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Prevalence, correlates, co-morbidity, and comparative disability of DSM-IV generalized anxiety disorder in the USA: results from the National Epidemiologic Survey on Alcohol and Related Conditions

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ABSTRACT

Background. This study addressed the prevalences, correlates, co-morbidity and disability of DSM-IV generalized anxiety disorder (GAD) and other psychiatric disorders in a large national survey of the general population, the National Institute on Alcohol Abuse and Alcoholism's (NIAAA) National Epidemiologic Survey on Alcohol and Related Conditions (NESARC). The study presents nationally representative data, for the first time, on prevalence, correlates, co-morbidity, and comparative disability of DSM-IV GAD.

Method. Data are taken from a large ($n=43093$) representative sample of the adult USA population.

Results. Prevalences of 12-month and lifetime GAD were 2·1% and 4·1%. Being female, middle-aged, widowed/separated/divorced, and low income increased risk, while being Asian, Hispanic, or Black decreased risk. GAD was highly co-morbid with substance use, and other anxiety, mood, and personality disorders. Co-morbidity in GAD was not substantially greater than for most other Axis I and II disorders. Disability and impairment in pure GAD were equivalent to pure mood disorders, but significantly greater than in pure substance use, and other anxiety and personality disorders. Individuals co-morbid for GAD and each mood disorder were more disabled than those with pure forms of GAD or each mood disorder. When co-morbid with GAD, nicotine dependence and other anxiety and personality disorders were not associated with increased disability over that associated with pure GAD, but GAD did show increased disability over that due to each of these disorders in pure form.

Conclusions. Associations between GAD and Axis I and II disorders were strong and significant, with variation among specific disorders. Results strongly support GAD as an independent disorder with significant impairment and disability.

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INTRODUCTION

Generalized anxiety disorder (GAD) is a chronic, disabling disorder associated with substantial personal, societal, and economic costs (Ballenger *et al.* 2001; Wittchen, 2002). Individuals with GAD more frequently utilize

primary and specialty health care resources than the mental health sector (Ormel *et al.* 1994; Schonfeld *et al.* 1997). GAD is highly associated with other psychiatric disorders, and this co-morbidity increases the economic and personal burden and severity of the disorder (Kessler *et al.* 1994; Wittchen *et al.* 1994, 2002; Judd *et al.* 1998; Stein, 2001; Nutt *et al.* 2002).

The concept and diagnostic criteria of GAD have changed significantly since the disorder first appeared in the *Diagnostic and Statistical Manual of Mental Disorders, third edition* (DSM-III) (APA, 1980). Despite these changes, rates of GAD have remained relatively consistent throughout the subsequent revised third edition (DSM-III-R; APA, 1987) and fourth edition (DSM-IV; APA, 1994) classifications in epidemiological surveys conducted worldwide since the early 1980s (Lee *et al.* 1987; Wittchen *et al.* 1992; Merikangas *et al.* 1996; Bijl *et al.* 1998; Meyer *et al.* 2000; Carter *et al.* 2001; Kringlen *et al.* 2001; Wittchen & Hoyer, 2001; Andrade *et al.* 2002; Hunt *et al.* 2002; Alonso *et al.* 2004; Faravelli *et al.* 2004*a*, *b*; Jacobi *et al.* 2004; Kawakami *et al.* 2004; Vincente *et al.* 2004; Kessler *et al.* 2005*a*, *b*).

For DSM-III, lifetime rates of GAD were 3·6–9·5% (mean 5·4; median 4·0%). Two additional surveys (Wells *et al.* 1989; Stefansson *et al.* 1991) based on DSM-III criteria found extremely high rates of lifetime GAD (21·7% and 31·1%), findings that remain to be explained. For DSM-III-R, lifetime rates of GAD were 1·4–5·4% (mean 3·5%; median 3·4%). For DSM-IV, lifetime rates were 0·8–6·4% (mean 4·0%; median 4·3%). Twelve-month prevalences of GAD were similar for DSM-III (2·4–2·8%: mean 3·0%; median 2·6%), DSM-III-R (0·8–3·1%: mean 2·0%; median 1·8%) and DSM-IV (0·5–3·7%: mean 2·4%; median 3·1%).

High rates of co-morbidity found among GAD patients (Roy-Byrne, 1996; Noyes & Hoehn-Saric, 1998; Noyes, 2001) have raised concerns about GAD as an independent disorder, with suggestions that GAD might be better conceptualized as a prodrome, residual, or severity marker of other disorders (Breslau & Davis, 1985; Noyes *et al.* 1992). A central nosological issue arising from this debate is whether generalized anxiety is itself associated with impairment or disability, or whether the impairment in individuals with GAD is due entirely to other co-morbid disorders. The co-morbidity of GAD with major depressive episode (MDE) has been of special interest because of the high level of co-morbidity and the status of MDE as one of the most burdensome disorders worldwide (Murray & Lopez, 1996).

Epidemiological studies have addressed this question by assessing the comparative disability of GAD and MDE. In these studies (Kessler *et al.* 1999, 2002; Kessler, 2000) the separate and joint effects of GAD and MDE were evaluated by comparing the disability of pure GAD, pure MDE, and the two conditions when co-morbid. No significant differences in disability were found between pure GAD and pure MDE, and two of the three surveys found that individuals with co-morbid GAD-MDE had significantly greater disability than those with either pure GAD or pure MDE.

These findings have led researchers to conclude that the status of GAD as an independent disorder is at least as strongly supported as it is for MDE. However, to better understand GAD, current and detailed information is needed about its prevalence and its disability relative to a broader array of anxiety, mood, substance use, and personality disorders (PDs) than examined in earlier studies. Representative general population data are also needed to supplement clinical studies of GAD. Accordingly, this study addressed the prevalences, correlates, co-morbidity and disability of DSM-IV GAD and other psychiatric disorders in a large national survey of the general population, the National Institute on Alcohol Abuse and Alcoholism's (NIAAA) National Epidemiologic Survey on Alcohol and Related Conditions (NESARC) (Grant *et al.* 2003*a*, 2004*a*). The sample size ($n = 43093$) and excellent response rate (81%) of the NESARC allow for the accurate estimation of rates of GAD in minorities not previously studied on a national basis and the co-morbidity and comparative disability of GAD and specific psychiatric conditions not previously assessed in nationally representative samples.

METHOD

Sample

The 2001–2002 NESARC is a representative sample of the USA conducted by NIAAA, as

described elsewhere (Grant *et al*. 2003*a*, 2004*a*). The NESARC target population was the civilian population residing in households and group quarters, 18 years and older. Face-to-face interviews were conducted with 43093 respondents at their residences. Eighty-one per cent of all randomly selected respondents completed the 1-hour interviews. Blacks, Hispanics, and young adults (aged 18–24 years) were oversampled, with data adjusted for this oversampling and household- and person-level nonresponse. The weighted data were then adjusted to represent the USA civilian population based on the 2000 Census.

DSM-IV diagnostic interview

The diagnostic interview was the NIAAA Alcohol Use Disorder and Associated Disabilities Interview Schedule – DSM-IV version (AUDADIS-IV) (Grant *et al*. 2001). This diagnostic interview, designed for lay interviewers, was developed to advance measurement of substance use and mental disorders in large-scale surveys.

DSM-IV GAD

DSM-IV GAD was diagnosed when excessive anxiety and worry were present more days than not for at least 6 months, about a number of events or activities, accompanied by difficulty controlling the worry and at least three of the six DSM-IV GAD symptoms. Lifetime GAD was defined as having at least one episode of GAD over the life course. Respondents with an episode of GAD in the year preceding the interview were classified as having 12-month GAD. Diagnoses of GAD also required that the DSM-IV clinical significance criterion be met, that is, symptoms of the disorder must have caused clinically significant distress or impairment.

Other psychiatric disorders

Like GAD, other anxiety (panic disorder with and without agoraphobia, social phobia, and specific phobia) and mood [major depressive disorder (MDD), dysthymia, bipolar I, bipolar II] diagnoses in this report are DSM-IV primary diagnoses. In DSM-IV, 'primary' excludes mental disorders that are substance-induced or due to a medical condition. All mood and other anxiety disorders satisfied the DSM-IV clinical significance criterion and MDD diagnoses also ruled out bereavement.

AUDADIS-IV questions operationalize DSM-IV criteria for alcohol and drug-specific abuse and dependence for 10 drug classes (Grant *et al*. 2004*a*) (aggregated in this report). Consistent with DSM-IV, lifetime diagnoses of alcohol abuse required at least one of the four criteria for abuse either in the 12-month period preceding the interview or previously. Alcohol dependence diagnoses required at least three of the seven DSM-IV criteria for dependence during the past year. For prior diagnoses of alcohol dependence, at least three criteria must have occurred within a 1-year period. Drug use disorder and nicotine dependence (Compton *et al*. 2004; Grant *et al*. 2004*b*, *c*) diagnoses used the same algorithms.

AUDADIS-IV assessments of DSM-IV PDs have been described in detail previously (Grant *et al*. 2004*d*). These include avoidant, dependent, obsessive-compulsive, paranoid, schizoid, histrionic and antisocial personality disorders. DSM-IV PD diagnoses require evaluating long-term patterns of functioning. AUDADIS-IV PD diagnoses were made accordingly. Respondents needed to endorse the required number of DSM-IV symptom items for the specific PD, with at least one symptom causing distress or social/occupational dysfunction.

As reported in detail elsewhere (Chatterji *et al*. 1997; Cottler *et al*. 1997; Pull *et al*. 1997; Vrasti *et al*. 1997; Canino *et al*. 1999; Grant *et al*. 1995, 2003*b*, 2004*a*; Nelson *et al*. 1999; Hasin *et al*. 2003) test–retest reliability was fair for GAD (kappa = 0·42) and reliability (kappa > 0·74) and validity were good to excellent for substance use disorders. Reliability was fair to good for mood and other anxiety disorders (kappa 0·40–0·60) and personality disorders (kappa 0·40–0·67). In addition, evidence bearing on the validity of GAD diagnoses was ascertained using the Mental Component, Social Functioning, Role Emotional Functioning, and Mental Health scales of the Short Form-12v2, a reliable and valid measure of disability used in population surveys (Ware *et al*. 2002). Each SF-12v2 disability scale is a norm-based score with a mean of 50 and standardized range of 0–100. Higher scores indicate less disability. Linear regression analyses of associations between GAD and SF-12v2 scores controlling for

sociodemographic characteristics and other psychiatric disorders showed highly significant relationships ($p < 0{\cdot}00001$) between each mental disability scale and GAD. With few exceptions, analyses show similar relationships between other DSM-IV anxiety, mood, and personality disorders (Grant *et al.* 2004*a*, *c–e*; Hasin *et al.* 2005) and SF-12v2 scales.

Other measures

Treatment utilization, age at onset, age at first treatment, number of episodes, and duration of only or longest (if applicable) episode were ascertained among respondents with lifetime GAD. Respondents were classified as receiving treatment for GAD if they: (1) visited a counselor, therapist, doctor, or psychologist; (2) were a patient in a hospital for at least one night; (3) visited an emergency room; or (4) were prescribed medications.

Statistical analyses

Weighted percentages, means, and medians were computed to derive prevalences and clinical correlates of GAD. Logistic regression analyses yielded odds ratios (ORs), indicating rough measures of association, between: (1) 12-month GAD and sociodemographic correlates; and (2) 12-month and lifetime GAD and other disorders, adjusted for sociodemographic factors. Linear regression analyses were then used to estimate the associations of GAD and each other anxiety, mood, and substance use disorder, and PDs at 12 months with measures of impairment derived from the four mental disability scales of the SF-12v2. Linear regression analyses compared disability: (1) between pure GAD and each other pure disorder; (2) between pure GAD and GAD co-morbid with each other disorder to assess the effect on disability of the other disorder over and above GAD; and (3) between each pure psychiatric disorder and GAD co-morbid with each other psychiatric disorder in order to assess the effect on disability of GAD over and above that of each psychiatric disorder. All three comparisons were assessed in a single multivariate linear regression model, one for each psychiatric disorder being contrasted with GAD. All models controlled for other DSM-IV disorders as well as sociodemographic characteristics. Standard errors for all analyses were estimated using SUDAAN (Research Triangle Institute, 2004) a software package that adjusts for design characteristics of the survey.

RESULTS

Prevalence and sociodemographic correlates

Lifetime and 12-month estimates of DSM-IV GAD were 4·1% and 2·1% (Table 1). Females showed significantly greater odds than males. Odds of GAD were significantly lower among Asian, Hispanic, and Black adults compared with Whites. Compared with the oldest age group, the odds of GAD were significantly greater for middle-aged adults (30- to 64-year-olds). Odds of GAD were also significantly greater among widowed/separated/divorced respondents than among those married/cohabiting and among the three lowest income groups (< $69999) relative to the highest income group.

Onset, course, and treatment

Mean and median ages at onset of GAD were 32·7 and 30·6. Respondents with lifetime GAD reported a mean of 3·4 episodes, with mean and median durations of 11·1 and 11·6 months for the longest (or only) episode. Nearly 50% of those with GAD reported treatment specifically for the disorder. Mean and median ages at first treatment were 34·7 and 32·9.

Associations between GAD and other psychiatric disorders

GAD was significantly associated at varying levels with all other disorders except alcohol abuse. ORs were generally larger for 12-month than for lifetime disorders (Table 2). GAD was more strongly related to dependence than abuse for alcohol and drug disorders, with strongest associations for drug dependence. Mood and anxiety disorders were also strongly related to GAD. However, considerable variability in the odds ratios by specific mood and anxiety disorders illustrates the importance of examining the disorders separately. In both time-frames, bipolar I and dysthymia were the mood disorders most strongly related to GAD. Panic disorder with agoraphobia was the anxiety disorder most highly associated with GAD,

Table 1. *Prevalence of 12-month and lifetime DSM-IV generalized anxiety disorder and odds ratios of lifetime generalized anxiety disorder by sociodemographic characteristics*

	12-month ($n=894$)		Lifetime ($n=1757$)		
Characteristic	%	(S.E.)	%	(S.E.)	OR (95% CI)
Total	2·1	(0·10)	4·1	(0·17)	
Sex					
Male	1·3	(0·11)	2·8	(0·18)	0·5 (0·45–0·59)
Female	2·8	(0·15)	5·4	(0·23)	1·0
Race-ethnicity					
White	2·2	(0·12)	4·6	(0·20)	1·0
Black	1·9	(0·22)	3·0	(0·26)	0·6 (0·53–0·78)
Native American	2·6	(0·63)	6·3	(1·07)	1·4 (0·96–2·00)
Asian	1·1	(0·29)	1·9	(0·44)	0·4 (0·26–0·65)
Hispanic	1·7	(0·24)	2·8	(0·28)	0·6 (0·47–0·73)
Age (yr)					
18–29	2·1	(0·20)	3·2	(0·28)	1·2 (0·98–1·57)
30–44	2·5	(0·19)	4·6	(0·26)	1·8 (1·47–2·21)
45–64	2·1	(0·15)	5·2	(0·27)	2·1 (1·71–2·48)
65+	1·0	(0·12)	2·6	(0·22)	1·0
Marital status					
Married/cohabiting	1·7	(0·11)	3·7	(0·19)	1·0
Widowed/separated/divorced	3·3	(0·22)	6·8	(0·34)	1·9 (1·68–2·13)
Never married	2·0	(0·18)	3·3	(0·21)	0·9 (0·75–1·04)
Education					
Less than high school	2·3	(0·23)	3·7	(0·30)	0·9 (0·73–1·05)
High school	2·3	(0·18)	4·3	(0·26)	1·0 (0·88–1·19)
College or higher	1·9	(0·12)	4·2	(0·21)	1·0
Income					
$0–$19999	2·6	(0·17)	4·6	(0·24)	1·6 (1·19–2·13)
$20000–$34999	1·9	(0·17)	3·9	(0·25)	1·3 (1·01–1·79)
$35000–$69999	1·5	(0·14)	3·9	(0·28)	1·3 (1·01–1·79)
$70000+	1·0	(0·20)	2·9	(0·36)	1·0
Urbanicity					
Urban	2·0	(0·12)	4·0	(0·19)	1·0
Rural	2·4	(0·20)	4·6	(0·28)	0·9 (0·75–1·04)
Region					
Northwest	1·8	(0·20)	3·5	(0·35)	0·8 (0·58–1·02)
Midwest	2·4	(0·26)	5·0	(0·40)	1·1 (0·86–1·44)
South	2·0	(0·16)	3·7	(0·24)	0·8 (0·64–1·02)
West	2·1	(0·20)	4·5	(0·42)	1·0

S.E., Standard error; OR, odds ratio; CI, confidence interval.

followed in magnitude by social phobia, specific phobia, and panic disorder without agoraphobia. With respect to PDs, dependent, avoidant, paranoid and schizoid PDs were more strongly related to GAD than other PDs.

Percentages of pure and co-morbid GAD and other psychiatric disorders

Only 10·2% of respondents with 12-month GAD did not have a current co-morbid disorder, a figure comparable with other severe disorders including drug use disorders, bipolar I, and panic disorder with agoraphobia (Table 3). PDs rarely occurred in pure form (6·1–12·8%), with the exception of antisocial (17·9%) and obsessive-compulsive (29·9%) PDs. Alcohol use disorders, nicotine dependence, and specific phobia were associated with the greatest percentages (36·9–40·5%) of pure disorders.

Pure GAD *versus* other pure psychiatric disorders

Table 4 presents the linear regression coefficients comparing disability as measured on the four SF-12v2 mental disability scales between 12-month pure GAD (i.e. the referent group) and each of the other pure 12-month psychiatric

Table 2. *Twelve-month and lifetime odds ratios (ORs) of DSM-IV generalized anxiety disorder and other psychiatric disorders*

Other psychiatric disorder	12-month adjusted* OR (95% CI)	Lifetime adjusted OR (95% CI)
Any alcohol use disorder	2·0 (1·54–2·63)	2·2 (1·89–2·51)
Alcohol abuse	1·0 (0·64–1·49)	1·1 (0·95–1·32)
Alcohol dependence	3·1 (2·24–4·22)	2·8 (2·46–3·24)
Any drug use disorder	4·5 (3·19–6·40)	2·7 (2·35–3·17)
Any drug abuse	2·0 (1·16–3·35)	1·6 (1·30–1·91)
Any drug dependence	9·8 (5·84–16·49)	5·2 (4·18–6·58)
Nicotine dependence	2·9 (2·34–3·52)	2·5 (2·15–2·88)
Any mood disorder	18·7 (15·77–22·15)	14·1 (12·20–16·31)
Major depressive disorder	8·6 (7·12–10·45)	5·7 (5·00–6·50)
Dysthymia	12·4 (9·33–16·35)	7·1 (5·92–8·64)
Bipolar I	13·6 (10·64–17·36)	8·8 (7·43–10·48)
Bipolar II	5·1 (3·26–7·83)	5·0 (3·54–7·03)
Any anxiety disorder	8·9 (7·39–10·63)	7·5 (6·53–8·50)
Panic disorder	12·9 (10·24–16·37)	7·3 (6·25–8·41)
Panic disorder with agoraphobia	19·3 (13·62–27·36)	13·3 (10·09–17·53)
Panic disorder without agoraphobia	8·7 (6·48–11·77)	4·8 (4·00–5·68)
Social phobia	10·7 (8·49–13·50)	8·4 (7·13–9·81)
Specific phobia	6·0 (5·08–7·20)	5·4 (4·68–6·14)
Any personality disorder	9·1 (7·69–10·83)	7·2 (6·31–8·32)
Avoidant	11·3 (8·77–14·44)	10·7 (8·72–13·15)
Dependent	13·5 (8·57–21·25)	13·1 (8·36–20·50)
Obsessive-compulsive	6·2 (5·09–7·44)	5·3 (4·58–6·24)
Paranoid	9·4 (7·57–11·63)	8·9 (7·55–10·56)
Schizoid	7·6 (6·00–9·67)	7·1 (5·83–8·72)
Histrionic	5·9 (4·30–8·21)	5·9 (4·58–7·62)
Antisocial	4·6 (3·58–6·01)	4·1 (3·29–5·00)

OR, Odds ratio; CI, confidence interval.

Generalized anxiety disorder and sociodemographic variables served as independent variables with each other psychiatric disorder serving as the dependent variable.

* Adjusted for age, race-ethnicity, sex, marital status, education, income, urbanicity, region of country.

disorders. Coefficients that are both positive and significant indicate that respondents with the other pure disorder have significantly lower disability than those with pure GAD (or, alternatively, respondents with pure GAD have significantly greater disability than those with other pure psychiatric disorders). Coefficients that are not statistically significant indicate that there are no differences in disability between the pure GAD and the other pure psychiatric disorders.

With few exceptions, respondents with pure GAD have significantly greater disability than respondents with pure alcohol or drug use disorders, pure nicotine dependence, each other pure anxiety and personality disorder. In contrast, respondents with pure GAD were no more or less disabled than those with each pure mood disorder.

Disability of pure GAD and other psychiatric disorders relative to co-morbid disorders

Results in the first four columns of Table 5 indicate the disability of GAD when co-morbid compared to the disability associated with pure GAD, the reference group. Each column shows a different subscale of the disability measure.

There were no significant increases in disability of GAD when co-morbid with alcohol, drug use, other anxiety, or personality disorders compared with the disability associated with pure GAD (columns 1–4). However, disability was significantly greater when GAD was co-morbid with mood disorders compared with the disability associated with pure GAD.

Columns 5 through 8 indicate the disability of GAD when co-morbid compared with the disability associated with other psychiatric disorders when pure (the other disorders served as reference groups in these columns). Disability was not increased when GAD was co-morbid with alcohol or drug use disorders compared with the disability associated with these disorders when pure. However, disability was significantly increased when GAD was co-morbid with other disorders compared with the disability associated with these disorders when pure, including nicotine dependence, and mood, anxiety, and PDs.

DISCUSSION

Prevalences of 12-month and lifetime DSM-IV GAD in this general population survey were 2·1% and 4·1%. The 12-month and lifetime rates were within the ranges (0·5–3·7%; 0·8–6·4%) and corresponded closely to the mean estimates (2·0% and 4·0%) of DSM-IV GAD found in previous referenced epidemiologic surveys. These prevalences are slightly lower than those found in the NCS-Replication (Kessler *et al.* 2005*a*, *b*) largely because cases of substance-induced GAD were not excluded and the DSM-IV clinical significance criteria were not applied in that survey. Further, 12-month episodes of GAD in the NCS-R were defined by

Table 3. *Number, percentages and rates of 12-month DSM-IV pure and co-morbid generalized anxiety disorder and other psychiatric disorders*

	Pure disorder			Co-morbid disorder		
Psychiatric disorder	*n*[a]	%[b]	Rate	*n*[a]	%[b]	Rate
Substance use disorder						
Any alcohol use disorder	1353	40·1	3·4	1974	59·9	5·1
Any drug use disorder	106	14·0	0·3	671	86·0	1·7
Nicotine dependence	2048	40·5	5·2	2914	59·5	7·6
Mood disorder						
Major depressive disorder	709	28·6	1·5	1625	71·4	3·8
Dysthymia	105	16·0	0·2	489	84·0	1·1
Bipolar I	109	11·4	0·2	774	88·6	1·8
Bipolar II	75	19·2	0·2	281	80·8	0·7
Other anxiety disorder						
Generalized anxiety	87	10·2	0·2	807	89·8	1·9
Panic with agoraphobia	17	7·1	0·1	237	92·9	0·5
Panic without agoraphobia	142	20·6	0·3	511	79·4	1·2
Social phobia	200	17·8	0·5	940	82·2	2·3
Specific phobia	1218	36·9	2·6	1855	63·1	4·5
Personality disorder[c]						
Avoidant	83	7·2	0·2	912	92·8	2·2
Dependent	11	6·1	0·1	197	93·9	0·5
Obsessive-compulsive	958	29·9	2·4	2303	70·1	5·5
Paranoid	260	10·2	0·5	1845	89·8	4·0
Schizoid	192	12·8	0·4	1233	87·2	2·7
Histrionic	68	8·2	0·2	740	91·8	1·7
Antisocial	272	17·9	0·7	1150	82·1	3·0

[a] Numbers based on unweighted figures.
[b] Percentages based on weighted figures.
[c] Personality disorders assessed only on lifetime basis.

durations of 1 month or more rather than 6 months or more as specified by the DSM-IV.

GAD was more common among women, consistent with most epidemiologic surveys conducted since the early 1980s. Due to its size, the NESARC provides more precise information on race-ethnic differences than any other source. One previous study found no difference in the odds of GAD among Blacks, Hispanics and Whites (Wittchen *et al.* 1994) while another found higher rates among Blacks (Blazer *et al.* 1991) for lifetime GAD. The NESARC findings of lower odds among Asians, Blacks and Hispanics contribute new information. However, the finding of lower rates among disadvantaged minority groups does not rule out potential disparities in the treatment for GAD among minorities, an important topic for further investigation.

Consistent with previous surveys, the odds of GAD were significantly greater among widowed/separated/divorced individuals and those with lower socioeconomic status (Wells *et al.* 1989; Stefansson *et al.* 1991; Wittchen *et al.* 1994). Earlier surveys were inconsistent on age groups at highest risk for GAD. Due to its large sample size, NESARC results indicating that the 'baby boom' birth cohort is at highest risk are likely to be accurate. Further investigation to better understand the factors leading to this important finding should shed light on environmental risks for GAD.

Contrasting with earlier surveys showing age at onset of GAD in late adolescence or early twenties (Barlow *et al.* 1986; Burke *et al.* 1991; Kendler *et al.* 1992; Rogers *et al.* 1999; Kessler *et al.* 2001) NESARC found an average age of onset of GAD of 32·7, similar to the onsets associated with MDD (30·4 years), and panic disorder with (28·0) and without (31·8) agoraphobia (Hasin *et al.* 2005). In contrast to previous surveys (Angst & Vollrath, 1991; Blazer *et al.* 1991) and clinical studies (Mancuso *et al.* 1993; Noyes *et al.* 1996; Yonkers *et al.* 1996, 2000) showing that GAD episodes commonly persist for a decade or longer, the average

Table 4. *Linear regression analyses of DSM-IV pure generalized anxiety disorder and pure other psychiatric disorders predicting disability*[a]

Other psychiatric disorder	Mental Disability Scale β (95% CI)	Social Functioning Scale β (95% CI)	Role Emotional Functioning Scale β (95% CI)	Mental Health Scale β (95% CI)
Substance use disorder				
Any alcohol use disorder	8·4 (5·8–11·0)*	7·0 (3·8–10·2)*	10·4 (5·0–15·8)**	5·9 (2·7–9·1)**
Any drug use disorder	5·3 (1·3–9·2)**	3·8 (−0·4–8·0)****	5·9 (0·9–11·0)****	3·2 (−1·2–7·6)
Nicotine dependence	7·6 (5·1–10·1)*	5·5 (2·3–8·7)**	8·5 (3·7–13·4)**	5·0 (2·1–8·0)**
Mood disorder				
Major depressive disorder	1·2 (−1·6–4·0)	1·3 (−2·1–4·7)	3·4 (−0·9–7·8)	−0·9 (−4·4–2·6)
Dysthymia	0·9 (−2·4–4·1)	−1·0 (−4·9–2·9)	−0·3 (−5·3–4·7)	−1·0 (−4·6–2·6)
Bipolar I	0·6 (−3·2–4·4)	−3·2 (−7·4–0·9)	4·3 (−1·6–10·1)	−3·3 (−7·5–0·9)
Bipolar II	3·6 (−0·5–7·6)	1·4 (−3·6–6·4)	6·4 (0·6–12·2)****	1·1 (−3·2–5·4)
Other anxiety disorder				
Panic with agoraphobia	4·8 (1·7–11·2)****	4·1 (−2·0–10·2)	4·3 (2·3–10·9)****	2·7 (−3·8–9·2)
Panic without agoraphobia	5·6 (2·3–9·0)**	4·3 (0·2–8·3)****	4·9 (0·1–9·8)****	2·5 (−0·6–5·6)
Social phobia	7·8 (5·0–10·6)*	6·8 (3·4–10·2)*	9·6 (5·3–13·9)*	5·6 (2·5–8·6)**
Specific phobia	8·9 (6·4–11·5)*	6·6 (3·3–9·9)*	9·7 (5·1–14·4)*	6·3 (3·3–9·2)**
Personality disorder[b]				
Avoidant	4·3 (0·9–7·7)****	3·2 (−1·2–7·7)	5·9 (0·3–11·4)****	2·2 (−1·7–6·1)
Dependent	4·8 (−0·4–9·9)****	0·5 (−10·6–11·6)	−4·7 (−15·5–6·0)	5·6 (0·2–11·0)****
Obsessive-compulsive	8·0 (5·4–10·6)*	5·7 (2·3–9·1)**	9·0 (4·5–13·6)*	5·3 (2·3–8·4)**
Paranoid	8·1 (5·1–11·0)*	5·4 (1·4–9·3)***	9·0 (3·0–15·1)**	5·2 (1·2–9·3)***
Schizoid	9·1 (6·1–12·1)*	6·0 (2·5–9·5)**	10·0 (5·2–14·7)*	7·0 (3·3–10·8)**
Histrionic	6·5 (2·3–10·7)**	4·8 (−0·2–9·7)****	6·9 (2·2–11·6)**	4·4 (0·4–8·3)****
Antisocial	7·5 (4·2–10·8)*	4·4 (0·3–8·5)****	8·1 (3·2–12·9)**	5·1 (1·3–9·0)***

CI, confidence interval.

[a] Referent category was pure generalized anxiety disorder. Each model controlled for age, race-ethnicity, sex, marital status, education, income, urbanicity, region of the country, and all other psychiatric disorders.

[b] Personality disorders assessed only on lifetime basis.

* $p<0{\cdot}0001$, ** $p<0{\cdot}005$, *** $p<0{\cdot}01$, **** $p<0{\cdot}05$.

duration of a GAD episode in the NESARC was 11·1 months and the average number of episodes was 3·4. GAD is probably more chronic among patients than others because these are likely to be the most severe cases. Further, the Epidemiologic Catchment Area Survey (Blazer *et al.* 1991) finding of an average duration of 6·4 years is based on the age at onset of the first symptom of GAD and not the age at onset of the full syndrome as defined here.

The NESARC indicated a continued lack of treatment for many individuals with GAD. Nearly 50% of individuals with GAD received no treatment, with an average 2-year lag between onset and first treatment. The suffering and social/economic burden of this disorder is avoidable through highly effective pharmacological and psychological treatments (Arikian & Gorman, 2001; Culpepper, 2002; Gorman, 2002). That the proportion of treated cases has remained virtually unchanged over the past two decades (Blazer *et al.* 1991; Wittchen *et al.* 1994) suggests that efforts remain to be made to deliver effective treatments for GAD to the many who still need them and that such treatment should be delivered sooner.

The results provide new, detailed information on the co-morbidity of DSM-IV GAD and substance abuse and dependence. Most previous studies did not include samples large enough to investigate linkages between specific substance use disorders and mental disorders. Results presented above show that GAD is strongly associated with alcohol, drug and nicotine dependence, but not abuse, a finding consistent with the few surveys that have assessed these disorders (Wittchen *et al.* 1994; Kessler *et al.* 1996; Carter *et al.* 2001; Hunt *et al.* 2002; Alonso *et al.* 2004). Further, GAD showed a stronger relationship to drug dependence than to alcohol and nicotine dependence, a difference that remains to be explained.

GAD was also strongly associated with mood and other anxiety disorders. For 12-month disorders the magnitude ranged from ORs of 19·3

Table 5. *Comparative disability of pure generalized anxiety disorder (GAD), each pure other psychiatric disorder and co-morbid GAD and each other psychiatric disorder*[a]

Other psychiatric disorder	Co-morbid GAD–other psychiatric disorder *v.* pure GAD (referent category)				Co-morbid GAD–other psychiatric disorder *v.* pure other psychiatric disorder (referent category)			
	Mental Disability Scale (1) β (95% CI)	Social Functioning Scale (2) β (95% CI)	Role Emotional Functioning Scale (3) β (95% CI)	Mental Health Scale (4) β (95% CI)	Mental Disability Scale (5) β (95% CI)	Social Functioning Scale (6) β (95% CI)	Role Emotional Functioning Scale (7) β (95% CI)	Mental Health Scale (8) β (95% CI)
Substance use disorder								
Any alcohol use disorder	2·7 (−3·8–9·3)	5·5 (0·0–11·0)	8·0 (0·5–15·6)	0·9 (−7·0–8·9)	−5·7 (−11·6–0·3)	−1·5 (−6·1–3·0)	−2·4 (−7·7–3·0)	−5·0 (−12·2–2·3)
Any drug use disorder	4·3 (−6·7–15·2)	−4·1 (−17·2–8·9)	4·7 (−7·9–17·3)	−1·7 (−10·1–6·6)	−1·0 (−11·8–9·8)	−7·9 (−20·1–4·2)	−1·2 (−12·8–10·4)	−4·9 (−13·0–3·2)
Nicotine dependence	1·4 (−3·4–6·3)	−1·9 (−7·6–3·8)	3·3 (−3·3–9·9)	−3·0 (−8·1–2·2)	−6·2 (−10·3 to −2·1)**	−7·4 (−11·7 to −3·1)**	−5·2 (−9·6 to −0·8)****	−8·0 (−12·2 to −3·8)**
Mood disorder								
Major depressive disorder	−6·7 (−11·0 to −2·5)**	−3·7 (−8·7–1·3)****	−1·8 (−7·0–3·3)	−7·6 (−12·1 to −3·0)**	−8·0 (−11·2 to −4·7)*	−5·0 (−8·5 to −1·5)**	−5·3 (−8·4 to −2·1)**	−6·7 (−9·7 to −3·6)*
Dysthymia	−7·9 (−13·4 to −2·3)**	−4·7 (−10·2–0·9)****	−4·1 (−10·7–2·6)	−8·7 (−14·5 to −2·9)**	−8·8 (−14·0 to −3·5)**	−3·7 (−8·8–1·4)	−3·8 (−9·2–1·6)	−7·7 (−13·2 to −2·2)***
Bipolar I	−8·0 (−12·5 to −3·5)	−7·1 (−13·0 to −1·2)****	−4·5 (−10·8–1·7)	−11·0 (−15·3 to −6·8)*	−8·6 (13·0 to −4·2)**	−3·9 (−9·6–1·8)	−8·8 (−13·7 to −3·8)**	−7·7 (−11·8 to −3·7)**
Bipolar II	−6·8 (−14·2–0·7)****	−2·4 (−11·8–7·0)	−2·0 (−10·3–6·3)	−5·1 (−12·7–2·5)	−10·3 (−17·4 to −3·2)**	−3·8 (−12·8–5·2)	−8·4 (−16·0 to −0·8)****	−6·2 (−13·5–1·2)
Other anxiety disorder								
Panic with agoraphobia	7·0 (−2·4–16·1)	9·1 (−0·5–18·6)	5·7 (−3·3–14·6)	2·2 (−6·5–10·8)	2·3 (−8·0–12·5)	5·0 (−4·8–14·8)	1·4 (−7·6–10·3)	−0·5 (−11·0–10·0)
Panic without agoraphobia	−1·1 (−6·8–4·6)	2·7 (−3·3–8·7)	4·1 (−2·6–10·8)	−4·3 (−10·0–1·4)	−6·8 (−12·3–1·2)****	−1·6 (−7·2–4·1)	−0·8 (−6·4–4·8)	−6·8 (−12·3 to −1·3)****
Social phobia	−0·3 (−5·8–5·2)	−0·2 (−6·8–6·5)	1·6 (−5·4–8·5)	0·3 (−5·7–6·4)	−8·1 (−13·1 to −3·1)**	−7·0 (−13·3 to −0·7)****	−8·1 (−14·1 to −2·0)***	−5·2 (−10·5–0·1)****
Specific phobia	6·0 (2·1–9·8)**	5·3 (0·7–10·0)	6·3 (0·5–12·0)****	2·0 (−1·9–5·8)	−3·0 (−5·9 to −0·1)****	−1·3 (−4·5–2·0)	−3·5 (−7·3–0·3)****	−4·3 (−7·0 to −1·6)
Personality disorder[b]								
Avoidant	−2·9 (−8·4–2·7)	2·9 (−3·9–9·8)	−0·4 (−8·7–7·9)	−6·8 (−12·7 to −0·9)	−0·3 (−6·3–5·8)	−6·3 (−13·2 to −0·5)****	−9·0 (−14·3 to −3·6)**	−17·3 (−31·3 to −3·4)**
Dependent	−12·6 (−26·9–1·7)	−5·9 (−20·8–9·1)	−18·3 (−37·1–0·5)	−16·4 (−29·9 to −2·8)	−17·3 (−31·3 to −3·4)****	−6·3 (−22·8–10·2)	−13·6 (−33·2–6·0)**	−22·0 (−35·5 to −8·5)**
Obsessive-compulsive	1·4 (−3·2–6·0)	−0·4 (−6·0–5·3)	2·6 (−3·7–8·9)	−1·1 (−5·9–3·6)	−6·6 (−10·5 to −2·8)**	−6·0 (−10·7 to −1·4)****	−6·4 (−10·8 to −2·0)**	−6·5 (−10·3 to −2·6)**
Paranoid	0·5 (−4·3–5·3)	0·5 (−5·6–6·6)	3·5 (−2·8–9·8)	−2·5 (−7·8–2·9)	−7·5 (−12·1 to −3·0)**	−4·9 (−10·2–0·5)****	−5·5 (−10·5 to −0·6)****	−7·7 (−12·7 to −2·7)**
Schizoid	−0·3 (−5·3–4·8)	2·1 (−3·2–7·4)	2·8 (−3·6–9·1)	−3·5 (−8·9–2·0)	−9·4 (−14·0 to −4·8)*	−3·9 (−8·7–1·0)	−7·2 (−12·8 to −1·5)****	−10·5 (−15·8 to −5·2)**
Histrionic	5·9 (−1·1–12·9)	10·4 (0·5–20·2)****	4·1 (−3·4–11·6)	1·1 (−6·4–8·5)	−0·6 (−7·8–6·7)	5·6 (−4·0–15·2)	−2·8 (−9·8–4·2)	−3·3 (−11·3–4·8)
Antisocial	−3·4 (−10·1–3·3)	−6·2 (−14·7–2·3)	−4·2 (−13·0–4·6)	−7·1 (−13·7 to −0·5)*	−10·9 (−16·4 to −5·3)*	−10·6 (−18·1 to −3·0)**	−12·3 (−20·1 to −4·4)**	−12·3 (−17·8 to −6·7)*

[a] Each model controlled for age, race-ethnicity, sex, marital status, education, income, urbanicity, region of the country and all other psychiatric disorders.
[b] Personality disorders assessed only on lifetime basis.
* $p<0{\cdot}0001$, ** $p<0{\cdot}005$, *** $p<0{\cdot}01$, **** $p<0{\cdot}05$.

for panic disorder with agoraphobia to 6·0 for specific phobia. With regard to mood disorders, bipolar I and dysthymia were more strongly related to GAD than MDD and bipolar II, a new finding obscured in previous surveys that assessed only manic episodes and major depressive episodes (as opposed to MDD and bipolar disorders). Information in this report can provide a starting point for investigations of these observed patterns of co-morbidity.

Information on personality disorders among USA adults was not previously available and is highly relevant to GAD, as indicated by clinical studies (Mavissakalian *et al.* 1993; Reich *et al.* 1994; Sanderson *et al.* 1994; Dyke *et al.* 2001). All PDs assessed had strong associations with GAD, but magnitudes varied. The Cluster B PDs (histrionic, antisocial) showed lowest associations with GAD. Cluster A PDs (paranoid, schizoid) showed intermediate associations. Cluster C PDs (avoidant, dependent) showed the strongest associations with GAD, except for obsessive-compulsive PD. Future studies will address these varying associations and their impact on GAD, questions that will be addressed when the remaining PDs assessed in Wave 2 are included.

An important goal of this study was to compare disability among pure cases of GAD, pure cases of other disorders and co-morbid cases. Consistent with previous epidemiologic research, impairment of pure GAD was equivalent to pure MDD (Kessler, 2000; Kessler *et al.* 1999, 2002) as well as other mood disorders (i.e. bipolar I, bipolar II and dysthymia). More crucial were the new findings that pure GAD is significantly more disabling than pure alcohol and drug use disorders, nicotine dependence, other anxiety disorders and PDs, even when sociodemographic and all other co-occurring disorders were controlled. However, disability associated with other anxiety disorders, PDs and especially substance use disorders may differ from that of GAD, suggesting that future research should be extended to other domains of disability not presented here.

Consistent with most previous studies on GAD and MDE (Kessler, 2000; Kessler *et al.* 2002) individuals with co-morbid GAD-MDD were more disabled than those with pure GAD or pure MDD and individuals with GAD were more disabled than those without GAD. This was also the case for other mood disorders. However, when co-morbid with GAD, nicotine dependence, and other anxiety and PDs were not associated with increased disability compared with disability associated with pure GAD. In contrast, GAD showed increased disability over that due to each of these disorders in pure form. The results for alcohol and drug use disorders were unique in that individuals co-morbid for GAD and alcohol or drug use disorders were no more disabled than those with pure GAD or pure alcohol or drug use disorders. It is possible that alcohol and drugs are being used to self-medicate the anxiety associated with GAD. If this were the case, and self-medication were successful, the greater disability associated with GAD would be reduced, resulting in no significant differences in disability between individuals who were co-morbid for these disorders and those with pure GAD and pure alcohol or drug use disorders. This is precisely what this study demonstrated.

Taken together, these results argue against the view that GAD is a prodromal or residual form of other psychiatric disorders. GAD is no more co-morbid than many other psychiatric disorders assessed in this study and disability and role impairment in GAD is comparable to that due to mood disorders and significantly greater than impairment due to nicotine dependence, other anxiety disorders and PDs. Thus, there was no more evidence to support withholding independent status for GAD than for many other disorders.

With regard to public health implications, this study has determined the magnitude of GAD confronting the nation and identified important subgroups of the population at risk for the disorder, information critical to the planning of local and national health services. With respect to economic implications, individuals with GAD are heavy users of primary care and specialty health care resources, contributing substantially to the non-psychiatric burden associated with anxiety disorders in the USA (Ormel *et al.* 1994; Ustun & Sartorius, 1995; Schonfeld *et al.* 1997; Wittchen, 2002). Despite high levels of help-seeking among individuals with GAD, most present with physical health complaints that are often one focus of their anxiety, rather than with anxiety as the source of concern in itself. Health care initiatives geared

towards increasing recognition and treatment of GAD among individuals with the disorder and among primary care and specialty care physicians can lead to a reduction in the economic burden of GAD and improve the quality of life of those afflicted with a disorder as disabling as other psychiatric disorders. Moreover, as the results of this study demonstrate, individuals with co-morbid GAD and mood disorders were more disabled than those with pure GAD or each pure mood disorder, suggesting that increased intervention efforts be targeted toward these more-impaired co-morbid subgroups of GAD.

With regard to clinical implications, the results of this study are clear in showing that substance use, other anxiety, mood and personality disorders are highly co-morbid with GAD. Comprehensive evaluation of patients with GAD should include a systematic assessment of these and other co-morbid disorders. Longitudinal epidemiologic and clinical studies that attempt to address the limitations of this cross-sectional survey promise to elucidate the risk of chronicity and disability in GAD conferred by additional conditions and increase our understanding of patterns of co-morbidity. The second of three planned waves of the NESARC will allow use of the Wave 1 GAD results as a platform for investigation of these important prospective questions.

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DECLARATION OF INTEREST

None.

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