The Economic Burden of Anxiety Disorders in the 1990s

Paul E. Greenberg, M.A., M.S.; Tamar Sisitsky, M.A.; Ronald C. Kessler, Ph.D.; Stan N. Finkelstein, M.D.; Ernst R. Berndt, Ph.D.; Jonathan R. T. Davidson, M.D.; James C. Ballenger, M.D.; and Abby J. Fyer, M.D.

Background: We assess the annual economic burden of anxiety disorders in the United States from a societal perspective.

Method: Using data from the National Comorbidity Study, we applied multivariate regression techniques to calculate the costs associated with anxiety disorders, after adjusting for demographic characteristics and the presence of comorbid psychiatric conditions. Based on additional data, in part from a large managed care organization, we estimated a human capital model of the societal cost of anxiety disorders.

Results: We estimated the annual cost of anxiety disorders to be approximately $42.3 billion in 1990 in the United States, or $1542 per sufferer. This comprises $23.0 billion (or 54% of the total cost) in nonpsychiatric medical treatment costs, $13.3 billion (31%) in psychiatric treatment costs, $4.1 billion (10%) in indirect workplace costs, $1.2 billion (3%) in mortality costs, and $0.8 billion (2%) in prescription pharmaceutical costs. Of the $256 in workplace costs per anxious worker, 88% is attributable to lost productivity while at work as opposed to absenteeism. Posttraumatic stress disorder and panic disorder are the anxiety disorders found to have the highest rates of service use. Other than simple phobia, all anxiety disorders analyzed are associated with impairment in workplace performance.

Conclusion: Anxiety disorders impose a substantial cost on society, much of which may be avoidable with more widespread awareness, recognition, and appropriate early intervention.

(J Clin Psychiatry 1999;60:427–435)

Received Sept. 29, 1998; accepted April 29, 1999. From Analysis Group/Economics, Cambridge, Mass. (Mr. Greenberg and Ms. Sisitsky); the Department of Health Care Policy, Harvard Medical School, Boston (Dr. Kessler); M.I.T. Sloan School of Management, Cambridge, Mass. (Drs. Finkelstein and Berndt); the Department of Psychiatry and Behavioral Sciences, Duke University Medical Center, Durham, N.C. (Dr. Davidson); the Department of Psychiatry and Behavioral Sciences, Medical University of South Carolina, Charleston (Dr. Ballenger); and the New York State Psychiatric Institute, New York (Dr. Fyer).

This research was supported by the Anxiety Disorders Association of America (ADAA) via an unrestricted grant to the ADAA from the 9 pharmaceutical companies that comprise its Corporate Advisory Council.

We wish to acknowledge the outstanding research assistance of Jason C. Verner and Jennifer Donathan, as well as helpful comments received from Robert M. A. Hirschfeld, M.D., and James M. Russell, M.D. This was a project of the ADAA and its Scientific Advisory Board. We are grateful to Jan J. Ross for coordinating this study team.

The opinions expressed in this article are those of the authors and do not necessarily reflect the views of the organizations with which they are affiliated or the research sponsors.

Reprint requests to: Tamar Sisitsky, M.A., Analysis Group/Economics, One Brattle Square, Fifth Floor, Cambridge, MA 02138.

Each year, an estimated 44 million people, or 30.6% of the U.S. population between the ages of 15 and 54, experience at least one psychiatric disorder from among anxiety, mood, schizophrenia, and substance abuse or dependence disorders.[1] More than one third of these individuals, or 15.7 million people, suffer from anxiety disorders alone, while another 11.7 million experience both anxiety and at least one other psychiatric disorder.[1] Because anxiety is so prevalent, its resulting economic burden has the potential to be substantial. This burden can be meaningfully informed by a cost-of-illness assessment.

Within the psychiatric literature, cost-of-illness studies often reflect a mixture of different approaches, and precise interpretations of costs are not always given much attention. Some researchers have calculated direct costs by aggregating all expenditures associated with a particular primary diagnosis and indirect costs by isolating excess productivity loss for sufferers of the illness compared with nonsufferers.[2–4] Whereas confounding factors such as age, gender, education, and comorbid psychiatric conditions were held constant in calculating indirect costs, they were not in calculating direct costs.

The goal of this study was to calculate in a consistent manner the excess direct and indirect costs of anxiety disorders. By explicitly accounting for the influence of relevant demographic characteristics as well as comorbid psychiatric conditions with respect to both direct and indirect costs, this approach improves upon previous estimates of the societal burden of anxiety (e.g., DuPont et al.[2]). In addition, the umbrella category of anxiety disorders was unbundled to evaluate which subtypes are the primary cost drivers with respect to psychiatric service use and workplace losses. While this analysis focused on short-term societal costs, it also considered other potential

Table 1. Demographic Characteristics of the Sample[a]

Variable	With No Other Psychiatric Disorder(s)		With Other Psychiatric Disorder(s)		Overall	Overall	US
	Anxiety [1]	No Anxiety [2]	Anxiety [3]	No Anxiety [4]	With Anxiety[b] [5]	Without Anxiety[c] [6]	Population Overall[d] [7]
Female	69.4	47.6	35.4	61.5	54.9	49.6	50.6
Mean age, y	32.0	34.0	30.5	31.4	31.4	33.6	33.2
Age, y							
15–24	30.0	21.8	32.8	31.5	31.2	23.2	24.7
25–34	28.7	30.3	33.7	30.7	30.8	30.4	30.4
35–44	24.4	29.2	23.3	24.7	23.9	28.6	27.7
45–54	16.9	18.7	10.1	13.1	14.0	17.9	17.2
Education, y							
0–11	29.3	19.3	22.6	29.2	26.4	20.7	21.8
12	39.2	33.7	35.9	39.3	37.8	34.5	35.1
13+	31.5	47.0	41.5	31.6	35.8	44.8	43.1
Marital status							
Married	60.8	63.0	48.7	51.5	55.6	61.4	60.3
Never	29.0	26.6	39.2	30.0	33.3	27.1	28.3
Previously married	10.2	10.3	12.1	18.5	11.0	11.5	11.4
No. of children							
0	34.8	36.8	47.7	35.4	40.3	36.6	37.3
1	15.9	14.7	12.9	15.2	14.6	14.8	14.7
2	21.3	24.9	19.9	19.4	20.7	24.1	23.5
3+	28.1	23.6	19.6	30.0	24.5	24.5	24.5
Race							
White	73.7	75.0	80.5	75.8	76.6	75.1	75.4
Black	12.4	12.4	7.2	10.3	10.2	12.1	11.7
Hispanic	9.4	9.2	9.1	11.5	9.3	9.5	9.5
Other	4.4	3.4	3.2	2.5	3.9	3.3	3.4

[a]All values shown as percentages unless specified otherwise. Columns [1] through [4] from the National Comorbidity Study (NCS) dataset.
[b]Weighted average of columns [1] and [3].
[c]Weighted average of columns [2] and [4].
[d]Weighted average of columns [1] through [4].

costs (e.g., individual costs and long-term costs to society) qualitatively.

METHOD

Data Description

A primary data source for this investigation was the National Comorbidity Study (NCS), a congressionally mandated survey involving comprehensive interviews conducted between September 1990 and February 1992 on a national random sample of individuals aged 15 to 54.[1] It used the 1987 DSM-III-R criteria as a basis for diagnosing psychiatric disorders among survey participants,[5] including attention to anxiety disorder subtypes such as panic disorder, posttraumatic stress disorder (PTSD), agoraphobia, social phobia, simple phobia, and generalized anxiety disorder, but not obsessive-compulsive disorder. See Kessler et al.[1] for a more detailed description of the NCS.*

*A complete explanation of the methods used here, including illustrative calculations, can be found on the ADAA Web site at www.adaa.org.

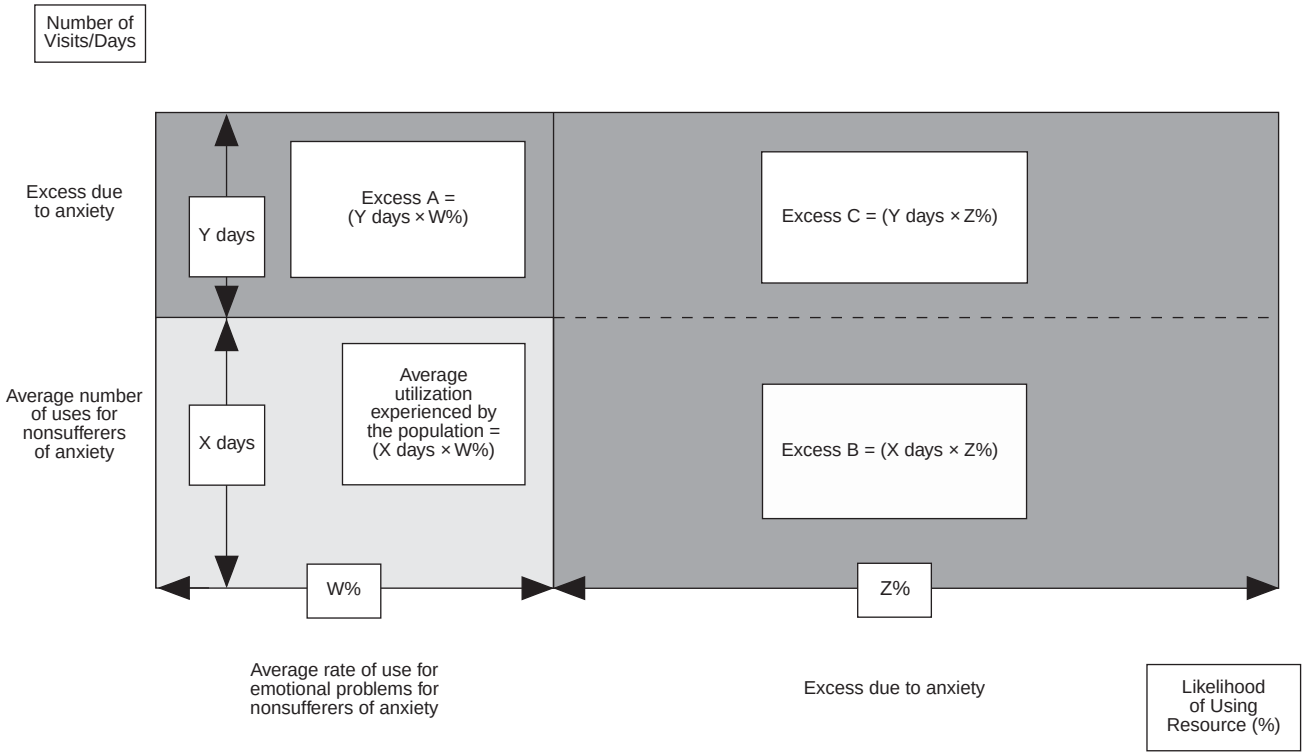
The NCS data revealed that compared with those who do not experience anxiety disorders, sufferers are more likely to be female, young, poorly educated, single, and childless (Table 1). Pairwise comparisons across population subgroups show that while the group suffering from anxiety disorders alone is approximately two-thirds female, the group suffering from anxiety along with other psychiatric conditions is approximately two-thirds male. A similar pattern exists with respect to education, as those suffering from anxiety disorders alone tend to have fewer years of schooling, while those suffering from anxiety disorders along with other psychiatric conditions tend to have more years of education than anxiety-free respondents. This pattern underscores the need for a cost-of-illness framework that explicitly controls for the demographic and psychiatric characteristics of those who suffer from anxiety disorders.

Information from the NCS was supplemented with data from a large staff–model health maintenance organization (HMO) to facilitate the derivation of nonpsychiatric direct medical costs.[6] These data served a dual purpose, enabling us both to compute an important component of the costs of anxiety disorders that would otherwise not be quantifiable with the NCS data alone and to provide a source of validation for the magnitude of direct psychiatric costs generated from the NCS. We also used population data from the U.S. Bureau of the Census,[7] cost data from professional associations and news periodicals,[8–10] suicide data from the National Center for Health Statistics,[11] and information on prescription drug costs from industry sources (see Table 3, footnote c). Future refinements to the estimates presented here could reflect changes in the economics of health care delivery by incorporating additional data as they become available.

Analytical Framework

The costs of anxiety disorders were evaluated using a prevalence-based human capital approach, a widely used methodology underlying many cost-of-illness evaluations.[3] The prevalence method considers the annual cost to society of all individuals who suffer from the condition within a given year, regardless of when the condition may have been diagnosed. Therefore, resulting estimates reflect a blend of costs for individuals who have been suffering for various lengths of time and do not isolate any potential differences in costs by stage or duration of the condition. The human capital approach is premised on the economic view that the productive value of a human resource (and thus the diminution of that value in the event of a physical or mental disorder) is best measured as the cumulative expected lifetime earnings of the individual, expressed on a present value basis.[4]

Figure 1. Excess Psychiatric Service Utilization Due to Emotional Problems Experienced by Anxiety Disorder Sufferers



Cost Categories

Within this framework, 2 types of costs were estimated, direct and indirect. Direct costs can include psychiatric service costs (e.g., counseling, hospitalization), nonpsychiatric medical costs (e.g., emergency room treatment), and prescription drug costs. Indirect costs include mortality costs that arise from the loss to society of all productive contributions from an individual as a result of anxiety-induced suicide. In addition, indirect costs include excess absenteeism (i.e., when sufferers of anxiety disorders cannot work, either due to time required for treatment or time spent at home) as well as anxiety-related reductions in at-work productivity.

Regression Estimation Methodology

We estimate both direct psychiatric service usage costs and workplace costs of anxiety using the same basic methodology. Estimates are derived from a 2-step multivariate regression approach that controls for a variety of possibly confounding factors. As shown in Figure 1, the regression analyses are designed to capture 2 different effects, each of which could contribute to excess resource utilization in the presence of anxiety disorders: (a) a greater likelihood that a particular resource will be used at all, noted along the horizontal axis, and (b) an excess number of visits or duration of use of that resource when such utilization in fact occurs, noted along the vertical axis.

For example, although anxiety disorder sufferers who are in the labor force may be no more likely than nonsufferers to experience absenteeism from work, the average duration of their absenteeism may be longer. This would be shown as Excess A in Figure 1. Alternatively, it may be the case that anxiety disorder sufferers are more likely than nonsufferers to be hospitalized, for example, even though the average duration of hospitalization is no different compared with nonsufferers given the occurrence of this event. This would be shown as Excess B in Figure 1. Of course, there may be both a higher chance that a resource will be used and a greater intensity of use among the anxiety disorder sufferers. This would be represented as the combination of Excess A, B, and C in Figure 1.

In the first stage of the statistical analysis, the impact of anxiety disorders on 9 types of psychiatric service utilization and 2 types of workplace outcomes (among employed individuals) was isolated. Logistic regressions were estimated that included the following explanatory variables: (a) controls for demographic characteristics, such as gender, age, education, and number of children (i.e., alone and interacted with gender), since, as suggested by the above discussion of the data, these factors

Table 2. Methodology for Calculating Nonpsychiatric Treatment Costs of Anxiety Disorders*

Patient Group	Cost per Person With Anxiety, $	Population With Anxiety, Millions	Total Cost, $ Billion	Total Nonpsychiatric Direct Treatment Costs, $ Billion
Treated total	2703[a]	7.3[b]	19.7[c]	
Psychiatric treatment	1928[d]		14.0[e]	
Nonpsychiatric treatment	775[f]		5.6[g]	5.6[g]
Untreated	862[h]	20.2[i]	17.4[j]	17.4[j]
Total anxiety disorder sufferers		27.5[k]		23.0[l]

*Each letter in parentheses in the footnotes represents the value from the corresponding footnote.
[a]Calculated as $5713 – ($5713/1.898), where $5713 is the average health care cost for individuals treated for anxiety disorders and 89.8% is the change in costs per person because of the presence of anxiety disorders, from results presented by Fishman et al.[6]
[b]Calculated as (k) × 27%, where 27% is the treated percentage of anxiety disorder sufferers; data from the National Comorbidity Study (NCS).
[c]Calculated as (a) × (b).
[d]Calculated as (e) / (b).
[e]Total direct psychiatric treatment costs estimated from NCS data ($13.2 billion) plus pharmaceutical costs ($0.759 billion) of anxiety disorders. See Table 3 for detail.
[f]Calculated as (a) – (d).
[g]Calculated as (c) – (e).
[h]Calculated as (f)/90%, where 90% is based on a 10% cost offset, which represents the reduction in nonpsychiatric medical costs as a result of psychiatric treatment for anxiety disorders. We have chosen a cost offset of 10%, which we believe is conservative, based on estimates presented in the literature, including a recent article by Salvador-Carulla et al.[14]
[i]Calculated as (k) – (b).
[j]Calculated as (h) × (i).
[k]NCS data.
[l]Calculated as (g) + (j).

could have an impact on both service use and workplace outcomes independent of the presence of an anxiety disorder; (b) occurrence of any form of anxiety disorder during the previous 12 months; and (c) presence of other psychiatric disorders during the previous 12 months.

For people suffering from psychiatric disorders in addition to anxiety, it can be difficult to isolate the impact of any one of these illnesses on excess use of health services or workplace impairment. If comorbid disorders were entirely ignored, all psychiatric service costs associated with these individuals implicitly would be attributed to anxiety, resulting in an overstated burden-of-illness estimate. For example, to the extent that alcoholism leads to both secondary anxiety as well as workplace impairment, failure to control for alcoholism would lead to an overestimate of the impact of anxiety on workplace impairment. In contrast, controlling entirely for all comorbid disorders would lead to an underestimate of the effects of anxiety. If, for example, anxiety leads to self-medication that promotes alcoholism, which, in turn, exacerbates workplace impairment, this indirect workplace effect should be counted as a cost of anxiety. However, this and other indirect effects are removed from the estimates when controls are introduced for comorbidity. Our analysis employs an intermediate approach, controlling for temporally primary comorbid disorders (that is, those with an age at onset earlier than that of the respondent's earliest anxiety disorder), but not for comorbid disorders that occurred after the onset of anxiety.

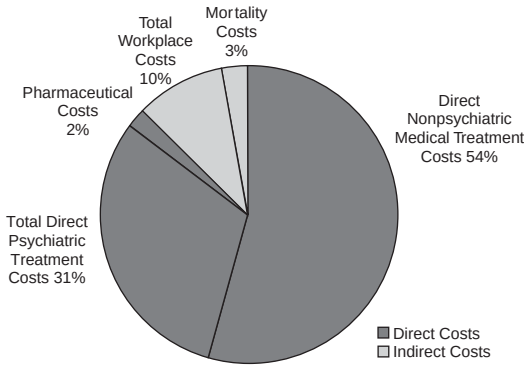
The second stage of the analysis measured the impact of anxiety disorders on the duration of the event (e.g., length of hospital stay given hospitalization, number of days absent from work given an absence) using ordinary least squares. Each category of psychiatric service and workplace outcome was treated separately, and dollar values were applied to the results to obtain the total estimated cost of each component due to the presence of anxiety disorders. Estimates of lost productivity also incorporated a 40% impairment rate, estimated from NCS data, and applied to work cutback days experienced by individuals suffering from anxiety disorders. This analysis was extended to ascertain which anxiety disorders are the primary cost drivers with respect to psychiatric service use and workplace costs.

To the extent anxiety disorder sufferers obtain more general and emergency medical services than nonsufferers, excess use of these services must be incorporated into a comprehensive calculation of the overall burden of anxiety disorders. Previously published multivariate regression results estimated from a large staff–model HMO were relied upon to supplement the NCS data with respect to nonpsychiatric medical service utilization.[6] The findings suggest that the presence of anxiety disorders among the treated plan members results in a 90% increase in health care costs per person (including nonpsychiatric and psychiatric costs) relative to untreated individuals.* This information was combined with estimates of direct psychiatric treatment costs derived from our regression analyses to obtain an estimate of total nonpsychiatric medical costs of anxiety for treated individuals. Since psychiatric intervention likely offsets accompanying nonpsychiatric costs by at least 10%,[12–16] a 10% reduction in nonpsychiatric costs following treatment was assumed. Table 2 sets out the methodology for this particular calculation.

Mortality costs represent the foregone value to society of lost human life due to an illness. Although there exists controversy concerning the precise causal relationship between anxiety disorders and suicides, following other literature in this area, a 10% estimate is used here.[2,17–20] In addition, the human capital approach was employed to es-

*The study reported in reference 4 permitted assessment of both anxiety disorders as a group as well as panic disorder on a stand-alone basis, as it reported separate results for these 2 categories. To the extent that panic disorder sufferers are excluded from the "anxiety" category, our estimate of nonpsychiatric direct medical costs will be understated, since health care costs are estimated to be higher among panic disorder patients than for anxiety disorder patients generally.

Figure 2. Distribution of Costs of Anxiety Disorder: (total costs = $42.3 billion per year in 1990 dollars)



timate total mortality costs as the present value of lifetime earnings lost to society owing to the number of suicides attributable to anxiety disorders per year.

RESULTS

The annual economic burden of anxiety disorders was estimated to be approximately $42.3 billion in 1990 dollar terms, or $63.1 billion in 1998 dollars. The 1990 results imply an average annual cost per sufferer of $1542, and an average annual cost in the workplace of $256 per suffering worker, of which 88% is attributable to lost productivity while at work as opposed to absenteeism. As noted above with respect to the underlying methodology, these averages capture individuals who have had anxiety for different durations and who may not contribute uniformly to costs.

As shown in Figure 2, the largest component of the societal costs of anxiety disorders was found to be nonpsychiatric direct medical costs, accounting for 54% of the total, while direct psychiatric treatment costs accounted for an additional 31%. Table 3 shows that compared with nonsufferers, those with anxiety disorders were more likely to obtain psychiatric services in all categories of care analyzed (as shown in column 2), but that, with the exception of visits to counselors, anxiety disorders were not associated with more frequent visits (as shown in column 3). In addition, workers with anxiety disorders experienced a higher probability of cutback in at-work performance due to emotional problems, which also affected more days at work. Furthermore, while these workers were just as likely as their nonanxious counterparts to experience some amount of absenteeism due to emotional problems, the extent of this absenteeism tended to be greater among anxiety sufferers.

Table 4 shows the results of sensitivity analysis that considered the impact of varying the assumptions on which our estimates are predicated. Sensitivity analysis is generally undertaken with attention to the standard errors of the estimated parameters to assess the confidence interval of the findings. While such an approach would be possible with respect to some of the estimates reported here, in other cases data constraints prevent this approach from being fully implemented. For illustrative purposes here, Table 4 reports the results of varying the underlying parameters in our cost-of-illness model by a factor of 10%, which resulted in findings ranging from $35 billion to $56 billion. Table 4 also reports the results of sensitivity analyses within this example for each cost component. These analyses indicate that the range of the estimated economic costs to society of anxiety disorders is more constrained on the lower bound than the upper bound.

It is worth noting that the largest cost component, direct nonpsychiatric medical treatment costs, is the most sensitive to an increase of 10% in the underlying assumptions. Because estimation of this component was based on results from a single staff–model HMO that may not be fully generalizable to the entire population, it must be interpreted with caution. In addition, that analysis included explicit controls for a variety of other chronic nonpsychiatric conditions. If the presence of anxiety disorders caused or exacerbated any of those conditions, the reported change in cost per person associated with anxiety disorders would be understated. Table 4 shows that raising all parameter values that underlie our estimate of nonpsychiatric direct medical treatment costs by 10% would result in a 44% increase in this cost component. (In traditional economic terms, this indicates that the implicit elasticity of direct nonpsychiatric treatment costs with respect to the underlying assumptions is 4.4.) In contrast, reducing each of these parameters by 10% would lower this cost factor by 15%. This asymmetry arises owing to nonlinearity in the simulation model. For example, the direct psychiatric treatment cost estimate is an input to the estimate of direct nonpsychiatric medical costs and, therefore, flows through into this sensitivity analysis.

Table 5 shows which anxiety disorder subtypes are the primary cost drivers with respect to each category of psychiatric service use and workplace costs. PTSD and panic disorder were found to be the anxiety disorders with the highest rates of service use. In addition, all but simple phobia were associated with substantial impairment in workplace performance.

DISCUSSION

The results demonstrate, from a societal perspective, not only that anxiety disorders are associated with substantial costs, but also that more than half of the costs of these disorders are attributable to nonpsychiatric direct medical expenditures. This finding corroborates a broad literature on anxiety disorders.[16,19,20,22–27] To the extent that this particular cost distribution results from inappropriate or inefficient treatment of undiagnosed and misdiagnosed

Table 3. Cost-of-Illness Estimation

Cost Component	Stage 1 Regression Estimates: Likelihood of Event Among Anxiety Nonsufferers, % [1]	Stage 1 Regression Estimates: Excess Likelihood of Event Due to Anxiety, % [2]	Stage 2 Regression Estimates: Excess No. of Visits/Days Due to Anxiety[a] [3]	Mean No. of Visits/Days per Person [4]	Prevalence of Anxiety (in 1000s) [5]	Mean Cost per Visit/Day, $[b] [6]	Cost of Anxiety Disorders (in $1000s): Based on Excess Likelihood [7] = [2] × ([3] + [4]) × [5] × [6]	Cost of Anxiety Disorders (in $1000s): Based on Excess Number of Visits/Days [8] = [1] × [3] × [5] × [6]	Cost of Anxiety Disorders (in $1000s): Total Cost of Anxiety Disorders (in $1000s) [9] = [7] + [8]
Direct psychiatric treatment costs									
Inpatient (Hospitalization)	0.4	2.1	0.0	29.4	27,453	591.55	10,043,008	0	10,043,008
Outpatient									
Physicians									
Psychologists	1.5	3.3	0.0	13.4	27,453	70.00	857,550	0	857,550
Psychiatrists	1.3	3.8	0.0	9.3	27,453	75.00	718,115	0	718,115
Family doctors	2.2	3.7	0.0	3.4	27,453	31.24	106,447	0	106,447
Other specialists (eg, gynecologists, cardiologists)	0.4	1.6	0.0	3.9	27,453	49.80	87,799	0	87,799
Total physicians							1,769,910	0	1,769,910
Other									
Counselors	2.8	2.7	7.3	10.9	27,453	55.00	747,976	306,135	1,054,111
Social workers	0.8	1.2	0.0	9.3	27,453	55.00	170,226	0	170,226
Nurses/therapists	0.3	0.7	0.0	11.6	27,453	55.00	120,563	0	120,563
Other professionals	0.2	0.6	0.0	11.2	27,453	55.00	105,287	0	105,287
Total other							1,144,053	306,135	1,450,188
Subtotal							12,956,971	306,135	13,263,106
Indirect workplace costs									
Excess absenteeism	1.7	0.0	2.0	3.1	16,087	77.32	0	507,476	507,476
Lost productivity while at work	3.5	7.3	2.0	5.3	16,087	77.32	3,189,567	419,628	3,609,195
Subtotal							3,189,567	927,104	4,116,671
Total direct psychiatric treatment and indirect workplace costs							16,146,538	1,233,239	17,379,777
Direct pharmaceutical costs[c]									759,732
Direct nonpsychiatric treatment costs[d]									23,027,177
Indirect mortality costs[e]									1,174,226
								Total Cost of Illness	42,340,911

[a]Calculated conditional on the event occurring.
[b]Cost per visit to family doctors and other specialists are 1990 mean fees for an office visit with an established patient, from reference 6; cost per inpatient day is a weighted average estimate of mean fees per day at different categories of short-stay inpatient hospitals, from reference 7, Table 1. Costs per psychiatric visit to psychologists, psychiatrists, social workers, and other mental health counselors are from reference 8. Workplace costs per day are derived from average annual personal income among employed individuals, from the NCS data used here.
[c]Based on written communication from officials at Pfizer Inc, we estimate that the 1997 pharmaceutical costs of anxiety disorders were approximately $1 billion. We deflate these costs by the producer price index for pharmaceutical preparations to obtain a 1990 dollar estimate.
[d]See Table 2.
[e]Using 10% as an estimate of the percentage of all suicides caused by anxiety disorders, we employ the human capital approach to estimate total mortality costs as the present value of lifetime earnings lost to society due to the number of suicides attributable to anxiety disorders per year. Total number of suicides calculated from 1990 population data from reference 21, and suicide death rates from reference 11. See Greenberg et al. (1993)[4] for methodology.

Table 4. Sensitivity of Estimates to Alternative Assumptions

Cost Category	Estimate[a]	Key Assumptions	Basis for Calculation	Sensitivity of Estimate to Variation of Assumption by: +10%[a]	–10%[a]
Direct psychiatric treatment costs	$13.26 (31%)	Regression estimates of excess utilization	NCS data used here	$16.08 (28%)	$10.72 (30%)
		Cost per day/visit of psychiatric service	News periodicals; professional associations (references 9 and 10)		
Indirect workplace costs	$ 4.12 (10%)	Regression estimates of excess adverse workplace outcomes	NCS data used here	$ 4.99 (9%)	$ 3.35 (9%)
		Impairment rate	NCS data used here		
Direct pharmaceutical costs	$ 0.76 (2%)	Direct pharmaceutical costs	Written communication from officials at Pfizer Inc	$ 0.84 (1%)	$ 0.68 (2%)
Direct nonpsychiatric treatment costs	$23.03 (54%)	Average health care costs for individuals treated for anxiety disorders	Fishman et al[6]	$33.23 (59%)	$19.52 (55%)
		Percent change in cost per person because of presence of anxiety disorder	Fishman et al[6]		
		Treated percentage of anxiety disorder sufferers	NCS data used here		
		Cost offset assumption	Medical literature (reference 14)		
		Direct psychiatric treatment costs	Regression models described herein		
Indirect mortality costs	$ 1.17 (3%)	Percentage of suicides related to anxiety disorders	Medical literature (references 4, 11, and 21)	$ 1.29 (2%)	$ 1.06 (3%)
Total	$42.34 (100%)			$56.43 (100%)	$35.33 (100%)

[a]In billions of dollars.

Table 5. Risk Factors for Service Usage and Adverse Workplace Outcomes[a]

Variable	PTSD	Panic Disorder	Agora-phobia	GAD	Social Phobia	Simple Phobia
Direct psychiatric medical service utilization						
Hospitalization	▲		▲		●	
Physicians						
Family doctors	▲	▲	●	▲		
Psychiatrists	▲	▲	▲		●	
Psychologists	▲	●		●		●
Other specialists (eg, gynecologists, cardiologists)	▲		▲	▲		
Other						
Social workers	▲	▲	●			
Counselors	▲	▲				
Nurses/therapists	●	▲	▲	●	●	
Other professionals	●	●			●	
Indirect workplace outcomes						
Work loss (absenteeism)		●	●	●	●	
Work cutback days	▲	▲		▲	▲	
Number of categories with significant or large impact	10	9	7	6	6	1
Number of categories with significant impact	8	6	4	3	1	0

[a]▲ indicates statistically significant impact at the 5% level; ● indicates large odds ratio was obtained, but above the 5% level of significance. Abbreviations: GAD = generalized anxiety disorder, PTSD = posttraumatic stress disorder.

sufferers, a substantial portion of the overall economic burden of anxiety disorders can be avoided. Furthermore, since only 27% of individuals with a current diagnosis of an anxiety disorder have received treatment,[1] more widespread recognition and effective treatment of patients in primary care are likely to result in a reduction in the burden of illness. As inroads are made in treating the remaining 73% of individuals who suffer from anxiety disorders, it seems likely that the eventual reduction in inappropriate treatment expenditures will exceed incremental treatment costs. This is because the majority of deliberate treatment costs for anxiety disorders, which are largely chronic in nature, most likely are incurred within the first few years of treatment, whereas inappropriate costs resulting from nontreatment of anxiety most likely persist over the long term. The implication of this pattern is that although more aggressive outreach and treatment of people with anxiety disorders could lead to a short-term increase in societal costs, these costs would be reduced over the long run.

Not only would progress in this direction likely help reduce the overall economic burden, it could also confer benefits in terms of a reduced extent or severity of psychiatric conditions that often occur secondary to anxiety disorders, such as depression or substance abuse. As a result, investments in diagnosis and treatment could lead to improved quality of life for patients and caregivers in terms of their functionality on a range of daily activities. Even though such investments could be justified in economic terms, further research is needed to target areas in which

incremental investments in diagnosis and treatment of anxiety disorders would yield the greatest returns.

Although the overall findings presented here are similar to the $46.6 billion estimate reported by DuPont et al.[2] with respect to anxiety disorders, the distribution of costs reported in the 2 studies is quite different. For instance, the current approach concluded that the costs of anxiety disorders are overwhelmingly direct in nature, whereas the study by DuPont et al. found that over 75% of the total costs were indirect. The confidence in the current findings derives in large part from the consistency of the regression methodologies and data set used to calculate indirect costs as well as direct psychiatric treatment costs. Moreover, our study expanded on the cost categories of focus in the analysis by DuPont et al. to include nonpsychiatric direct medical costs. Taken together, these different features result in the different cost distributions identified above.

It is also noteworthy that despite underlying differences in methodologies, the total cost estimate reported here is quite similar to those previously reported for depression—$42.3 billion for anxiety disorders compared with $43.7 billion to $52.9 billion for depression.[4,28] However, the distribution of these costs is also rather different. The vast majority of the costs of anxiety were found to be direct in nature, with a large component arising due to nonpsychiatric direct medical costs. In contrast, in the case of depression, "hidden" workplace costs accounted for the largest share. Furthermore, whereas reduced productivity while at work accounted for almost 90% of all workplace costs among the 16% of the labor force suffering from anxiety disorders, the majority of the burden of depression in the workplace was attributable to excess absenteeism. This particular difference on a disease-by-disease basis has been corroborated by other research that used objective measures of productivity,[29] and quite likely has important implications for employers seeking to develop strategies to enhance awareness, recognition, and effective treatment of mental illnesses.

The implications of the growing presence of managed care in the United States warrant consideration in interpreting our findings. With heightened cost consciousness in the health care system, the rise of managed care has resulted in a general move away from hospitalization and extended stays in the hospital toward greater reliance on other types of care. As a result, it is possible that the costs of anxiety in the late 1990s are smaller, and somewhat more skewed toward outpatient care,[30–32] than those estimated here.

Another implication of the growing presence of managed care is that the time horizon adopted by providers often is shorter than is appropriate in a societal cost-of-illness assessment because membership in any managed care organization rarely is permanent. This may impose a structural impediment on improving outcomes, since managed care organizations may not actively attempt to increase the treatment rate of anxiety sufferers, despite the potential long-term societal benefits of such treatment.

The cost estimates presented here should be interpreted as conservative estimates of the true burden of anxiety disorders for several reasons. First, the NCS does not include data on individuals suffering from obsessive-compulsive disorder or individuals younger than 15 and older than 54 years of age. Although these individuals undoubtedly contribute to the burden of anxiety disorders, no attempt has been made in this analysis to speculate as to the possible magnitude of costs that might be attributable to these omitted groups of people.

Second, because the initial age at onset associated with anxiety disorders is very early in so many instances, numerous adverse outcomes, such as high rates of school dropout, teenage childbearing, marital instability, and poor career choices, may impose substantial additional individual and long-term societal costs[19,33] not considered here. Many of those who experience early-onset anxiety also go on to develop other psychiatric disorders.[24,34] Thus, prevention of costly comorbidity could be an added by-product of earlier recognition and treatment of high school– and college-aged sufferers.

Third, cost categories likely exist that were not quantified, including not only long-term disability, but also excess use of nontraditional health-related services such as hot line help, self-help groups, pastoral counselors, and alternative medical practitioners, as well as attendant care costs and the accompanying reduction in productivity of family, friends, and coworkers that may be a consequence of anxiety disorders.[1,19,20,34–36]

Fourth, general reductions in the quality of life of sufferers may exceed those captured explicitly within the framework of a human capital model. These include subtle burdens of illness such as those resulting from failed suicide attempts due to PTSD,[37,38] as well as substantial self-imposed constraints on the range of activities performed by individuals suffering from panic disorder.[27]

Finally, although the average labor force participation rate among individuals suffering from anxiety disorders is 16.5 percentage points less than for nonsufferers, this potential macroeconomic inefficiency was not quantified explicitly in this analysis as an additional cost. Because the widespread presence of anxiety disorders might not only cause but also be a result of high unemployment, it is difficult to disentangle these effects and isolate that portion that could be appropriately assigned as a cost of anxiety.[39,40] To estimate properly the effects of anxiety on production losses from being out of the labor force, it would be necessary to (a) control for the probability that an individual with an anxiety disorder would be observed in the labor force sample and (b) estimate workplace outcomes had these individuals actually been in the labor force. As additional data become available, these and other cost cat-

egories may be incorporated to refine the analysis presented here.

REFERENCES

1. Kessler RC, McGonagle K, Zhao S, et al. Lifetime and 12-month prevalence of DSM-III-R psychiatric disorders in the United States. Arch Gen Psychiatry 1994;51:8–19
2. DuPont RL, Rice D, Miller L, et al. Economic costs of anxiety. Anxiety 1996;2:167–172
3. Rice DP, Kelman S, Miller LS, et al. Economic Costs of Alcohol and Drug Abuse and Mental Illness: 1985. Report Submitted to the Office of Financing and Coverage Policy of the Alcohol, Drug Abuse, and Mental Health Administration, US Dept Health Human Services. San Francisco, Calif: Institute for Health and Aging, University of California; 1990:31–37
4. Greenberg PE, Stiglin LE, Finkelstein SN, et al. Economic burden of depression in 1990. J Clin Psychiatry 1993;54:405–418
5. DiNardo P, Moras K, Barlow D, et al. Reliability of DSM-III-R anxiety disorder categories: using the Anxiety Disorders Interview Schedule-Revised (ADIS-R). Arch Gen Psychiatry 1993;50:252–256
6. Fishman P, Von Korff M, Lozano P, et al. Chronic care costs in managed care. Health Aff (Millwood) 1997;16:239–247
7. Resident population of the United States: estimates by age and sex. Available at: http://www.cwnsus.gov/population/estimates/nation/intfile2-1.txt. Accessed April 29, 1997
8. Gonzalez ML, ed. Socioeconomic Characteristics of Medical Practice. Chicago, Ill: American Medical Association Center for Health Policy Research; 1997:81
9. American Hospital Association. Hospital Statistics. Chicago, Ill: American Hospital Association; 1992:4–7
10. Hunt M. Navigating the therapy maze. The New York Times Magazine; Aug 30, 1987:49
11. Office of Vital Statistics. Death Rates for 282 Selected Causes by 5-Year Age Groups, Color, and Sex: United States: 1979–1989; Trend C, Table 292A. Hyattsville, Md: US Dept Health Human Services; Public Health Service; Centers for Disease Control, National Center for Health Statistics; 1992
12. Mumford E, Schlessinger HJ, Glass GV, et al. A new look at evidence about reduced cost of medical utilization following mental health treatment. Am J Psychiatry 1984;141:1145–1158
13. Rogers MP, White K, Warshaw MG, et al. Prevalence of medical illness in patients with anxiety disorders. Int J Psychiatry Med 1994;24:83–96
14. Salvador-Carulla L, Segui J, Fernandez-Cano P, et al. Costs and offset effect in panic disorders. Br J Psychiatry 1995;166(suppl 27):23–28
15. Weissman MM, Markowitz JS, Ouellette R, et al. Panic disorder and cardiovascular/cerebrovascular problems: results from a community survey. Am J Psychiatry 1990;147:1504–1508
16. Zaubler TS, Katon W. Panic disorder and medical comorbidity: a review of the medical and psychiatric literature. Bull Menninger Clin 1996;60: A12–A38
17. Allgulander C. Suicide and mortality patterns in anxiety neurosis and depressive neurosis. Arch Gen Psychiatry 1994;51:708–712
18. Fawcett J. Suicide risk factors in depressive disorders and in panic disorder. J Clin Psychiatry 1992;53(3, suppl):9–13
19. Jacobs RJ, Davidson JR, Gupta S, et al. The effects of clonazepam on quality of life and work productivity in panic disorder. Am J Manag Care 1997; 3:1187–1196
20. Markowitz JS, Weissman MM, Ouellette R, et al. Quality of life in panic disorder. Arch Gen Psychiatry 1989;46:984–992
21. United States Bureau of the Census. 1990 Census of Population and Housing, Summary Tape File 1C, US Summary. Washington, DC: US Bureau of the Census; 1990
22. Katon W, Von Korff M, Lin E, et al. Distressed high utilizers of medical care: DSM-III-R diagnoses and treatment needs. Gen Hosp Psychiatry 1990;12:355–362
23. Klerman GL, Weissman MM, Ouellette R, et al. Panic attacks in the community: social morbidity and health care utilization. JAMA 1991;265: 742–746
24. Manning WG Jr, Wells KB. Effects of psychological distress and psychological well-being on use of medical services. Med Care 1992;30:541–553
25. Leon AC, Portera L, Weissman MM. Social costs of anxiety disorders. Br J Psychiatry 1995;166(suppl 27):19–22
26. Souetre E, Lozet H, Cimarosti I, et al. Cost of anxiety disorders: impact of comorbidity. J Psychosom Res 1994;38(suppl 1):151–160
27. Whalley D, McKenna SP. Measuring quality of life in patients with depression or anxiety. Pharmacoeconomics 1995;8:305–315
28. Greenberg PE, Kessler RC, Nells TL, et al. Depression in the workplace: an economic perspective. In: Feighner JP, Boyer WF, eds. Selective Serotonin Re-Uptake Inhibitors. Chichester, England: John Wiley & Sons; 1996
29. Berndt ER, Finkelstein SN, Greenberg PE, et al. Illness and Productivity: Objective Workplace Evidence. Cambridge, Mass: MIT; 1997. Working Paper WP#42–97
30. American Psychiatric Association Online Public Information, Psychiatric hospitalization. Available at: http://www.psych.org/public_info/HOSPIT~1.HTM. Accessed July 17, 1997
31. Graves EJ, Owings MF. 1995 Summary: National Hospital Discharge Survey. Hyattsville, Md: National Center for Health Statistics; 1997. Advance Data From Vital and Health Statistics, No. 291
32. National Center for Health Statistics, 1993 Summary: National Hospital Discharge Survey. Available at: http://www.cdc.gov/nchswww/products/pubs/pubd/ad/270-261/ad264.htm. Accessed Sept 9,1997
33. Kessler RC, Foster C, Saunders W, et al. Social consequences of psychiatric disorders, I: educational attainment. Am J Psychiatry 1995;152: 1026–1032
34. Edlund MJ, Swann AC. The economic and social costs of panic disorder. Hosp Community Psychiatry 1987;38:1277–1288
35. Bourdon KH, Rae DS, Narrow WE, et al. National prevalence and treatment of mental and addictive disorders. In: Manderscheid RW, Sonnenschein MS, eds. Mental Health: United States 1994. Rockville, Md: Center for Mental Health Services; 1994:22–51
36. Narrow WE, Regier DA, Rae DS, et al. Use of services by persons with mental and addictive disorders: findings from the National Institute of Mental Health Epidemiologic Catchment Area Program. Arch Gen Psychiatry 1993;50:95–107
37. Henry JA, Rivas CA. Constraints on antidepressant prescribing and principles of cost effective antidepressant use. Pharmacoeconomics 1997;11: 419–443
38. Kramer TL, Lindy J, Green B, et al. The comorbidity of post-traumatic stress disorder and suicidality in Vietnam veterans. Suicide Life Threat Behav 1994;24:58–67
39. Hamilton VH, Merrigan P, Dufresne E. Down and out: estimating the relationship between mental health and unemployment. Health Econ 1997;6: 397–406
40. Ettner SL, Frank RG, Kessler RC. The impact of psychiatric disorder on labor market outcomes. Industrial and Labor Relations Review 1997;51: 69–75