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Health Care Use And At-Work Productivity Among Employees With Mental Disorders

Can workers with one or more mental health problems function satisfactorily on the job?

by Ernst R. Berndt, Howard L. Bailit, Martin B. Keller,
Jason C. Verner, and Stan N. Finkelstein

ABSTRACT: This study examines the differential medical care use and work productivity of employees with and without anxiety and with other mental disorders at a large national firm. A unique aspect of this study is that we integrate medical claims and employer-provided, objective productivity data for the same employees. We find extensive mental health comorbidities among anxious employees. Although medical care use differs considerably among employees having no, one, or several treated mental disorders, in most cases their annual average absenteeism and average at-work productivity performance do not differ. Differences among subgroups are observed for job tenure and maternity claims. We discuss these long-term average productivity findings in relation to other literature encompassing shorter time periods.

244

**WORKPLACE
MENTAL
HEALTH**

EMPLOYERS AND POLICYMAKERS have a compelling interest in knowing the financial burden accompanying employees' illnesses. Studies of this burden frequently are undertaken at an aggregate, national level. Direct medical costs typically are derived from medical claims data, while indirect costs such as absenteeism and reduced at-work productivity are estimated based on data from other sources and assumptions, with productivity losses almost always being a subjective estimate.¹ While such studies provide useful perspectives, the billions of dollars in national costs are

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difficult for employers to interpret, and the indirect costs often appear abstract. How burden of illness actually manifests itself in the workplace is not clear. Moreover, since labor-force participation rates can vary depending on what illness a worker has, employers and their insurers or providers may find that the prevalence, diagnosis, and treatment of some mental illnesses among employees are quite different than they are for the population as a whole.

In this DataWatch we examine the differential medical care use and average at-work productivity of employees with and without anxiety and with other mental disorders at a large national firm. Anxiety sufferers have been estimated to have a 16.5 percent lower labor-force participation rate than that of nonsufferers, and thus employees diagnosed with and treated for anxiety may differ considerably from the anxious who are not in the labor force.² A unique aspect of this study is that along with employee medical claims, we analyze employer-provided objective productivity data, rather than relying on self-reported perceptions of performance at work.

Data And Methods

We obtained data from a large U.S. insurance claims processing company on the daily productivity of 2,222 persons employed as data processors at multiple sites nationwide who also received medical and drug benefits from the company's self-insured, indemnity, or preferred provider organization (PPO) plans continuously while employed. Inpatient, outpatient, and prescription drug claims data were available for these employees and their covered dependents during the thirty-month period 1 January 1993–30 June 1995. To protect confidentiality, we deleted personal information and randomly assigned identification numbers, allowing us to match information across different files without identifying individuals.

■ Medical claims data and disease classification system.

For each medical claim, utilization and expenditures were assigned to the primary diagnosis according to *International Classification of Diseases*, Ninth Revision, Clinical Modification (ICD-9-CM) codes. Mental disorders are those in the 290–319 ICD-9-CM range and are disaggregated into four categories: anxiety states (panic disorders, generalized anxiety disorders, phobic disorders, and other anxiety disorders); major depressive disorders; adjustment reactions (prolonged post-traumatic stress disorder and all other adjustment reactions); and all other mental disorders (including drug and alcohol abuse and bipolar and personality disorders).³ For comparative purposes, we also constructed a randomly selected sample of 229 employees (approximately 10 percent of the sample) and data for the 1,892 employees without any mental disorder diagnosis.

The expenditure claims represent the total dollar amount of claims paid by the employer and the employee to providers and take into account adjustments, discounts, rebates, and patient copayments. We annualized claims and expenditures by converting each person's days employed since 1 January 1993 (or since hired, if later) into yearly equivalents.

■ **Objective measurement of productivity.** Productivity is objectively measured by a company computer tracking the number of claims processed each day at work for each employee. The company pays claims processors for a fixed contractual number of hours per week. Actual hours worked each day are not observed, and absentee days due to specific illnesses are inferred rather than directly observed. To minimize heterogeneity, we examined productivity, tenure, and absenteeism data only for the 1,712 full-time employees processing indemnity claims, although we used all 2,222 employees' data for examining health claims.

Average daily at-work productivity for each employee is computed as the sum over each day at work of daily claims processed, divided by the number of days at work. A typical employee processed about 160 claims per day, or about one claim every three minutes. The variability in daily claims processed is large, indicating perhaps actual productivity variability but also possibly reflecting unobserved variation in actual hours worked. By measuring average daily productivity over an extended time period (up to thirty months), we minimized the effects of outlier observations and daily variability in hours worked. Absentee days include regular vacation-benefit days, training days, sick and disability leave days, and days off from work for other reasons, but they exclude regular holidays. Absentee days are converted into annualized equivalents for each employee.

■ **Socioeconomic profile.** Workers' average age was about thirty-four, almost 95 percent were female, 55 percent were married, 73 percent completed high school as their highest educational attainment, 10 percent had an associate's degree, and 17 percent had a bachelor's degree. The mean annual salary was about \$21,000. Mean job tenure with this employer was slightly more than five years.

■ **Statistical methods.** To infer whether any of the medical expenditure and average productivity differences are statistically significant, one must account for extensive comorbidity patterns in employees, as well as skewed distributions. The entire set of possible comorbidity combinations among illnesses is large, and comparing them all in pairwise combinations would be cumbersome. We therefore classify each employee into one of ten mutually exclusive groups: (1) no mental disorder; (2) anxiety only; (3) major depression only; (4) adjustment reaction only; (5) other mental disorder

only; (6) anxiety with depression; (7) anxiety with a nondepressive mental disorder; (8) depression with a nonanxiety mental disorder; (9) adjustment reaction disorder with a mental disorder other than anxiety or depression; and (10) post-traumatic stress disorder (PTSD).⁴ We created corresponding dummy variables and assigned each employee to one of these ten groups.⁵

Prevalence Of Mental Disorders In The Workplace

Over the thirty-month study period, 330 or about 14.9 percent of the company's claims processors had a primary diagnosis of, and received treatment for, a mental disorder. The most common mental disorder in this employee population was depression (7.4 percent prevalence). While this prevalence rate is less than the National Comorbidity Survey (NCS)—estimated female prevalence of 12.9 percent, the NCS prevalence rate is for a lifetime, it includes both diagnosed and undiagnosed depression, and it encompasses both the working and nonworking populations.⁶ The prevalence of other diagnosed mental disorders at this company was in the range of 4.3–5 percent.

We observed extensive comorbidities with other mental disorders. Slightly more than half of the employees diagnosed with a mental disorder during the study period had multiple distinct primary mental disorder diagnoses: 24.2 percent had two, 11.8 percent had three, 4.5 percent had four, 2.7 percent had five, 2.7 percent had six, 1.5 percent had seven, and 2.1 percent had eight (the largest was sixteen). Among employees with anxiety, 51 percent had a comorbid mental disorder, the most common being depression (36 percent). These comorbidity patterns are roughly consistent with those observed for total populations that include nonworkers.⁷ One implication of this is that it was not uncommon for employees to show up at work and attempt to function even as they coped with and were being treated for one or more mental disorders.

DATAWATCH

247

Direct Cost Findings

■ **Medical care use and spending.** Medical care use and spending (from claims data) differed considerably among the employee subgroups (Exhibit 1). Annualized inpatient expenditures were lowest for the no-mental-disorder and random groups; increased sharply for those with depression, anxiety, and adjustment reactions; and were highest for those with an “other mental disorder” diagnosis. The outpatient and drug expenditure comparisons are similar to the inpatient patterns. In terms of total direct medical expenditures, employees with depression, anxiety, and adjustment reactions, on average, had claims about three times the amount filed by those with no mental disorder or in the randomly selected employee groups, while employees with other mental disorders had even higher

EXHIBIT 1**Annualized Medical Care Use And Claims Expenditures For Employees In Alternative Major Diagnosis Categories, 1993–1995**

	Major depression disorder	Anxiety	Adjustment reaction	Other mental disorder	No mental disorder	Random
Number of employees	165	96	105	112	1,892	229
Utilization quantity						
Inpatient days						
Mean	7.9	7.9	8.5	12.6	1.7	1.9
SD	22.2	20.0	23.4	27.9	6.1	6.2
Outpatient visits						
Mean	18.5	17.9	21.1	19.5	5.8	8.2
SD	21.1	20.0	25.8	24.1	7.0	11.0
Prescriptions						
Mean	20.5	19.6	17.9	20.9	8.3	9.2
SD	25.9	23.1	21.3	25.5	12.9	13.5
Expenditures						
Inpatient						
Mean	\$ 2,965	\$ 2,665	\$ 2,982	\$ 3,928	\$ 851	\$1,037
SD	7,827	7,169	7,867	9,211	2,411	2,752
Outpatient						
Mean	3,234	2,853	3,566	3,474	1,150	1,219
SD	4,664	5,161	5,417	5,886	2,099	1,867
Prescriptions						
Mean	468	429	382	425	134	144
SD	680	649	611	680	276	238
Total						
Mean	6,667	5,921	6,931	7,828	2,135	2,401
SD	12,269	12,297	12,907	15,043	4,248	4,357

SOURCE: Authors' analysis of company's data.

NOTES: Employees having at least one diagnosis. SD is standard deviation.

claims. Although employees with mental disorders accounted for 15 percent of the employee population, they accounted for 31 percent of all employees' total medical spending during the study period.

Additional variation in spending patterns emerges when one examines subtypes within both the anxiety and adjustment reaction disorders (Exhibit 2). Employees with panic disorder and other anxiety diagnoses had slightly lower total medical spending than did those diagnosed with generalized anxiety and social phobias, while those with other adjustment reactions had expenditures in between. In sharp contrast, mean total medical spending for the PTSD group was about fourteen times larger than that of the random group and about five times larger than that of any of the other anxiety and adjustment disorder subtypes in Exhibit 2. The sample size for PTSD is, however, very small (five females and one male).

These univariate comparisons are compromised by extensive comorbidities, and possibly by age and sex. As noted earlier, we deal with this by using multivariate least squares and a set of solo-multiple mental disorder dummy variables. The first set of findings we observed from our regression analyses was not unexpected: The

EXHIBIT 2

Annualized Medical Use And Claims Expenditures For Employees By Anxiety Or Adjustment Reaction Subtype Diagnosis, 1993–1995

	Anxiety state subtype				Adjustment reaction subtype	
	Panic disorder	Generalized anxiety disorder	Phobic disorder	Other anxiety disorder	PTSD	Other adjustment reaction
Number of employees	17	20	15	73	6	102
Utilization quantity						
Inpatient days						
Mean	12.1	11.9	12.6	5.9	69.1	6.7
SD	25.0	29.4	31.1	13.4	103.7	15.1
Outpatient visits						
Mean	17.0	18.1	19.5	18.4	63.4	19.8
SD	17.4	17.1	19.1	20.4	95.3	20.4
Prescriptions						
Mean	19.6	19.3	22.0	18.7	27.5	17.7
SD	21.3	30.3	30.1	20.9	31.8	21.0
Expenditure						
Inpatient						
Mean	\$2,432	\$ 3,204	\$ 3,124	\$ 2,544	\$19,422	\$2,393
SD	2,725	7,796	7,999	7,293	32,189	5,388
Outpatient						
Mean	2,621	3,089	3,315	2,939	12,736	3,301
SD	2,589	3,770	3,819	5,617	16,142	4,725
Prescriptions						
Mean	449	504	504	384	1,039	358
SD	598	1,010	1,009	438	1,756	542
Total						
Mean	5,502	6,747	6,944	5,867	33,198	6,053
SD	5,169	12,223	12,476	12,755	49,146	9,533

SOURCE: Authors' analysis of company's data.

NOTES: PTSD is post-traumatic stress disorder. SD is standard deviation.

medical expenditures of those with more than one mental health disorder were significantly higher than expenditures for those with one mental health disorder, which in turn were significantly greater than expenditures for those with no mental disorder. However, employees in the ten solo/multiple disorder classes can be validly aggregated into four groups: no mental disorder, a single mental disorder, multiple mental disorders, and PTSD.

More specifically, in the log total medical expenditure equation, the regression coefficients for the four solo mental disorders—anxiety, depression, adjustment reactions, and other mental disorder—are similar in magnitude to each other. Since they average about 1.5 and are each statistically significant, they imply that controlling for age and sex, the total medical expenditures for those with a single mental disorder are about 4.5 times larger than for those with no mental disorder. Moreover, total medical expenditures are even greater for those with mental health comorbidities, and their parameter estimates are also all quite similar to each other. With an average of around 2.3, these parameter estimates imply that, control-

ling for age and sex, employees with more than one mental health disorder have total medical expenditures about ten times those of employees with no mental disorder. Finally, the coefficient estimate of 3.514 ($t = 2.72$) for the PTSD dummy variable implies even greater total medical expenditures for those with this condition (thirty-three times the no-mental-disorder group), other things being equal. For health care expenditure analyses involving the mental health disorders, not only is it conceptually convenient to simplify into these three groups—single disorder, multiple disorders, and PTSD—but in fact these claims data from this employer provide validating empirical support for this aggregation.⁸

■ **Anxiety disorders plus other illnesses.** Other published studies report that patients with anxiety disorders not only often have other mental disorders but also frequently have somatic symptoms, as well as injury from attempted suicide (Exhibit 3).⁹ As expected, average total medical costs associated with mental disorders are much larger for anxious employees than for the randomly se-

EXHIBIT 3

Annualized Average Direct Medical Care And Emergency Room Expenditures, By Complaint, Among Employees Diagnosed With Anxiety And A Ten Percent Random Sample, 1993–1995

Complaint	Total medical costs		Emergency room costs	
	Anxiety	Random	Anxiety	Random
Infectious and parasitic	\$ 111	\$ 11	\$ 0	\$ 0
Neoplasms	190	37	82	0
Endocrine, immunity, and metabolic	116	48	27	0
Blood	1	1	0	0
Mental disorders	1,479	191	450	69
Anxiety	250		49	
Nonanxiety	1,229		402	
Nervous system	138	115	22	0
Circulatory system	193	115	45	78
Respiratory system	109	68	0	0
Digestive system	327	181	8	34
Genitourinary system	445	396	37	16
Pregnancy complications	296	455	12	54
Skin	327	27	38	0
Musculoskeletal and connective tissue	300	144	0	0
Congenital anomalies	3	5	0	0
Perinatal conditions	1	2	0	0
Symptoms, signs, and ill-defined	425	173	0	0
Injury and poisoning	453	121	152	0
Supplementary factors	224	123	0	0
Other	371	46	0	0
Total (including anxiety)	5,509	2,259	874	251
Total (excluding anxiety)	5,259		825	
Number of employees	96	229	96	229

SOURCE: Authors' analysis of company's data.

lected employee subset. However, differences are large in a number of somatic complaint categories, for which annualized average costs for employees with anxiety are more than \$250 higher than for randomly selected employees. The wide range of somatic disease types over which the anxiety group has much greater spending than the random group is notable.

Total annualized emergency room costs are three to four times higher for anxious employees than for the randomly selected subset. About 60 percent of the approximately \$625 annual average total difference is accounted for by differential mental disorder expenditures (\$450 versus \$69). However, most of the remainder is accounted for by greater emergency room claims for anxious employees involving injury and poisoning, neoplasms, and circulatory system complaints. These findings illustrate the much higher and wide-ranging use of emergency facilities by anxious employees.

Indirect Cost Findings

We now examine whether employees receiving treatment for these various health conditions differ in their work performance from other employees.

■ **Job tenure.** One possible source of differential performance among the employee subgroups is variation in on-the-job experience. We define *job tenure* as time since first employed at the company to the last date observed at work, in elapsed days. The mean job tenure is about 2,000 days. We estimated by multivariate least squares an equation with log job tenure as the dependent variable, with a variety of demographic and educational attainment variables as controls, and with the nine solo and comorbid mental health disorder dummy variables as regressors (defined earlier). As a group, we find no statistically significant difference in job tenure among those employees with one or more mental disorders relative to those without any diagnosed and treated mental disorder. However, using two-way comparisons between various subgroups, we find that those with depression only have a slightly shorter (about 20 percent) job tenure than those without any mental disorder, while the anxious only have a slightly longer (about 30 percent) job tenure, other things being equal. Apparently, heterogeneity in job tenure is related in some way to type of mental disorder.

This job-tenure variable measures elapsed time and may not accurately portray job experience if there were significant amounts of time away from work, such as for maternity leave. To assess this possibility, we estimated a logistic regression model with whether a female employee had any pregnancy-related medical claims as the dependent variable, with demographic variables as controls and the

“Employees with mental disorders have annualized absentee days that are no different from those with no mental disorders.”

various solo/multiple mental disorder dummy variables as additional regressors. As a group, those with one or more diagnosed and treated mental disorders were neither more nor less likely than those without any such disorder to have pregnancy-related medical claims. The only two-way statistically significant comparison involved depression-only relative to anxiety-only employees, with an odds ratio between them of 0.292, implying that depression-only employees were significantly less likely to have pregnancy-related claims than were anxiety-only employees. Those with anxiety plus depression were even less likely than those with anxiety only to have pregnancy-related claims, but the odds ratio of 0.131 was not as significant. These relationships should be interpreted cautiously, however, for the direction of causality could be ambiguous.

■ **Excess absenteeism.** In calculating employee absentee days, we excluded those days likely involving maternity leave. As noted earlier, however, this absentee measure includes regular holiday and vacation days and is essentially a regularly scheduled work day for which observed productivity was zero.

Based on least-squares estimates with the logarithm of these annualized absentee days as the dependent variable, we find no statistically significant difference in annualized absenteeism between employees with one or more diagnosed/treated mental disorders and those with none. The only two-way comparisons with the no-mental-disorder employee group that were statistically significant involved employees with depression plus another mental disorder, who with an estimated coefficient of 0.32 had approximately 37 percent more annualized absentee days than the no-mental-disorder group, other things being equal, and those with PTSD, whose absenteeism rate was about 200 percent higher.

■ **Productivity while at work.** We then excluded absentee days and instead addressed the question: Does the average daily at-work productivity of employees with various diagnosed and treated mental disorders differ from that of others? Using analogous multivariate regression procedures and with log of average daily productivity as the dependent variable, we find no evidence supporting the notion that employees diagnosed and being treated for one or more mental disorders are any different as a group in their average at-work productivity than those not diagnosed/treated for a mental disorder. None of the nine solo/multiple mental disorder coefficients

was significant. Hence, while several mental disorders have differential impacts on absenteeism, there is no differential effect on average at-work productivity.

Discussion

A unique aspect of this study is that we have been able to link employer-provided objective productivity data to employees' medical care use data, with confidentiality assured, and the productivity data do not rely on subjective or other self-reported perceptions of performance at work. These findings may not be generalizable, but the absence of any other comparable research to date makes this study a provocative and most interesting one.

■ **Diagnosis/treatment rate.** About 15 percent of the employees we studied had a primary diagnosis of and received treatment for various mental disorders during the thirty-month study period. For a workforce that is 95 percent female, given apparent widespread underdiagnosis and undertreatment, this rate appears quite substantial. It could reflect the generous health care benefits available at this company. While it is possible that the treatment-prevalence findings reflect such adverse selection, there is some evidence that they do not. Were adverse selection to be the case, one might expect to find job tenure to be greater among employees with treated mental disorders. We did not find this to be the case except among the anxiety-only employees, who have about a 30 percent longer job tenure.

■ **Absenteeism and productivity.** Although absentee rates vary among the mental disorders, in general those employees with one or more mental disorders have annualized absentee days that are no different from those with no mental disorders. While employees with either anxiety only or anxiety plus one or more mental health comorbidities exhibit no difference in annualized absentee days from the no-mental-disorders group, those with depression comorbid with a nonanxiety mental disorder had a statistically significant 37 percent higher absentee record. This suggests that the functional impairments associated with treating various mental disorders may well differ among the individual mental disorders, and particularly among the depressive comorbidities.

With respect to our average at-work productivity findings, a striking result is the lack of difference among employees with solo and multiple mental disorders compared with those with no mental disorder. These perhaps unexpected findings are not at all inconsistent, however, with the widespread perception that treatment of mental disorders results in productivity gain benefits to employees and employers.¹⁰ Several factors support the consistency of our findings with previous literature and these perceptions.

First, the similarities observed in the average productivity levels and absentee rates across groups can mask underlying differences in performance and absenteeism resulting from illness. For example, some employees suffering from a mental disorder may “make up” for poor performance, exerting greater effort at a later date when symptoms have abated. In terms of absenteeism, employees with mental disorders may use some of their regular vacation days when ill instead of taking a sick day. In such cases, the observed total number of days away from work over an extended period would be similar for those with and without mental disorders. Analyses spanning shorter periods of time, however, such as the week or two just prior to, during, and immediately following acute-phase treatment of a mental disorder, may reveal significant transitory productivity decreases that are offset later by work performance improvements. Employers may not be much concerned with transitory variations in at-work productivity, provided the employee’s average productivity over longer time spans is satisfactory, particularly when the tasks being performed are not time-critical.

Second, the employees we identify were receiving medical treatment for diagnosed mental disorders. We are of course unable to identify those employees who have but are not being treated for mental disorders. If treatments are effective, then the observed productivity levels of treated employees will reflect any improvements resulting from treatments. In contrast, since the productivity of the persons who go untreated (and therefore unobserved) is likely lower, this reduces the measured average productivity of the no-mental-disorder groups. Thus, to the extent that treatments are effective for those diagnosed, while functional impairments of untreated persons rise, the observed average productivity difference between the two groups is biased downward.

Third, the U.S. labor market is such that persons having chronic mental disorders are likely to have sorted themselves into occupations and jobs where they can perform at a level equal to that expected of the average employee. Thus, it may not be surprising to observe no difference in average productivity at work for mature employees with and without diagnosed/treated mental disorders. If the chronic illness were fully and permanently remitted, however, after some time one might expect that some employees would permanently improve their work performance, perhaps work more hours, or eventually change to an upgraded job. Moreover, if the mental disorder were diagnosed and effectively treated early, educational attainment and occupational choice could be affected.¹¹

■ **Medical care use.** We now turn to implications of findings involving use of medical care. The relatively very high direct medical

care expenditures of those employees with PTSD and with multiple mental disorders imply that the results of efforts to provide more efficient care, targeted to selected medical disorders and their comorbidities, should be readily observable and quantifiable by employers and policy analysts. In this context, it could be very useful to examine whether, for those patients having mental health comorbidities, medications indicated as being effective for several distinct mental disorders are also more cost-effective than a set of single-indication medications.

The indirect cost benefits manifesting as improvements in at-work productivity and absentee rates are not only more challenging to measure reliably than direct costs, but, as we find with these data, may not differ significantly among the various solo and multiple mental disorders. In the context of anxiety disorders, in the short term, providers and insurers may be the principal direct beneficiaries of improvements in treatment efficiency. Eventually, however, as favorable claims experiences accumulate and insurers pass on cost savings in the form of premium reductions, employers and employees benefit as well.

Our most notable empirical finding, however, is that evaluated over an extended time period of up to thirty months, the average daily productivity of employees diagnosed with and receiving treatment for one or more mental disorders is no different from that of employees with no mental disorders. That persons with more than one diagnosed and treated mental disorder are able to function satisfactorily at work is an important finding, with encouraging implications for employers, employees, and providers.

DATAWATCH

255

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NOTES

1. See, for example, P. Greenberg et al., "The Economic Burden of Depression in 1990," *Journal of Clinical Psychiatry* 54, no. 11 (1993): 405–418; and P. Greenberg et al., "The Economic Burden of Anxiety Disorders in the 1990s," *Journal of Clinical Psychiatry* 60, no. 7 (1999): 427–435.
2. V.H. Hamilton, P. Merrigan, and E. Dufresne, "Down and Out: Estimating the Relationship between Mental Health and Unemployment," *Health Economics* 6, no. 4 (1997): 397–406.
3. Details are available upon written request from Ernst Berndt, MIT Sloan School of Management, 50 Memorial Drive, E52-452, Cambridge, Massachusetts 02142.
4. In all cases of PTSD, other mental disorder comorbidities occurred. All PTSD cases are excluded from the other comorbid categories.
5. We used multivariate least squares to estimate parameters in an equation

with log total medical expenditures as the dependent variable, with controls for age, age squared, and gender, and with nine of the ten solo-comorbid dummy variables defined above (no mental disorder is the reference case). Similar equations are estimated with log job tenure, log annualized number of days absent, and log average productivity as the dependent variable. We also estimated a maternity claims probability equation by logistic regression methods, having the same set of explanatory variables. Using analysis of variance and F-tests in the linear regression equation, we examined whether certain coefficients on the nine solo-multiple mental disorder dummy variables were equal, so that aggregating into a smaller number of solo-multiple disease groupings was empirically valid. To test whether any two coefficients were equal, we used the studentized t-test. For the logistic regressions, we used chi-square tests for parameter significance and likelihood ratio tests for parameter equality.

6. R. Kessler et al., "Lifetime and Twelve-Month Prevalence of DSM-III-R Psychiatric Disorders in the United States: Results from the National Comorbidity Survey," *Archives of General Psychiatry* 51, no. 1 (1994): 8–19.
7. See Greenberg et al., "The Economic Burden of Anxiety Disorders in the 1990s"; and P.P. Roy-Byrne et al., "Panic Disorder in the Primary Care Setting: Comorbidity, Disability, Service Utilization, and Treatment," *Journal of Clinical Psychiatry* 60, no. 7 (1999): 492–499.
8. The F-statistic for the joint hypotheses that the single mental disorder coefficients are equal to each other and that the multiple mental disorder coefficients are equal to each other is 0.10, much less than the .05 critical value of 2.10. When a log total medical expenditure equation with the various disorder classes aggregated in this way is estimated by least squares, the parameter estimate on the one mental disorder only variable is 1.550 ($t = 6.81$), for comorbid mental disorders it is 2.456 ($t = 6.68$), and for PTSD it is 3.514 ($t = 2.72$). The PTSD estimate is not significantly different from that for multiple mental disorders ($t = 0.79$) due in part to the small PTSD sample size ($n = 6$), nor is it different from the single mental disorder estimate ($t = 1.50$). The estimates on the solo and multiple mental disorder dummy variables are, however, significantly different from each other ($t = 2.16$, p -value .038).
9. See, for example, W.J. Katon, "Chest Pain, Cardiac Disease, and Panic Disorder," *Journal of Clinical Psychiatry* 51 (Supplement 1990): 27–30; B.D. Beitman, "Panic Disorder in Patients with Angiographically Normal Coronary Arteries," *American Journal of Medicine* 92, no. 5A (1992): 33S–40S; C. Bass et al., "Patients with Angina with Normal and Near Normal Coronary Arteries: Clinical and Psychosocial State Twelve Months after Angiography," *British Medical Journal* 287, no. 6404 (1983): 1505–1508; and T. Zaubler and W. Katon, "Panic Disorder and Medical Comorbidity: A Review of the Medical and Psychiatric Literature," *Bulletin of the Menninger Clinic* 60, no. 2 (Supplement A, 1996): A12–A38.
10. See, for example, K. Wells et al., "The Functioning and Well-Being of Depressed Patients: Results from the Medical Outcomes Study," *Journal of the American Medical Association* 262, no. 7 (1989): 914–919; W. Broadhead et al., "Depression, Disability Days, and Days Lost from Work in a Prospective Epidemiologic Study," *Journal of the American Medical Association* 264, no. 19 (1990): 2524–2528; S. Ettner, R. Frank, and R. Kessler, "The Impact of Psychiatric Disorder on Labor Market Outcomes," *Industrial and Labor Relations Review* 51, no. 1 (1997): 69–75; D. Conti and W. Burton, "The Economic Impact of Depression in a Workplace," *Journal of Occupational Medicine* 36, no. 9 (1994): 983–988; and E. Berndt et al., "Workplace Performance Effects from Chronic Depression and Its Treatment," *Journal of Health Economics* 17, no. 5 (1998): 511–535.
11. E. Berndt et al., "Lost Human Capital from Early Onset Chronic Depression," *American Journal of Psychiatry* 157, no. 6 (2000): 940–947.