The Economic Burden of Depression in the United States: How Did It Change Between 1990 and 2000?

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Background: The economic burden of depression was estimated to be $43.7 billion in 1990. A subsequent study reported a cost burden of $52.9 billion using revised prevalence data and a refined workplace cost estimation approach. The objective of the current report is to provide a 10-year update of these estimates using the same methodological framework.

Method: Using a human capital approach, we developed prevalence-based estimates of 3 major cost categories: (1) direct costs, (2) mortality costs arising from depression-related suicides, and (3) costs associated with depression in the workplace. Cost-of-illness estimates from 1990 were updated to reflect the experience in 2000 using current epidemiologic data and publicly available population, wage, and cost information.

Results: Whereas the treatment rate of depression increased by over 50%, its economic burden rose by only 7%, going from $77.4 billion in 1990 (inflation-adjusted dollars) to $83.1 billion in 2000. Of the 2000 total, $26.1 billion (31%) were direct medical costs, $5.4 billion (7%) were suicide-related mortality costs, and $51.5 billion (62%) were workplace costs.

Conclusion: The economic burden of depression remained relatively stable between 1990 and 2000, despite a dramatic increase in the proportion of depression sufferers who received treatment. Future research will incorporate additional costs associated with depression sufferers, including the excess costs of their coexisting psychiatric and medical conditions and attention to the role of painful conditions as a driver of these costs.

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In 1990, the economic burden of depression in the United States was estimated to be $43.7 billion, including direct treatment costs, lost earnings due to depression-related suicides, and indirect workplace costs.[1] The cost-of-illness framework used in the analysis by Greenberg et al.[1] drew upon prior studies of the societal burden of depression (i.e., major depression, bipolar disorder, and dysthymia).[2,3] That analysis was based on a human-capital methodology, relying on prevalence data from the Epidemiologic Catchment Area survey (ECA), published information on medical resource utilization and median wages, and assumptions concerning the treatment rate of depression as well as the duration and profile of depression episodes. A subsequent study refined this cost estimate using updated prevalence rate data from the National Comorbidity Survey (NCS)[4] and treatment rate data from the ECA.[5] That study, also by Greenberg et al.,[6] estimated the economic burden of depression to be $52.9 billion in 1990, with over 60% of the reported costs resulting from increased absenteeism and presenteeism among depressed workers. The objective of the current report is to present results of a similar analysis aimed at updating the estimation of the economic burden of depression in light of changes in both the disease- and treatment-specific profile of illness, as well as changes in general economic conditions during the 1990s.

The economic burden of depression is driven by a number of factors, including its prevalence rate (i.e., how widespread the disorder is in society), its treatment rate (i.e., the extent to which the illness is addressed in the medical sector), and its debilitating nature (i.e., how impairing the condition is among sufferers). Changes in any of these factors are likely to affect the estimated burden of illness. Furthermore, because the symptoms of depression can be cognitive (e.g., reduced concentration), behavioral (e.g., social withdrawal), and physical (e.g., bodily pain), there are numerous possible manifestations of impairment among sufferers. In fact, depression has been shown to substantially limit activities of daily living at work, home, and school, and to result in adverse social outcomes that may be irreversible, including reduced educational attainment, increased likelihood of teenage

parenting, and marital instability.[7–12] All of these disease-specific characteristics influence not only the magnitude but also the distribution of costs (i.e., among direct treatment, suicide related, and workplace costs).

Although prevalence estimates vary, consistent with the $52.9 billion estimate of the total economic burden of depression in 1990,[6] the adult prevalence rate of depression was estimated to be 10.1%, with a relatively young median age at onset compared with that of the most widespread and debilitating physical conditions such as arthritis and heart disease.[13] In addition, previous research found that a large proportion of depression sufferers did not receive treatment for any emotional disorder, let alone adequate care specifically for depression. For example, an NCS-based study reported that, in 1990, only 27.9% of depression sufferers received treatment in the health care sector for any emotional problem during the prior 12 months.[14] This low treatment rate was probably due to several factors, including the stigmatization of mental illness in general, a lack of realization among sufferers that they needed care, a belief that treatment would not be effective given their particular circumstances, impatience with slow-acting antidepressants and their side effects, and/or improper dosing of medications by general practice physicians.[15–19] When sufferers did receive depression treatment, it was often inadequate in that it failed to meet minimum standards of care according to best-practice treatment guidelines.[20–23]

In the early 1990s, care for depression was often provided in the inpatient setting,[24–26] with about two thirds of direct costs borne in the hospital and only 9% of direct costs spent on antidepressants.[1] More recent evidence shows that the extent of treatment increased dramatically over the past decade, and its composition changed significantly as well. There was a shift away from relatively expensive inpatient and specialty care toward less expensive types of treatment encounters, including outpatient and office visits, more frequent reliance on primary care physicians, and greater use of prescription drugs.[27–29] However, even as greater outreach was made to treat depressed people, quality of care provided in this context was low,[30–34] with less than one quarter of all sufferers estimated to receive adequate care.[19]

One additional important change in the landscape has to do with the nature of the comparative epidemiologic data. Whereas the NCS used the *Diagnostic and Statistical Manual of Mental Disorders*, Third Edition, Revised (DSM-III-R) criteria as the basis for the 1990 epidemiologic estimates for depression, the NCS Replication survey (NCS-R) used the somewhat more restrictive DSM-IV criteria for the recent estimates. Although this change tended to reduce the reported prevalence of depression in the United States, those identified as sufferers based on this definition probably were, on average, somewhat more severe cases, with higher treatment and treatment adequacy rates than would have emerged based on the earlier criteria.[19]

During the time frame of investigation, not only were there numerous changes in the epidemiologic profile of depression, but the macroeconomic context in which the cost comparison was made also changed significantly, from a period of recession starting in mid-1990 to one of long-term economic expansion that continued until early 2001.[35] The business cycle impact on cost-of-illness estimates can manifest through numerous pathways including, most prominently, its effect on the employment rate of depressed people and, therefore, access to health care coverage, as well as the possibility of a prevalence rate reduction from an economic upswing. The economic analysis that follows works through the implications of these changes in the disease- and treatment-specific characteristics of depression, as well as changes in general business conditions to develop a comparably estimated burden of illness assessment for 2000, as has been widely reported for 1990.

METHOD

The methodology implemented for this cost-of-illness analysis was similar to that used in the earlier studies of the economic burden of depression,[1,2,6] relying on prevalence rate estimates from the NCS-R.[19] The cost components considered were also the same as in the earlier studies and focused on (1) direct treatment costs, (2) depression-related suicide costs, and (3) workplace costs, including attention to both absenteeism and presenteeism.

Direct treatment costs were estimated based on published utilization data for individuals recorded as receiving any medical treatment for depression in 2000. These sources are updates of the very same data compilations underlying the original 1990 estimates. Data on the number of inpatient and outpatient hospital admissions were obtained from *Mental Health, United States, 2000*,[36] while nursing home admissions in 2000 were extrapolated based on data from the *National Nursing Home Survey*[25,37] and population estimates from the Census Bureau.[38,39] Median days of stay per inpatient admission were extrapolated based on data from the *National Hospital Discharge Survey*,[24,40] while total office visits were obtained from the *National Ambulatory Medical Care Survey*.[41] Aggregate pharmaceutical costs were based on antidepressant sales in 2000.[42,43] Cost findings from the earlier studies were inflated to 2000 U.S. dollar terms using the *Medical Care Consumer Price Index*[44] to permit direct comparison with the updated results presented here.

Suicide-related costs were estimated using a human capital framework based on the total number of suicides by age and gender cohort in 2000, as reported by the Centers for Disease Control.[45] As in the earlier analyses, the present value of lost lifetime earnings was calculated

for the 60% of suicides attributed to depression,[1,2] an assumption supported by studies that find that the majority of all suicides are depression related.[46–50] No attempt was made in the 2000 analysis to update this particular estimate, although changes in the number of suicides over the decade were incorporated explicitly into the model.

The present value of lifetime earnings was estimated based on mortality rates and life expectancies from the *National Vital Statistics Report*,[51] as well as wage data from the Bureau of Labor Statistics.[52] To compare the current findings with the earlier estimates of suicide-related costs, an adjustment was made to account for changes in the lifetime earnings estimation approach used here. In the earlier analysis, the calculation had included an imputation of the value of household services, which not only added substantially to the cost base but also was not applied uniformly.[1] Instead, only the non–labor market services provided by women and individuals aged 65 years and above were seen in that earlier work as contributing value outside the labor market. To address these concerns, valuation of non–labor market services was removed from both the earlier estimates of lifetime earnings and the current assessment in favor of a consistent and more conservative (i.e., lower bound) calculation of the present value of lifetime market wages alone in the 2 years of comparison.

Workplace costs were estimated as the wage-based value of both absenteeism (i.e., days missed from work due to depression) and presenteeism (i.e., reduced productivity while at work due to depression). As in the earlier estimates of workplace costs, we distinguished between treated and untreated employees in terms of the number of episodes they experienced while at work, the duration of those episodes, and the number of days spent either in treatment and thus not at work or at work but suffering from reduced productivity. These calculations were based, in part, on NCS-R treatment rates and employment statistics from the Bureau of Labor Statistics,[19,53] as well as on assumptions regarding the number of days missed from work due to treatment for depression among those treated or "home bed days" among those untreated, which were the same as those used to generate the earlier cost-of-illness estimates.[1] With respect to presenteeism, we maintained the assumption used in the previous study that 20% of the time spent at work while suffering from a depression episode resulted in lost productivity. As in the previous research, the estimated work time lost due to depression was valued using median wage data from the Bureau of Labor Statistics[52] applied to the prevalence distribution of depression sufferers by age and gender. To the extent that depressed workers, in fact, earn less than their nondepressed counterparts in the labor force, holding all else equal, this approach may overstate the workplace cost to specific employers. Nonetheless, it would accurately reflect, from a societal perspective, the foregone value due to depression-related impairment in productive workplace capacity.

Comparisons of the current findings with the earlier estimates of workplace costs are, of course, premised on a consistent methodology. In fact, although the earlier calculations for 1990 had relied on NCS prevalence estimates, the treatment rate estimate used in those calculations was based on other sources that were not nationally representative. Consequently, for comparative purposes, an adjustment was made in the previous calculations using the 27.9% medical sector treatment rate for depression reported in the NCS for 1990.[14] In addition, those findings were expressed in 2000 dollar terms using the Employment Cost Index[54] to create a benchmark for comparison with the updated results.

Because of the integrative nature of the estimation process that involved combining data from a variety of different sources, it was not possible to assess statistical significance regarding the results presented below. However, we focus on findings that reflect either economically meaningful differences or those that are very similar in magnitude over time and therefore striking in their stability.

RESULTS

Prevalence, Employment, and Treatment Rate Comparison

As noted above, prevalence, employment, and treatment rate data were derived from the NCS and NCS-R. As shown in Table 1, the current prevalence rate of depression from the NCS-R was estimated as 8.7%, a decline of 1.4 percentage points. In contrast, the 12-month treatment rate in the medical sector for all psychiatric problems among depressed individuals rose dramatically between 1990 and 2000, from 27.9% to 43.6%, an increase of 56%. In fact, this substantial change may actually understate treatment rate growth, as a 3-fold increase during the decade between 1987 and 1997 has been reported elsewhere.[27] Consequently, while the total number of depressed people remained relatively stable (i.e., 17.5 million in 1990 vs. 18.1 million in 2000), the number of *treated* depression sufferers grew substantially (i.e., 4.9 million in 1990 and 7.9 million in 2000). To the extent that treatment of depression is associated with reduced episode severity and duration in general, this dramatic change over time conferred substantial benefits on society from an economic and quality of life perspective.

Tables 1 and 2 also show that the employment rate increased among depressed individuals between 1990 and 2000, from 59.2% to 63.3%, at least in part due to an economic upturn in the United States. At the same time, the number of depressed people who were working also increased, from 10.4 million in 1990 to 11.4 million in 2000. Correspondingly, the proportion of depressed people who were unemployed fell from 7.4% in 1990 to 4.7% in 2000 as the number of unemployed depressed individuals declined, from 1.3 million to 0.9 million.

Table 1. One-Year Prevalence of Depression by Employment Status: 1990 and 2000

	1990[a]		2000[b]		Change	
Status	No. of Cases (in millions) [1]	Rate, % [2]	No. of Cases (in millions) [3]	Rate, % [4]	No. of Cases (in millions)[c] [5] = [3] – [1]	Rate, % [6] = [4] – [2]
Employed	10.4	9.0	11.4	8.3	1.1	–0.7
Unemployed	1.3	20.3	0.9	15.9	–0.4	–4.4
Out of labor force	5.9	9.8	5.8	8.4	–0.1	–1.4
Overall prevalence[d]	17.5	10.1	18.1	8.7	0.6	–1.4
Treated prevalence	4.9	27.9	7.9	43.6	3.0	15.7

[a]1990 number of cases, [1], and prevalence rates, [2], are from Greenberg et al.[6]
[b]2000 prevalence rates, [4], are from the National Comorbidity Survey Replication. With the exception of treated prevalence, 2000 number of cases, [3], are calculated by applying the prevalence rate, [4], to population estimates from the Bureau of the Census[39] and employment status estimates from the Bureau of Labor Statistics.[53] The number of treated cases in 2000 is calculated by applying the treated prevalence rate in 2000 to the overall number of cases in 2000.
[c]Change may not equal the difference from 1990 to 2000 due to rounding.
[d]Overall prevalence rates computed as the weighted average of employment status categories.

Table 2. Employment Status of Depression Population: 1990 and 2000[a,b]

Status	1990 [1]	2000 [2]	Change[c] [3] = [2] – [1]
Employed	59.2	63.3	4.2
Unemployed	7.4	4.7	–2.6
Out of labor force	33.5	31.9	–1.5

[a]Data are shown as percentage of overall population.
[b]1990 and 2000 percentage of overall population, [1] and [2], are calculated from Table 1.
[c]Change may not equal the difference from 1990 to 2000 due to rounding.

These dramatic improvements in the working status of depressed individuals outpaced the upturn in the overall economy, where more modest improvements in employment (62.8% employed in 1990 vs. 64.4% in 2000) and less substantial declines in unemployment (3.7% unemployed in 1990 vs. 2.7% in 2000) were experienced.[55] Even with these overall gains, the prevalence rate of depression was still approximately twice as high among unemployed people compared with those who were employed as well as those who were out of the labor force. Of course, it is difficult to distinguish cause and effect in this context since, in many instances, the presence of an emotional disorder is likely to diminish labor market attachment and/or capability, while in other cases, unemployment itself could contribute to a more fragile state of emotional well-being.

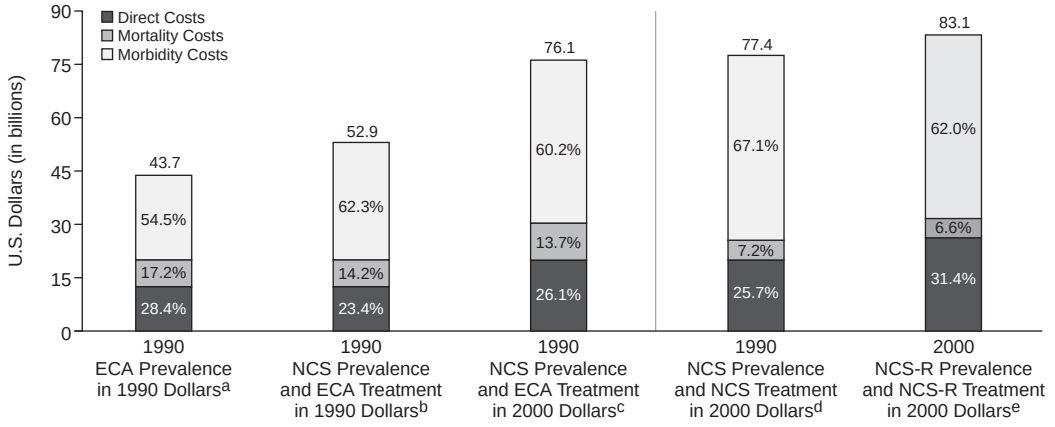
Treatment rates varied enormously by employment status. Depressed individuals who were employed had a 40.2% treatment rate, implying that for every 2 depressed employees who were treated, an additional 3 employees remained untreated in 2000. Among depressed people who were unemployed, only 32.9% were treated, underscoring the relative difficulty experienced by this group in accessing health care services. Since so many people obtain health care coverage through their jobs,[56] being unemployed would appear to severely limit depression treatment opportunities. Paradoxically, those depressed people who were out of the labor force had the highest treatment rate of all, at 54.1%. While it is certainly possible that the symptoms of depression among these individuals could be severe enough to curtail their labor market activity entirely, it is unclear how they manage to gain access to treatment at rates that are so much higher than those among the unemployed/depressed group. Of course, it is possible that a self-selection mechanism exists that makes it more likely for depressed individuals with spousal health insurance coverage to withdraw entirely from the labor force. These treatment rate differentials highlight the extent to which help-seeking behavior is conditioned by employment status among depressed people and the health coverage that is often dependent upon that status.

Cost Comparison

Based on these changes in the prevalence and treatment rates of depression over time, the total economic burden of illness was $83.1 billion in 2000. Of this total, $26.1 billion (31%) were direct treatment costs, $5.4 billion (7%) were suicide-related costs, and $51.5 billion (62%) were workplace costs.

Given several changes in the methodology used to generate these results, multiple points of comparison can be made with earlier findings. The economic burden of depression was estimated to be $43.7 billion in 1990, of which $12.4 billion (28%) were direct costs, $7.5 billion (17%) were suicide-related costs, and $23.8 billion (55%) were workplace costs.[1] Refining the workplace cost calculations to reflect improved prevalence data resulted in a subsequent cost-of-illness estimate of $52.9 billion in 1990,[6] which translated to $76.1 billion in 2000 dollars. Updating the earlier methodology in several ways to be consistent with that used here yielded modified results. In particular, applying comparably estimated NCS-based treatment rates as well as suicide-related lifetime earnings and inflating the cost estimates to express the 1990 results in 2000 dollar terms resulted in a cost-of-

Figure 1. Economic Burden of Depression: 1990 and 2000



[a]Greenberg et al.[1]
[b]Greenberg et al.[6]
[c]Calculated by expressing [b] in 2000 U.S. dollar terms using the *Medical Care Consumer Price Index*[44] and the *Employment Cost Index*[54] from the Bureau of Labor Statistics.
[d]Calculated by updating [c] with a revised mortality cost methodology and NCS treatment rates from Kessler et al.[14]
[e]Calculated using similar methodology as in [d] and preliminary prevalence and treatment rates from the NSC-R.
Abbreviations: ECA = Epidemiologic Catchment Area survey, NCS = National Comorbidity Survey, NCS-R = NCS Replication.

Table 3. Economic Burden of Depression, 1990 Versus 2000

	1990 (in 2000 U.S. dollars)		2000		1990 to 2000
Type of Cost	Dollars (in millions)	Percentage of Total	Dollars (in millions)	Percentage of Total	Change in Dollars, %[a]
Direct costs[b]	19,883	25.7	26,087	31.4	31.2
Inpatient	13,368	17.3	8,883	10.7	–33.6
Outpatient[c]	4,632	6.0	6,803	8.2	46.9
Pharmaceutical	1,882	2.4	10,400	12.5	452.5
Suicide-related costs[d]	5,584	7.2	5,450	6.6	–2.4
Workplace costs[e]	51,888	67.1	51,543	62.0	–0.7
Absenteeism	39,450	51.0	36,248	43.6	–8.1
Presenteeism	12,439	16.1	15,295	18.4	23.0
Total	77,355	100.0	83,080	100.0	7.4

[a]Percentage change in dollars from 1990 to 2000 may be different due to rounding.
[b]1990 direct costs are from Greenberg et al.[1]
[c]Outpatient costs in 1990 include both outpatient and partial care facilities as reported by Greenberg et al.[1]
[d]1990 suicide-related costs are based on Greenberg et al.[1] and adjusted methodologically to exclude lifetime earnings related to household services.
[e]1990 workplace costs from Greenberg et al.[6] are modified using the National Comorbidity Survey prevalence and treatment rates.

illness finding of $77.4 billion. Of this total, $19.9 billion (26%) were direct costs, $5.6 billion (7%) were suicide-related costs, and $51.9 billion (67%) were workplace costs. A comparison of these cost estimates is provided in Figure 1.

Direct costs. Between 1990 and 2000, there was a real increase in direct treatment costs, from $19.9 billion (in 2000 dollars) to $26.1 billion. Whereas inpatient care represented 17.3% of the total costs of depression and two thirds of the direct costs in 1990, by 2000, inpatient care had decreased to 10.7% of total costs and accounted for only one third of all direct costs (see Table 3). In addition, there was a 5-fold increase in dollar sales of antidepressants over the 10-year period (after accounting for inflation), as relatively less costly health sector encounters were increasingly used to treat a substantially larger patient population. These findings are consistent with other reported evidence of the effects of managed care on the delivery of health services for depression.[27]

Suicide-related costs. In real terms, suicide costs decreased marginally, resulting in an estimated $5.6 billion of societal costs in 1990 and $5.5 billion in 2000 (see Table 3). Not only did the number of suicides among individuals aged 15 to 34 years decrease by over 2600

Table 4. Total Number of Suicides in the United States: 1990 and 2000[a]

	Male			Female			Overall		
Age, y	1990 [1]	2000 [2]	Change [3] = [2] – [1]	1990 [4]	2000 [5]	Change [6] = [5] – [4]	1990 [7]	2000 [8]	Change [9] = [8] – [7]
< 1	0	0	0	0	0	0	0	0	0
1–4	0	0	0	0	0	0	0	0	0
5–9	0	6	6	0	1	1	0	7	7
10–14	184	238	54	61	62	1	245	300	55
15–19	1,638	1,351	–287	391	270	–121	2,029	1,621	–408
20–24	2,554	2,073	–481	406	300	–106	2,960	2,373	–587
25–29	2,695	1,956	–739	545	385	–160	3,240	2,341	–899
30–34	2,545	1,982	–563	653	469	–184	3,198	2,451	–747
35–39	2,337	2,457	120	634	655	21	2,971	3,112	141
40–44	1,886	2,657	771	600	793	193	2,486	3,450	964
45–49	1,498	2,307	809	490	680	190	1,988	2,987	999
50–54	1,257	1,842	585	408	608	200	1,665	2,450	785
55–59	1,203	1,306	103	383	402	19	1,586	1,708	122
60–64	1,257	959	–298	346	278	–68	1,603	1,237	–366
65+	6,026	4,477	–1,549	744	829	85	6,770	5,306	–1,464
Total[b]	25,080	23,618	–1,462	5,662	5,732	70	30,741	29,343	–1,398

[a]For the purposes of analysis, 60% of all suicides are assumed related to depression. 1990 suicide data, [1], [4], and [7], are from Greenberg et al.[1] 2000 suicide data, [2], [5], and [8], are from the Centers for Disease Control and Prevention.[45]
[b]Total may not equal the sum of all age cohorts due to inclusion of suicide victims of unidentified age.

during this period, there were over 1800 fewer suicides among men aged 60 years and older. Even though there was a substantial increase in suicides in the intermediate age categories (ages 35 to 59 years), on balance, the overall total fell by almost 1400 in 2000 compared with 1990, perhaps related to the increased treatment rate of depression as well as the improvement in general business conditions. In addition, the economic boom was probably responsible for increased employment and therefore improved access to health care treatment, even though it may not have directly contributed to the decline in suicides during the 1990s[57] (see Table 4).

Workplace costs. Workplace costs accounted for over 60% of the economic burden of depression in both years of analysis. Given the substantial changes in the employment status of depressed people, the level of total workplace costs was remarkably stable over the decade: $51.9 billion in 1990 (in 2000 dollars) and $51.5 billion in 2000. At the same time, however, the proportion of total workplace costs attributable to days missed from work decreased somewhat, from 76% to 70%, implying an accompanying increase in the share attributable to reduced productivity while at work (see Table 3). This finding contrasts with the recently reported estimate of the excess costs of lost work time among employees with depression totaling $31 billion, in which 81% of the costs were associated with presenteeism and only 19% were attributed to absenteeism.[58] However, that calculation excluded bipolar disorders from the set of depressive disorders considered and did not incorporate the effects of short- or long-term disability leaves, all of which were explicitly factored into the updated estimates reported here. These and several other methodological differences between the 2 aggregate estimates of workplace costs help explain why such a large gap exists in the estimation of this particular cost category.

Changes in the Health Care Environment

The increased depression treatment rate, with a less than proportional rise in total treatment costs, was most likely due in large measure to changes in the health care environment. With the widespread penetration of managed care during the 1990s, treatment for depression shifted toward greater utilization of relatively less expensive outpatient, office-based, and pharmaceutical care and away from relatively more expensive inpatient care.[27–29] In addition, the ease of administering and managing patients receiving new types of antidepressant medications made it possible for primary care physicians to provide drug treatment, leading to a cost shifting from the salaries of mental health care specialists (e.g., psychiatrists, psychologists) to the costs of prescription drugs. A recent study reported that among depressed people who received outpatient treatment in 1997, 87% received care from a primary care physician as compared with only 69% in 1987. Similarly, the percentage of patients who received treatment from a psychologist decreased from 30% in 1987 to 19% in 1997.[27] Another study reported that, between 1985 and 1995, office-based psychiatry visits became shorter, included less psychotherapy, and resulted in more medications being prescribed.[59] Since treatment adequacy tends to be highest in the specialty medical sector,[19] the reduced emphasis on this venue for care probably resulted in substantial unmet needs on the part of patients suffering from depression. These fundamental changes over time in the mix and quality of medical care services help to explain how the

Table 5. Depression Costs per Patient, 1990 Versus 2000

Type of Cost	1990 (in 2000 U.S. dollars) Total Cost, $ (in millions)[a]	N (in millions)[b]	Cost/Case, $[c]	2000 Total Cost, $ (in millions)[a]	N (in millions)[d]	Cost/Case, $[c]	1990 to 2000 Change in Cost/Case, %[e]
Direct costs for treated depressed population	[1]	[2]	[3] = [1] / [2]	[4]	[5]	[6] = [4] / [5]	[7] = ([6] – [3]) / [3]
Inpatient	13,368	4.9	2,738	8,883	7.9	1,127	–58.8
Outpatient	4,632	4.9	949	6,803	7.9	863	–9.0
Pharmaceutical	1,882	4.9	385	10,400	7.9	1,319	242.2
Subtotal	19,883	4.9	4,072	26,087	7.9	3,309	–18.7
Suicide-related costs for total depressed population[f]	[8]	[9]	[10] = [8] / [9]	[11]	[12]	[13] = [11] / [12]	[14] = ([13] – [10]) / [10]
Subtotal	5,584	17.5	319	5,450	18.1	302	–5.4
Workplace costs for employed depressed population	[15]	[16]	[17] = [15] / [16]	[18]	[19]	[20] = [18] / [19]	[21] = ([20] – [17]) / [17]
Absenteeism	39,450	10.4	3,810	36,248	11.4	3,169	–16.8
Presenteeism	12,439	10.4	1,201	15,295	11.4	1,337	11.3
Subtotal	51,888	10.4	5,012	51,543	11.4	4,507	–10.1

[a]Total costs, [1], [4], [8], [11], [15], and [18], are from Table 4.
[b]1990 treated depressed population, [2], is calculated by applying the NCS treatment rate from Kessler et al.[14] to the total depressed population in 1990, [9].
[c]Costs/case may not equal total costs divided by population estimates due to rounding.
[d]2000 treated depressed population, [5], is from Table 3.
[e]Change may not equal the difference from 1990 to 2000 due to rounding.
[f]Total depressed, [9] and [12], and employed depressed, [16] and [19], populations are from Table 1.

overall cost of illness could remain stable even as so many more depressed individuals were treated in some manner.

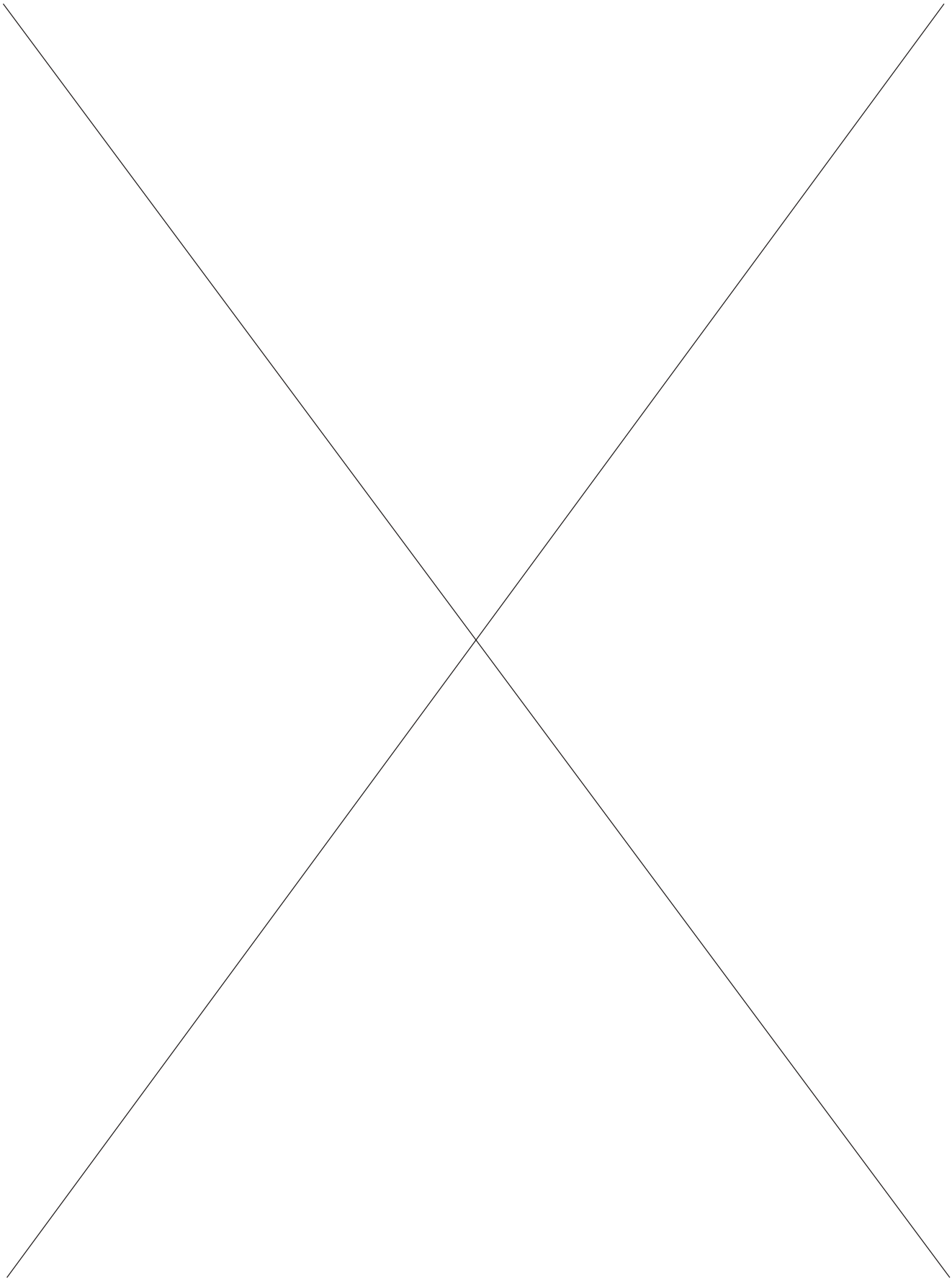
DISCUSSION

Whereas the number of people suffering from depression in the United States remained relatively stable between 1990 and 2000, their overall treatment rate increased by over 50%. During this period, there was a less than proportional increase in the direct treatment costs of depression, from $19.9 billion in 1990 to $26.1 billion in 2000 (31% growth). As a result of successful outreach and a shift toward less costly forms of treatment, the annual direct cost per treated patient decreased substantially over time, from approximately $4100 in 1990 to $3300 in 2000, a reduction of 18.7% (see Table 5).

While treatment rates grew faster than costs, interpretation of these results from the perspective of relative cost effectiveness over time is not immediately apparent. Lower direct costs per treated case in this context seem to imply greater value obtained for only slightly greater expenditures. While this explanation may indeed accurately characterize the net effect of all these changes for some patients, in an effort to realize cost savings for a much larger number of treated patients, it is likely that the overall quality of care provided for depression patients suffered. At the same time, since appropriate care for depression has been shown to improve clinical, quality of life, and economic outcomes substantially, there is an opportunity to realize a favorable return on continued investment in the quality of care.[60] From a resource utilization perspective, this fact underscores that there is a tension between making outreach to treat depression sufferers and the typical quality of care provided as that occurs.

A higher rate of depression treatment probably has contributed to the very stable suicide-related and workplace costs associated with this illness. Patients treated for depression were 4.8 times more likely to receive an antidepressant in the late 1990s compared with a decade earlier. In addition, selective serotonin reuptake inhibitors (SSRIs), which were first introduced in the United States. in 1988, were prescribed to more than half of the patients receiving outpatient treatment for depression by 1997.[27] The widespread increase in the use of substantially less toxic antidepressants over time (e.g., SSRIs as compared with tricyclic antidepressants) most likely resulted in a lower rate of overdosing, potentially reducing the number of depression-related suicides.[61–63] Between 1990 and 2000, as the total number of suicides fell somewhat, depression-related suicide costs decreased by 5.4% per depressed person, from approximately $320 in 1990 to $300 in 2000 (see Table 5).

With the improvement in macroeconomic conditions in the form of a lower unemployment rate and a larger labor force, many more depressed people were employed in 2000 compared with a decade earlier, which probably had beneficial impacts on suicide-related costs as well as workplace costs. However, even as treatment for depression was available to an increased number of workers, tending to lower workplace costs, the robust economy drew into the labor force many more individuals dealing with this psychiatric disorder, which tended to raise workplace costs. Unbundling these counteracting effects shows that an increased treatment rate resulted in a 7% decrease in workplace costs, from $51.9 billion to $48.2 billion,



while a higher employment rate increased workplace costs by 6%, from $48.2 billion to $51.5 billion. Although these effects tended to offset one another, with the large increase in the number of depressed workers overall workplace costs per depressed employee declined by 10.1% between 1990 and 2000, from approximately $5000 to $4500.

Had the DSM-III-R criteria underlying NCS rather than the DSM-IV criteria underlying NCS-R been consistently used to identify depression in the population more recently, the ensuing 12-month prevalence estimates probably would have been larger than those reported here. However, because direct and suicide-related costs were not based on NCS/NCS-R prevalence rates but on national estimates of depression-specific resource utilization and adverse events, these particular dollar magnitudes would have remained unchanged. Consequently, even larger reductions than those reported here in the ratios of direct cost per depressed patient, as well as suicide cost per depression sufferer, would have resulted. In contrast, in the case of workplace costs per depressed employee, a higher reported prevalence would have resulted in proportionately higher cost estimates, leaving this ratio unchanged.

CONCLUSION

The objective of this study was to update the burden of illness estimates for depression, incorporating attention to a great many changes that occurred between 1990 and 2000 in the prevalence and treatment profile of this widespread psychiatric disorder, in the context of general economic conditions. While the aggregate economic burden of depression changed only moderately in real terms during this period, the treatment rate of depression increased substantially. Thus, increased awareness and recognition of depression, as well as more frequent utilization of lower cost forms of care for its treatment, fundamentally changed the economic landscape with respect to the burden of this disease. While indirect workplace costs were still the largest single burden of illness, an increasing share of total depression-related costs was spent on direct treatment, representing a more effective use of societal resources in the sense that, unlike indirect suicide-related and workplace burdens of illness, it is a cost category that tends to be actively monitored and managed with depression sufferers explicitly in mind. However, the quality of care in this context so often is inadequate, as evidenced by the enormous gap among treated depression sufferers between a possible treatment adequacy rate of at least 80% cited by the National Institute of Mental Health versus the 42% rate actually found in the NCS-R results for patients with major depression.[19,64] Thus, there remains substantial opportunity for further improvement in the mix of total expenditures in attempting to close the gap between what may be possible under ideal treatment conditions and what is, in fact, realized in the health care sector.

There are a variety of reasons why the workplace cost component continued to be so large. It is plausible that the assumptions underlying the earlier cost-of-illness model with respect to the workplace impact of depression, incorporated here, are not conservative but instead overstate the adverse impact.[65] In addition, the characteristics of the disease itself offer further insight into this finding. Depression is a widespread, chronic illness that affects people especially in their prime working-age years. Furthermore, its underlying symptoms, including reduced concentration, inability to become motivated to accomplish even routine tasks, moodiness, and fatigue, can all contribute to both absence from work and performance impairment at work. In many cases, the symptoms of illness are not so severe that sufferers withdraw entirely from the labor force, which results in the presence of a very sizable pool of depressed workers at any given time. Because of this particularly problematic constellation of disease-specific factors, no employer is exempt from the adverse consequences of depression in the workplace.

The economic findings noted above highlight a tension that exists between societal interests and those of employers in the context of optimal patient management. On the one hand, society is better off when depressed workers are drawn into employment situations, as the opportunity cost of their lost productive capacity is at least partially recaptured through their newfound labor market activity. On the other hand, individual employers tend to incur added private costs as the employment rate of depressed people rises. This inherent tension raises a continual challenge during the best of macroeconomic conditions, even in the presence of a considerable increase in overall treatment rates. Furthermore, the excess unemployment rate resulting from depression was not explicitly enumerated among the cost categories in both years of analysis. Had it been, the transition by depressed people into employment probably would have been seen as lowering societal costs, albeit starting from a much larger cost base. Nonetheless, even in this instance, the private interests of employers would still be at odds with those of society as a whole around the issue of cost incidence (i.e., who incurs the added economic burden associated with an improved employment status of depressed people).

There are other significant structural impediments that limit the realization of optimal outcomes with respect to the management of depressed people. For example, in many companies, plans covering discrete types of benefits (e.g., medical insurance, prescription drug coverage, disability) are set up as isolated cost categories. In such an environment, even if a new form of treatment were developed that had the potential to reduce costs to the company as a whole, taking all direct and indirect costs into account, there may not be a mechanism in place to ensure its

adoption if it were to have an adverse impact on one specific benefit category (e.g., the prescription drug budget). Furthermore, to the extent that greater outreach to treat depressed employees is successful in alleviating their symptoms and improving their workplace performance, these favorable outcomes may have the unintended effect of increasing worker mobility in securing a job in an entirely different organization. If such an outcome were anticipated by the employer, this would likely blunt its incentive to invest in additional treatment initiatives, as the benefits of those incremental investments would not be fully captured privately. These and other tensions that may exist among health care constituents at various times (e.g., payer vs. provider, primary care physician vs. specialists, patient vs. provider/payer) can make it difficult to realize optimal outcomes in terms of the management of individuals suffering from depression.

This study does not include explicit attention to the excess health care costs associated with treating psychiatric and medical conditions that often coexist with depression. In this sense, the current analysis focuses on the costs of the disease itself rather than on all the related and (seemingly) unrelated manifestations of excess cost associated with patients suffering from the disease. This distinction highlights the difference between disease management and patient management. Consequently, the economic burden of illness as presented in this analysis is likely to be an understatement of the burden associated with depression sufferers from a societal perspective. For example, one study based on employer claims data found that only 41% of total outlays for employees treated for depression were for *International Classification of Diseases, Ninth Revision*, medical codes for depression, National Drug Codes pharmaceutical codes for antidepressants, and disability claims due to depression.[17] Of the 59% of costs that were not directly attributable to depression-specific claims, approximately two thirds involved comorbid physical conditions and the remaining one third involved other psychiatric disorders. If those same proportions held in the aggregate, the $83.1 billion cost-of-illness estimate reported here would imply an equivalent amount of costs due to the physical disorders experienced by depressed people and in excess of $40 billion more due to their other psychiatric disorders. Since the extent of comorbidities probably well exceeds what would be expected for people with the demographic profile of depressed individuals, a portion of these expenditures probably belongs among the itemized costs of depressed individuals.

The magnitude of additional direct and indirect resource utilization associated with depressed people underscores that, in many instances, it takes some time to properly identify this disease state. In fact, earlier diagnoses often focus on the physical manifestations of symptomatic complaints (e.g., headaches, backaches) that often coexist. In other instances, depression may result from the onset of a physical disorder (e.g., cancer, arthritis) that changes the sufferer's life expectancy or limits their ability to undertake usual activities.[66,67] In future research, it would be useful to develop a complete accounting of the various forms of excess costs incurred before, during, and after depression episodes and to distinguish those added comorbid costs that are causally due to depression from those for which depression is a likely consequence of a comorbid chronic disease. Such an analysis would be helpful in targeting opportunities for further outreach where effective treatment has the greatest potential to improve patient outcomes and perhaps even realize cost offsets.

One possible example arises in the context of estimating the proportion of a depression patient's total health care as well as workplace costs that are due to the treatment of coexisting painful physical conditions (e.g., arthritis, fibromyalgia, back pain).[53,68–73] Because of the complex relationship between depression and pain, such an analysis could shed light on the economic characteristics underlying this widespread concern. Another cost offset opportunity worth documenting more fully is the caregiver burden of depression, which can be assessed by estimating the excess medical and disability costs incurred by nondepressed employees with a depressed spouse or child in their family. The timing of excess costs incurred by the caregiver in relation to the manifestation of depression symptoms on the part of the family member suffering from depression warrants particular attention. While evidence from the medical literature regarding cost offsets in the form of reduced inefficient medical expenditure is mixed,[74,75] only by properly accounting for all the subtle mechanisms by which associated costs accrue can this important line of analysis be fully understood.

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