.51	1,157	26.22	443	10.03	926	42.71	103	12.85	
Marital status											<0.0001
Married	6,202	57.94	2,521	59.92	1,893	62.27	1,520	68.86	268	36.18	
W/D/S	1,826	19.90	900	20.72	563	14.71	190	8.57	173	24.67	
Never married	2,090	22.16	759	19.36	625	23.02	468	22.57	238	39.15	
Employment status											0.0151
Employed	6,583	64.37	2,795	64.83	1,928	64.16	1,451	64.96	409	61.41	
Unemployed	602	5.25	216	5.15	219	7.65	146	5.98	21	3.03	
Out of labor force	2,921	30.37	1,162	30.02	933	28.19	581	29.06	245	35.56	
Income											<0.0001
\$0–14,999	1,910	17.02	519	13.28	796	25.89	388	17.85	207	31.35	
\$15,000–34,999	2,168	21.13	845	19.89	834	28.77	320	13.17	169	24.12	
\$35,000–74,999	3,153	33.31	1,516	35.72	860	27.34	592	28.11	185	26.22	
\$75,000 or more	2,887	28.54	1,300	31.11	591	18.00	878	40.87	118	18.31	
W/D/S Widowed/divorced/or separated											

The ρ value is from Rao-Scott statistic for the Pearson Chi-square test for contingency table

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Table 2

Lifetime and past 12-month neurasthenia with and without exclusion criteria for total sample and by race and ethnicity

	Total sample % (SE)	non-Latino Whites % (SE)	Latinos % (SE)	Asians % (SE)	African Americans % (SE)	p-value
Unadjusted						
With exclusion criteria ^A						
Lifetime ICD Neurasthenia	2.21 (0.20)	2.35 (0.28) ^a	1.69 (0.28)	1.20 (0.33) ^b	2.23 (0.74)	*
Past 12-month ICD Neurasthenia	1.20 (0.16)	1.31 (0.20)	0.93 (0.23)	0.57 (0.23)	1.02 (0.57)	ns
Without exclusion criteria						
Lifetime ICD Neurasthenia	4.91 (0.37)	5.37 (0.50) ^a	3.26 (0.38) ^b	2.29 (0.38) ^b	4.73 (1.00)	***
Past 12-month ICD Neurasthenia	2.82 (0.23)	2.97 (0.30) ^a	2.18 (0.29)	1.19 (0.33) ^b	3.19 (0.76)	***
Age and gender adjusted						
With exclusion criteria ^A						
Lifetime ICD Neurasthenia	2.22 (0.19)	2.32 (0.27) ^a	1.89 (0.31)	1.16 (0.31) ^b	2.37 (0.76)	*
Past 12-month ICD Neurasthenia	1.19 (0.15)	1.31 (0.20)	1.06 (0.28)	0.50 (0.19)	0.88 (0.45)	*
Without exclusion criteria						
Lifetime ICD Neurasthenia	4.89 (0.37)	5.33 (0.50) ^a	3.59 (0.48) ^b	2.16 (0.36) ^b	4.52 (1.00)	***
Past 12-month ICD Neurasthenia	2.80 (0.23)	2.97 (0.29) ^a	2.42 (0.34)	1.05 (0.27) ^b	2.75 (0.65)	***

ns non-significant

P value is from omnibus test. A different superscript denotes a significant difference from Whites.

 $p < 0.001$;*
 $p < 0.05$ ^ADiagnosis of neurasthenia precludes presence of affective disorders, panic disorder, or generalized anxiety disorder

Adjusted associations of lifetime and 12-month neurasthenia with and without exclusion criteria with acculturation measures

Table 3

	Lifetime ICD neurasthenia				Past 12-month ICD neurasthenia			
	Mean %	SE	OR	95% CI	Mean %	SE	OR	95% CI
With exclusion criteria ^a								
Generation status								
1st Generation	1.12	0.28	0.47 [*]	(0.26–0.84)	0.55	0.15	0.39 ^{**}	(0.20–0.74)
2nd Generation	2.27	0.54	1.12	(0.66–1.89)	0.83	0.29	0.70	(0.34–1.46)
3rd Generation	2.38	0.26	1.00		1.36	0.19	1.00	
<i>p</i> value	<0.05				<0.01			
English language proficiency								
Poor/fair	0.89	0.28	1.00		0.48	0.18	1.00	
Good/excellent	2.29	0.21	2.60 ^{**}	(1.35–5.03)	1.24	0.16	2.62 [*]	(1.17–5.84)
<i>p</i> value	<0.001				<0.01			
Language of interview								
English	2.29	0.21	1.00		1.24	0.17	1.00	
Non-English	1.04	0.28	0.46 ^{**}	(0.26–0.81)	0.59	0.20	0.46 [*]	(0.22–0.96)
<i>p</i> value	<0.001				<0.05			
Without exclusion criteria								
Generation status								
1st Generation	2.50	0.36	0.45 ^{***}	(0.30–0.67)	1.43	0.25	0.43 ^{***}	(0.28–0.67)
2nd Generation	4.32	0.58	0.96	(0.71–1.31)	1.90	0.33	0.71	(0.51–0.99)
3rd Generations	5.37	0.47	1.00		3.16	0.28	1.00	
<i>p</i> value	<0.001				<0.001			
English language proficiency								
Poor/fair	2.07	0.46	1.00		1.30	0.30	1.00	
Good/excellent	5.09	0.39	2.56 ^{***}	(1.58–4.14)	2.92	0.24	2.32 ^{***}	(1.43–3.77)
<i>p</i> value	<0.001				<0.001			
Language of interview								
English	5.09	0.39	1.00		2.91	0.24	1.00	

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Lifetime ICD neurasthenia				Past 12-month ICD neurasthenia			
Mean %	SE	OR	95% CI	Mean %	SE	OR	95% CI
2.27	0.52	0.44 ^{***}	(0.27–0.72)	1.56	0.35	0.52 ^{**}	(0.32–0.84)
<i>p</i> value				<0.001			

p < 0.001;

**
p < 0.01;

*
p < 0.05. Odds ratio adjusted by age and sex

^aDiagnosis of neurasthenia precludes presence of affective disorders, panic disorder, or generalized anxiety disorder

Table 4

Lifetime and 12-month neurasthenia without exclusion criteria, no-neurasthenia, and co-occurring psychiatric disorders among total sample

	Lifetime ICD neurasthenia			Without lifetime neurasthenia			Past 12-month ICD neurasthenia			Without past 12-month neurasthenia		
	%	SE	OR	(95% CI)	%		%	SE	OR	(95% CI)	%	
Any depressive disorder	58.59	3.16	5.34***	(4.13–6.92)	17.00		44.17	3.38	6.30***	(4.54–8.74)	7.40	
Major depressive disorder	57.82	3.12	5.33***	(4.13–6.87)	16.68		43.75	3.38	6.47***	(4.71–8.89)	7.18	
Dysthymia	20.45	2.44	5.66***	(4.10–7.82)	3.06		17.67	2.28	6.15***	(4.11–9.21)	1.88	
Any anxiety disorder	57.99	2.92	4.16***	(3.10–5.58)	20.04		51.70	3.46	5.55***	(3.78–8.14)	11.79	
Panic disorder	15.87	1.96	3.31***	(2.32–4.71)	3.81		16.55	2.89	5.27***	(3.04–9.14)	2.14	
Agoraphobia without panic	9.87	1.52	3.88***	(2.60–5.77)	1.99		11.73	2.47	7.34***	(4.19–12.85)	1.15	
Social phobia	29.24	2.39	2.83***	(2.23–3.58)	10.74		24.02	3.05	3.35***	(2.30–4.87)	6.28	
Posttraumatic stress disorder	26.24	2.59	4.07***	(2.71–6.11)	5.41		21.92	2.65	5.48***	(3.65–8.22)	2.81	
Generalized anxiety disorder	29.67	3.18	4.42***	(3.14–6.22)	6.37		24.74	2.62	5.91***	(4.32–8.07)	3.28	
Any substance disorder	23.72	2.39	2.13***	(1.58–2.87)	13.18		3.55	1.40	1.13	(0.48–2.66)	3.46	
Alcohol abuse	20.91	2.15	2.09***	(1.53–2.85)	11.94		2.84	1.25	1.17	(0.49–2.77)	2.70	
Alcohol dependence	10.70	1.53	2.24***	(1.64–3.06)	4.73		2.50	1.24	2.20	(0.81–5.93)	1.13	
Drug abuse	13.08	1.76	1.96***	(1.36–2.84)	6.99		1.32	0.63	1.16	(0.38–3.51)	1.20	
Drug dependence	5.19	1.14	1.70*	(1.02–2.85)	2.65		0.85	0.56	1.90	(0.56–6.46)	0.40	

Odds ratio adjusted by sex, age, education, marital status, employment status, income, perception of financial need, and race. The mean percentage is not adjusted

 $p < 0.001$;*
 $p < 0.05$

Table 5

Impairment associated with lifetime and Past 12-month neurasthenia with exclusion criteria for total sample

	Mean %	SE	p value	Mean %	SE	p value
Lifetime = No (<i>n</i> = 9,884)				Past 12-month = No (<i>n</i> = 9,992)		
Lifetime = Yes (<i>n</i> = 234)				Past 12-month = Yes (<i>n</i> = 126)		
Days out of role due to mental reason						
No	0.28	0.03	ns	No	0.28	0.03 ns
Yes	0.62	0.26		Yes	1.00	0.44
Cognition						
No	0.88	0.05	***	No	0.89	0.05 ***
Yes	5.38	1.17		Yes	8.79	1.83
Mobility						
No	4.39	0.24	***	No	4.41	0.23 ***
Yes	14.80	2.25		Yes	21.89	3.23
Self-care						
No	0.97	0.14		No	0.97	0.14 *
Yes	3.11	0.96		Yes	4.28	1.55
Social functioning						
No	0.55	0.05	*	No	0.56	0.05 *
Yes	2.55	0.89		Yes	3.53	1.43
Role functioning						
No	9.52	0.33	***	No	9.58	0.33 ***
Yes	33.94	3.93		Yes	49.38	5.28

Diagnosis of neurasthenia precludes presence of affective disorders, panic disorder, or generalized anxiety disorder

ns non-significant

p < 0.001;

*
p < 0.05