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TEN

The Association between Chronic Medical Conditions and Work Impairment

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The MIDUS survey design focuses on three broad classes of outcomes: health, well-being, and social responsibility. We hypothesized that some aspects of these outcomes would be positively associated. This chapter reports the results of analyses that investigate the hypothesized positive association between chronic medical conditions (one aspect of ill health) and work impairment (one aspect of diminished social responsibility).

The impact of chronic medical conditions on work performance has become a topic of considerable interest to health policy analysts in recent years (Murray and Lopez 1996). The incidence of chronic conditions in the general population is increasing as the age structure of society shifts upward (Fox 1989). This growing prevalence and the proliferation of costly therapies compromise our ability to provide medical treatment to people who suffer from chronic conditions (Burner, Waldo, and McKusick 1992). Healthcare administrators confront the practical problems of allocating scarce treatment resources and the ethical issues of letting availability and affordability affect medical treatment decisions. Concerned providers and policy-makers need and are seeking rational and humane triage rules.

The growing use of cost-effectiveness and cost-benefit analyses as tools for medical decision making is a result of the search for reasonable and acceptable treatment guidelines (Weinstein and Fineberg 1980). These approaches estimate ratios of the costs of health resources consumed by particular therapies to the benefits of treating each condition either in dollar terms (cost-benefit analysis) or in broader terms of quality of life outcomes (cost-effectiveness analysis). By using these ra-

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tios to make intervention determinations for individuals and resource allocations across conditions, healthcare administrators, providers, and policy-makers confer the maximum aggregate health benefit to the entire population (Hillner and Smith 1991; Pauker and Pauker 1987).

Cost-effectiveness studies regarding the benefits of treating versus not treating medical conditions are heavily dependent on the quality and availability of information. Many dimensions, such as well-being, quality of life, and societal burden, must be considered both from the perspective of the ill person and from the perspectives of family, friends, and others whose lives are affected by the illness. Because of difficulties in interpreting and valuing these outcomes, considerable uncertainty exists about the implications of current information on cost-effectiveness. Despite this uncertainty, the available evidence clearly shows irrationalities in the allocation of healthcare resources.

One of the most unfortunate of these irrationalities is the underutilization of inexpensive early detection and intervention programs. Preventive measures available for many illnesses avoid both direct and indirect costs (Breslow 1990). The disproportionate allocation of healthcare resources across conditions and therapies illustrates another irrationality. For example, the resources devoted in the United States to fatal disorders and to acute conditions are much greater in relation to their comparative prevalence and effects on functioning than the resources devoted to nonfatal disorders and chronic conditions (Hoffman, Rice, and Sung 1996; Verbrugge and Patrick 1995). Also problematic is the differential allocation of treatment resources to mental disorders versus physical disorders. Empirical studies show clearly that mental disorders affect functioning about as much as or more than most physical disorders (Hays et al. 1995; Ormel et al. 1998), but U.S. health insurance plans traditionally impose special barriers to mental health treatment, such as considerably higher co-payments and caps on number of visits (Frank and McGuire 1994).

The healthcare community must move beyond making broad conclusions about existing irrationalities and make practical decisions about particular therapies for particular conditions. Future research needs to focus on the direct costs of treating medical conditions versus the indirect costs of not treating these conditions and versus the cost-saving effects of restoring lost functional capacities by means of these treatments. Cost-effectiveness comparisons available to date are largely indirect because most studies focus on only a single condition at a time (Farnham 1994; Stang, Von Korff, and Galer 1996) or on only a small

set of conditions at a time (Tarlov et al. 1989; Verbrugge and Patrick 1995). This report takes a first step toward expanding this comparative picture by presenting nationally representative data on a wide range of chronic conditions.

Work impairment is not the only important factor to consider in a comprehensive comparative analysis of the costs of illness, but it has generated considerable interest recently because it can be operationalized and monetized fairly easily and it represents a cost both to employees and to employers. Initial study results estimating the effects of specific illnesses on work performance reveal enormous implications for the economy. For example, depression is the mental disorder thought to have the largest effect on work disability (Conti and Burton 1994; Kouzis and Eaton 1994). A recent analysis estimated that depression alone leads to an annual loss of $17 billion due to work absenteeism in the United States (Greenberg et al. 1993). With costs as great as this, can society afford not to treat disorders that not only are highly prevalent and highly impairing, but that also are responsive to treatment? Given the preceding example, the indirect cost reductions from improved workplace performance likely would substantially outweigh the costs of treatment for at least some chronic conditions. Treatment of these conditions becomes an investment opportunity for employers, rather than a cost of doing business.

Employers clearly are aware that certain health programs are cost-effective in increasing worker performance, as worksite-sponsored initiatives for flu vaccination and substance abuse treatment demonstrate. Many health policy researchers believe that aggressive outreach and treatment would be cost-effective for a much larger set of conditions. Accurate information on the indirect costs of medical disorders and on the direct costs of prevention could substantiate this hypothesis and also would inform the health insurance debate, have an impact on workplace intervention programs, and help direct future cost-benefit research. Considerable interest already exists for conducting comparative studies that would examine the relative effects of many different chronic conditions on workplace functioning. The current chapter presents the first nationally representative study of this sort.

Methods

Measures

The data analyzed in this chapter result from MIDUS questions regarding the twelve-month prevalence of twenty-nine chronic medical

conditions or clusters of conditions and the thirty-day prevalence of work-loss days and work-cutback days. Respondents selected from a standard checklist of conditions preceded by the question "In the past twelve months, have you experienced or been treated for any of the following?" Twenty-seven of the twenty-nine items on the list are physical disorders (e.g., tuberculosis, hay fever); the other two refer more generally to substance disorders ("alcohol or drug problems") and mental disorders ("anxiety, depression, or some other emotional disorder").

A separate section of the interview expanded these last two items using the World Health Organization Composite International Diagnostic Interview Short-Form, or CIDI-SF (Kessler et al. 1998), screening scales for the DSM-III-R (American Psychiatric Association 1987) disorders of alcohol dependence, drug dependence, major depression (MD), generalized anxiety disorder (GAD), and panic attacks (PA). Respondents were classified as having alcohol or drug dependence if they screened positive for these items on the CIDI-SF. If they did not screen positive for alcohol or drug dependence, but did endorse the checklist item "alcohol or drug problems," they were classified as having some "other substance disorder." Respondents were classified as having MD, GAD, or PA based on the CIDI-SF. If they did not screen positive for MD, GAD, or PA, but did endorse the checklist item about mental disorders, they were classified as having some "other emotional disorder."

This augmentation of the original checklist resulted in a total of thirty-four items, twenty-seven physical and seven mental. We reduced this list to twenty-nine for purposes of analysis by collapsing tuberculosis (TB) and "other lung problems" into the "other lung problems" category and by collapsing stroke with hypertension into one category of "hypertension/stroke" due to the small number of respondents reporting strokes. We combined "lupus or other autoimmune disorders" and "multiple sclerosis, epilepsy, or other neurological disorders" into an "autoimmune/neurological disorders" category because few respondents fell into the original categories. We deleted "AIDS or HIV infection" and "other substance disorder" entirely because only a handful of people endorsed these choices.

The questions on thirty-day prevalence of work-loss days and work-cutback days asked each respondent how many days out of the past thirty he or she was "totally unable to work or carry out your normal household work activities because of your physical health or mental health" and how many additional days out of thirty he or she was able to work, but had to "cut back on work or how much you got done

because of your physical health or mental health." We combined the information on work-loss and work-cutback days into a summary measure of work "impairment" days. This report defines work "impairment" days as a weighted sum of work-loss days and work-cutback days with each work-cutback day counted as a half day. This weighting scheme is based on results from a national phone survey pilot for MIDUS in which respondents estimated that they were about half as productive on reported work-cutback days as on normal work days.

Analysis Procedures

We examined the aggregate distribution of work-loss days and work-cutback days in the total sample as a function of number and type of chronic conditions. Using a series of regression equations, we then determined whether some conditions are more powerful than others in predicting work impairment. We also checked for any significant interactions among conditions. Finally, we used a series of moderated regression equations to estimate the relative effects of different conditions on work performance as a function of age, sex, education, and occupational status.

All results are based on weighted data that adjust for differential probabilities of selection within households and for differences between the sample distribution and census population distribution on a range of sociodemographic variables. Statistical significance was evaluated using .05-level two-sided tests. These tests did not take into consideration the design effects introduced by weighting because simulations using jackknife repeated replications (Kish and Frankel 1974) have found that inflation of standard errors in design-based estimation for most univariate and bivariate estimates are too small to affect significance tests of the sort reported in this chapter.

Results

Prevalence of Work-Loss Days and Work-Cutback Days

As shown in table 10.1, approximately one-sixth of MIDUS respondents (16.0%) reported at least one work-loss day in the previous thirty days, and a somewhat larger number (18.8%) reported at least one work-cutback day. The monthly averages for number of work-loss days among those with any work loss and for number of cutback days among those with any cutback are 6.7 and 5.9, respectively. Over one-fourth of respondents (28.0%) reported at least one work loss or work-cutback day, with a monthly average of 5.8 impairment days among

TABLE 10.1 Prevalence and Frequency of Work Loss, Work Cutback, and Work Impairment

	Prevalence[a]	Frequency	
		Mean[b]	Average per Capita[c]
A. Total sample			
Work-loss days	16.0 (0.6)	6.7 (0.3)	1.1 (0.1)
Work-cutback days	18.8 (0.6)	5.9 (0.2)	1.1 (0.1)
Work-impairment days	28.0 (0.7)	5.8 (0.2)	1.6 (0.1)
B. Employed			
Work-loss days	13.9 (0.9)	4.2 (0.4)	0.6 (0.1)
Work-cutback days	16.5 (0.8)	4.7 (0.3)	0.8 (0.1)
Work-impairment days	24.6 (0.7)	3.8 (0.3)	0.9 (0.1)
C. Retired			
Work-loss days	11.9 (2.2)	8.4 (1.3)	1.0 (0.2)
Work-cutback days	19.7 (2.0)	8.9 (0.9)	1.8 (0.3)
Work-impairment days	26.2 (1.6)	7.0 (0.8)	1.8 (0.3)
D. Homemaker			
Work-loss days	21.3 (3.6)	6.8 (1.2)	1.5 (0.3)
Work-cutback days	30.0 (3.3)	5.1 (0.7)	1.5 (0.3)
Work-impairment days	43.3 (2.9)	5.0 (0.7)	2.2 (0.4)
E. Other employment status			
Work-loss days	36.0 (1.3)	14.8 (0.6)	5.3 (0.3)
Work-cutback days	26.7 (1.2)	10.2 (0.4)	2.7 (0.2)
Work-impairment days	44.9 (1.3)	14.9 (0.5)	6.8 (0.3)

Note: "Work-impairment days" are defined as a weighted sum of work-loss days plus 50% of work-cutback days. For example, a person with three work-loss days and four work-cutback days has five work-impairment days, since $3 + (.5 \times 4) = 5$. Respondents reporting at least one day of either work loss or work cutback are also counted as having at least a partial work-impairment day. Numbers in parentheses in the body of the table indicate standard error.

[a] The percentage of respondents in each specified category who reported at least one work-loss or work-cutback day during the preceding thirty days.

[b] The mean number of days of the indicated type accumulated during the preceding thirty days by respondents who reported at least one work-loss or work-cutback day during that time.

[c] The mean number of days of the indicated type accumulated during the preceding thirty days by all respondents in the specified category, including those who reported no work impairment.

those with at least one day of either sort. The estimated average per capita number of work-impairment days in the total sample ages twenty-five to seventy-four is 1.6 per month. This is equivalent to an annualized national estimate of over three billion work-impairment days in the age range of the sample.

The remainder of table 10.1 presents comparable results broken

down by employment status. The highest average per capita number of work-impairment days (6.8 per month) occurs among respondents in the "other" employment status category, which consists largely of the disabled or people looking for work. The lowest average per capita number of work-impairment days (0.9 per month) occurs among employed people. It is noteworthy that work impairment is not markedly more likely among the "other" employment status respondents (44.9%) than among homemakers (43.4%), but that the average monthly frequency of impairment is much higher among the "others" (14.9 days) than among homemakers (5.0 days). Presumably this is because many people with long-term disabilities fall into the "other" category.

Bivariate Associations of Conditions and Work Impairment

The summary results in table 10.2 show associations of number and prevalence of chronic conditions with probability of any work-impairment days, average frequency of impairment, and average per capita number of impairment days accumulated during a thirty-day

TABLE 10.2 Bivariate Associations between Number of Chronic Conditions and Work Impairment

Number of Conditions	Prevalence of Conditions	Prevalence of Impairment[a]	Mean Number of Impairment Days[b]	Average per Capita Number of Impairment Days[c]
0	21.9 (0.6)	13.6 (1.0)	2.6 (0.4)	0.3 (0.1)
1	19.9 (0.6)	19.1 (1.4)	3.4 (0.4)	0.7 (0.1)
2	16.1 (0.6)	23.4 (1.6)	5.2 (0.6)	1.2 (0.2)
3	13.1 (0.5)	30.0 (2.1)	4.4 (0.6)	1.3 (0.2)
4–5	16.1 (0.6)	39.5 (2.0)	6.4 (0.6)	2.6 (0.2)
6+	13.0 (0.5)	55.1 (2.3)	8.7 (0.6)	4.8 (0.4)
		$\chi^2_5 = 273.1$ $p < .001$	$F_{5,832} = 13.0$ $p < .001$	$F_{5,3026} = 56.0$ $p < .001$

Note: "Work-impairment days" are defined as a weighted sum of work-loss days plus 50% of work-cutback days. For example, a person with three work-loss days and four work-cutback days has five work-impairment days, since $3 + (.5 \times 4) = 5$. Numbers in parentheses in the body of the table indicate standard error.

[a] The percentage of respondents who reported at least one work-loss or work-cutback day during the preceding thirty days.

[b] The mean number of days accumulated during the preceding thirty days by respondents who reported at least one work-loss or work-cutback day during that time.

[c] The mean number of days accumulated during the preceding thirty days by all respondents, including those who reported no work impairment.

period. A clear dose-response relationship exists between number of conditions and probability of any work impairment, from a low of 13.6% for respondents with no conditions to a high of 55.1% for those with six or more conditions. A dose-response relationship also exists between number of conditions and average monthly frequency of work impairment, from a low of 2.6 days for respondents with no conditions to a high of 8.7 days for those with six or more conditions. Overall average per capita impairment frequency ranges from a low of 0.3 days per person per month for respondents with no conditions to a high of 4.8 days per person per month for those with six or more conditions.

More detailed results regarding prevalence and frequency of work impairments associated with each of the twenty-nine chronic conditions derived from MIDUS appear in table 10.3. Physical and mental disorders are listed separately in order of prevalence. Condition-specific probabilities of any work impairment range from a low of 33.8% for foot problems to a high of 61.3% for generalized anxiety disorder (GAD). Four of the five most commonly reported chronic conditions are mental disorders. In addition to GAD, these are drug dependence (60.8%), panic attacks (56.4%), and major depression (51.9%).

TABLE 10.3 Condition-Specific Prevalence of Work Impairment

Chronic Condition	Prevalence of Condition	Prevalence of Impairment[a]	Mean Number of Impairment Days[b]	Average per Capita Number of Impairment Days[c]
Physical				
Stomach problems[d]	20.4 (0.6)	42.9 (1.9)	7.3 (0.5)	3.1 (0.2)
Back problems[e]	20.3 (0.6)	39.7 (1.8)	8.0 (0.5)	3.2 (0.2)
Arthritis[f]	19.4 (0.6)	38.8 (1.8)	8.3 (0.6)	3.2 (0.3)
Hypertension/stroke[g]	18.2 (0.6)	34.6 (1.8)	9.0 (0.6)	3.1 (0.3)
Hay fever	15.7 (0.6)	39.6 (2.0)	5.1 (0.5)	2.0 (0.2)
Bladder problems[h]	13.5 (0.5)	41.9 (2.2)	7.9 (0.6)	3.3 (0.3)
Sleep problems[i]	12.8 (0.5)	50.6 (2.3)	9.8 (0.7)	5.0 (0.4)
Asthma[j]	12.6 (0.5)	44.7 (2.3)	7.7 (0.6)	3.5 (0.3)
Foot problems[k]	11.6 (0.5)	33.8 (2.3)	7.4 (0.4)	2.5 (0.3)
Piles or hemorrhoids	11.4 (0.5)	34.0 (2.4)	7.8 (0.8)	2.7 (0.3)
Migraine headaches	11.2 (0.5)	49.9 (2.6)	7.2 (0.6)	3.6 (0.4)
Skin problems[l]	10.5 (0.5)	44.5 (2.4)	5.7 (0.5)	2.6 (0.3)
Teeth problems[m]	10.3 (0.5)	35.3 (2.5)	8.0 (0.7)	2.8 (0.3)
Gum problems[n]	8.3 (0.4)	37.1 (2.9)	7.3 (0.8)	2.7 (0.4)
Constipation[o]	6.9 (0.4)	46.0 (3.4)	8.0 (0.8)	3.7 (0.5)
Diabetes[p]	5.6 (0.4)	40.2 (3.5)	7.6 (1.1)	3.1 (0.5)

TABLE 10.3 *continued*

Chronic Condition	Prevalence of Condition	Prevalence of Impairment[a]	Mean Number of Impairment Days[b]	Average per Capita Number of Impairment Days[c]
Ulcer	4.4 (0.3)	52.7 (4.1)	10.9 (1.1)	5.8 (0.7)
Thyroid disease	4.3 (0.3)	35.5 (3.8)	5.6 (0.9)	2.0 (0.4)
Other lung problems[q]	3.7 (0.3)	49.1 (4.2)	11.0 (1.1)	5.4 (0.7)
Hernia[r]	3.2 (0.3)	44.8 (4.8)	11.3 (1.5)	5.1 (0.8)
Autoimmune/neurological disorders[s]	2.6 (0.2)	51.6 (4.8)	9.7 (1.0)	5.0 (0.7)
Gall bladder	2.6 (0.2)	44.8 (5.4)	9.5 (1.4)	4.3 (0.8)
Varicose veins[t]	1.5 (0.2)	40.7 (7.3)	13.2 (2.0)	5.4 (1.2)
Mental				
Major depression[u]	14.1 (0.5)	51.9 (2.0)	8.3 (0.5)	4.3 (0.3)
Other emotional disorder[v]	9.6 (0.5)	39.7 (2.6)	4.9 (0.5)	2.0 (0.2)
Panic attacks[u]	6.8 (0.4)	56.4 (2.9)	9.5 (0.7)	5.3 (0.5)
Alcohol dependence[u]	4.3 (0.3)	37.1 (3.7)	4.3 (0.8)	1.6 (0.3)
Generalized anxiety disorders[u]	3.3 (0.3)	61.3 (4.4)	9.8 (1.0)	6.0 (0.8)
Drug dependence[u]	2.0 (0.2)	60.8 (5.9)	8.1 (1.2)	4.9 (0.8)

Note: "Work-impairment days" are defined as a weighted sum of work-loss days plus 50% of work-cutback days. For example, a person with three work-loss days and four work-cutback days has five work-impairment days, since $3 + (.5 \times 4) = 5$. Numbers in parentheses in the body of the table indicate standard error.

[a] The percentage of respondents in each specified category who reported at least one work-loss or work-cutback day during the preceding thirty days.

[b] The mean number of days accumulated during the preceding thirty days by respondents who reported at least one work-loss or work-cutback day during that time.

[c] The mean number of days accumulated during the preceding thirty days by all respondents in the specified category, including those who reported no work impairment.

[d] "Recurring stomach trouble, indigestion, or diarrhea."

[e] "Sciatica, lumbago, or recurring backache."

[f] "Arthritis, rheumatism, or other bone or joint diseases."

[g] "High blood pressure or hypertension" or "stroke."

[h] "Urinary or bladder problems."

[i] "Chronic sleeping problems."

[j] "Asthma, bronchitis, or emphysema."

[k] "Persistent foot trouble (e.g., bunions, ingrown toenails)."

[l] "Persistent skin trouble (e.g., eczema)."

[m] "Persistent trouble with your teeth."

[n] "Persistent trouble with your gums or mouth."

[o] "Being constipated all or most of the time."

[p] "Diabetes or high blood sugar."

[q] "Tuberculosis" or "other lung problems."

[r] "Hernia or rupture."

[s] "Lupus or other autoimmune disorder" or "multiple sclerosis, epilepsy, or other neurological disorder."

[t] "Trouble with varicose veins requiring medical treatment."

[u] Screened positive for this DSM-III-R diagnosis in the CIDI-SF.

[v] Endorsed the MIDUS item "anxiety, depression, or some other emotional disorder," but did not screen positive for MD, GAD, or PA on the CIDI-SF.

The only physical disorder in the top five is ulcer (52.7%). Average monthly frequency of work impairment for people with specific conditions range from a low of 4.3 days for alcohol dependence to a high of 13.2 days for varicose veins. The other conditions with highest average impairment frequency are hernia (11.3), other lung problems (11.0), ulcer (10.9), GAD (9.8), and sleep problems (9.8). The conditions with the highest per capita number of impairment days, taking into consideration both probability of impairment and average frequency of impairment, are GAD (6.0 impairment days), ulcer (5.8), varicose veins (5.4), other lung problems (5.4), and panic attacks (5.3).

Multivariate Associations of Conditions and Work Impairment

The results in table 10.4 show that both probability of work impairment and average frequency of impairment significantly vary with age and employment status. Young adults are more likely than older adults to have any work impairment, but the average frequency of their impairments is less than that of older adults. Employed people are significantly less likely than homemakers, the retired, and those in the "other" employment category (those looking for work, the disabled, and students) to have any work impairment. The respondents from the "other" category, without employment, have a dramatically higher average frequency of impairment than those with employment, reflecting the fact that "other" includes respondents who are disabled. Women are significantly more likely than men to have any work impairment, but their average frequency of impairment is marginally less than that of men. Although probability of work impairment did not vary by level of educational attainment, education is significantly related to average frequency of impairment such that those with a high school education or less have greater average frequency of impairment than those with at least a college education.

We began our multivariate analysis of condition-specific effects on per capita impairment by estimating a multiple regression equation that controlled for all the sociodemographic influences. The equation also included separate dummy variables for each of the twenty-nine conditions in table 10.3 in order to adjust for the fact that some people suffer from more than one condition. Results (not shown) found that only fifteen of the twenty-nine conditions were either statistically significant or substantively meaningful predictors of per capita work impairment. Results of a reduced model that included these fifteen predictors plus sociodemographic controls appear in table 10.5. This

TABLE 10.4 Regressions of any Work Impairment and Mean Number of Impairment Days on Sociodemographic Predictor Variables

	Prevalence of Impairment Days[a]		Mean Number of Impairment Days[b]	
Variable	OR	(95% CI)	*b*	(SE)
Sex				
Female	2.1*	(1.7–2.5)	−1.0	(0.5)
Male	1.0	(—)	0.0	(—)
Age				
25–35	1.8*	(1.4–2.3)	−1.6*	(0.8)
36–54	1.5*	(1.2–1.9)	−0.7	(0.7)
55–74	1.0	(—)	0.0	(—)
Education				
0–12	0.8	(0.7–1.0)	2.4*	(0.6)
13–15	1.0	(0.8–1.2)	1.2	(0.7)
16+	1.0		0.0	(—)
Employment				
Employed	1.0	(—)	0.0	(—)
Retired	1.7*	(1.2–2.3)	1.6	(0.9)
Homemaker	1.9*	(1.5–2.6)	0.8	(0.8)
Other	2.4*	(1.8–3.1)	10.5*	(0.8)
	$\chi^2_8 = 160.3$ $p < .001$		$F_{8,829} = 31.3$ $p < .001$	

Note: "Work-impairment days" are defined as a weighted sum of work-loss days plus 50% of work-cutback days. For example, a person with three work-loss days and four work-cutback days has five work-impairment days, since $3 + (.5 \times 4) = 5$.

[a] The percentage of respondents in each specified category who reported at least one work-loss or work-cutback day during the preceding thirty days. The coefficients and confidence intervals were estimated using logistic regression (OR = odds ratio; 95% CI = 95% confidence interval of the OR).

[b] The mean number of days of the indicated type accumulated during the preceding month by respondents who reported at least one work-loss or work-cutback day during that time. The coefficients and standard errors were estimated using linear regression (*b* = nonstandardized regression coefficient; SE = standard error of the regression coefficient).

* Significant at the .05 level, two-sided test.

reduced set of conditions includes eleven physical disorders and four mental disorders, with net condition-specific effects on per capita impairment ranging from a low of 0.4 for migraine and back problems to a high of 1.8 for panic attacks.

Conditions are presented in table 10.5 in order of their per capita

TABLE 10.5 Regression of per Capita Number of Impairment Days on a Reduced Set of Chronic Conditions

Chronic Condition	*b*	(SE)	β
Panic attacks	1.8*	(0.3)	0.09
Ulcer	1.7*	(0.4)	0.07
Sleep problems	1.6*	(0.3)	0.11
Autoimmune/neurological disorders	1.5*	(0.5)	0.05
Major depression	1.4*	(0.2)	0.10
Generalized anxiety disorder	1.4*	(0.5)	0.05
Drug dependence	1.2*	(0.6)	0.03
Hernia	1.3*	(0.5)	0.04
Other lung problems	1.2*	(0.4)	0.04
Bladder problems	0.9*	(0.2)	0.06
Hypertension/stroke	0.8*	(0.2)	0.06
Asthma	0.7*	(0.2)	0.05
Arthritis	0.7*	(0.2)	0.06
Migraine headaches	0.4	(0.3)	0.03
Back problems	0.4*	(0.2)	0.04
	$F_{15,3008} = 34.8$		
	$p < .001$		

Note: See notes to table 10.1 for definitions of the outcome. The coefficients and standard errors were estimated using linear regression, controlling for the sociodemographic predictors in table 10.4 (*b* = nonstandardized regression coefficient; SE = standard error of the nonstandardized regression coefficient; β = standardized regression coefficient).

*Significant at the 0.05 level, two-sided test.

effects. The standardized coefficients presented in the last column of the table take into consideration both this variation in per capita effects and variation in the prevalence of the conditions. The conditions with the highest standardized coefficients are sleep problems, major depression, and panic attacks. The first two of these three have high prevalence in comparison to the other conditions (12.8% for sleep problems and 14.1% for major depression) in conjunction with comparatively large nonstandardized regression coefficients (third highest rank for sleep problems and fifth highest rank for major depression). Panic attacks, in comparison, are considerably less prevalent (6.8%), but have the highest nonstandardized regression coefficient of any condition considered in the table. Each of these three conditions uniquely explains approximately one percent of the variance in overall per capita work impairment (i.e., the square of each of their standardized regression coefficients is close to .01).

Next we tested the significance of between-condition variation in average per capita effects on impairment. We rejected the hypothesis that this variation is due entirely to chance ($F_{14,3008} = 2.8$). We also tested the significance of comorbidities among the conditions in predicting per capita impairment. Aggregate measures of having exactly two, exactly three, or four or more conditions were associated with significant explained variation in impairment over and above the variance explained by an additive model ($F_{3,3005} = 14.8$). The regression coefficients associated with these aggregate measures of comorbidity were all negative, which means that the impairment associated with comorbidity is less than the sum of the impairments associated with the component conditions.

Finally, we tested whether the effects of conditions on per capita work impairments vary as a function of sociodemographic variables. Statistically significant variations of this sort were found by sex ($F_{18,2987} = 1.7$), age ($F_{36,2969} = 2.2$), education ($F_{36,2969} = 1.8$), and employment status ($F_{53,2952} = 7.8$). Summary results appear in tables 10.6 and 10.7. Significant variations were found for twelve of the fifteen conditions, the largest number of which occurred for employment status (eight conditions) and the smallest for sex (three) and education (two). The general trend for conditions with significant variation was for effects to be lowest for respondents in the age range of twenty-five to thirty-five (lung, migraine, and bladder), higher for women (drug dependence, panic, and lung) than men, and higher for homemakers (autoimmune/neurological, ulcer, hypertension/stroke, migraine) than employed people. No consistent pattern in the conditions with significant variation exists by level of educational attainment. However, there is a clear pattern in the overall set of coefficients for the average effects to be higher among respondents with the lowest level of educational attainment than it is among those with higher levels of education.

In order to compare rank orderings of average effects across the subsamples in tables 10.6 and 10.7, we focused on the five conditions in each of the twelve subsamples with the highest average effects. The most consistently elevated effects are associated with mental rather than physical illnesses: major depression (a high ranking in eight of the twelve subsamples), panic (eight), and drug problems (seven). Other conditions with consistently high effects include sleep problems (seven) and ulcer (seven). Among employed people, four of the five most impairing conditions are mental disorders.

TABLE 10.6 Regression of per Capita Number of Impairment Days on a Reduced Set of Chronic Conditions, by Sex and Age

	Sex				Age					
	Female		Male		25–35		36–54		55–74	
	b	(SE)	*b*	(SE)	*b*	(SE)	*b*	(SE)	*b*	(SE)
Chronic condition										
Panic attacks	2.6*[a]	(0.5)	1.0	(0.6)	2.3*	(0.7)	1.6*[a]	(0.5)	4.0*	(0.8)
Ulcer	1.9*	(0.6)	2.0*	(0.6)	2.0*	(0.8)	2.8*	(0.6)	1.3*	(0.7)
Sleep problems	1.8*	(0.4)	2.5*	(0.4)	1.1	(0.6)	2.8*	(0.5)	2.0*	(0.5)
Autoimmune/neurological disorders	1.8*	(0.7)	2.0*	(0.8)	6.2*[a]	(1.2)	0.7	(0.7)	1.1	(1.0)
Major depression	1.9*	(0.4)	2.1*	(0.4)	1.7*	(0.5)	2.5*	(0.4)	1.1	(0.6)
Generalized anxiety disorder	1.5*	(0.6)	3.2*	(0.8)	1.6*	(0.9)	1.4*	(0.6)	5.2*	(1.5)
Drug dependence	2.7*	(1.1)	1.0	(0.7)	2.5*	(0.8)	0.7[a]	(0.9)	7.5	(3.9)
Hernia	1.1	(0.7)	1.9*	(0.6)	−0.7	(1.3)	1.9	(0.7)	1.7*	(0.7)
Other lung problems	2.3*[a]	(0.7)	0.3	(0.6)	0.0[a]	(0.9)	0.5[a]	(0.7)	2.8*	(0.8)
Bladder problems	1.3*	(0.4)	1.5*	(0.4)	0.5[a]	(0.5)	1.4*	(0.4)	2.1*	(0.5)
Hypertension/stroke	1.8*[a]	(0.4)	0.5	(0.3)	0.5	(0.6)	1.6*	(0.4)	1.4*	(0.4)
Asthma	1.2*	(0.4)	1.2*	(0.4)	0.8	(0.5)	1.0*	(0.4)	2.1*	(0.5)
Arthritis	1.7*	(0.4)	0.8*	(0.4)	0.9	(0.7)	1.9*	(0.4)	1.1*	(0.5)
Migraine headaches	0.9*	(0.4)	1.3*	(0.5)	0.2[a]	(0.5)	1.1*	(0.4)	1.9*	(0.7)
Back problems	0.8*	(0.4)	1.5*	(0.3)	0.8	(0.5)	1.6*	(0.4)	0.6	(0.5)
Number of conditions										
2	−1.8*	(0.4)	−1.8*	(0.4)	−1.3*	(0.6)	−2.1*	(0.4)	−1.7*	(0.6)
3	−2.3*	(0.6)	−1.8*	(0.6)	−1.9*	(0.8)	−2.5*	(0.6)	−1.9*	(0.8)
4+	−2.7*	(0.9)	−2.0*	(1.0)	−0.8	(1.3)	−2.8*	(1.0)	−3.7*	(1.3)
	$F_{18,1535} = 17.4$ $p < .001$		$F_{18,1445} = 16.0$ $p < .001$		$F_{18,682} = 9.2$ $p < .001$		$F_{18,1342} = 18.5$ $p < .001$		$F_{18,906} = 8.4$ $p < .001$	

Note: "Work-impairment days" are defined as a weighted sum of work-loss days plus 50% of work-cutback days. For example, a person with three work-loss days and four work-cutback days has five work-impairment days, since $3 + (.5 \times 4) = 5$. The per capita number of days is defined as the mean number of work-impairment days accumulated during the preceding thirty days by all respondents in the specified category, including those who reported no work impairment in the prior thirty days. The coefficients and standard errors were estimated using linear regression, controlling for the sociodemographic predictors in table 10.4 (b = nonstandardized regression coefficient; SE = standard error of the nonstandardized regression coefficient).

[a] Indicates that the slope for the particular category is significantly different than the norm category (i.e., male and age 55–74).

*Significant at the .05 level, two-sided test.

TABLE 10.7 Regression of per Capita Number of Impairment Days on a Reduced Set of Chronic Conditions, by Education and Employment

	Education						Employment							
	0–12		13–15		16+		Employed		Retired		Homemaker		Other	
	b	(SE)	*b*	(SE)	*b*	(SE)	*b*	(SE)	*b*	(SE)	*b*	(SE)	*b*	(SE)
Chronic condition														
Panic attacks	2.5*	(0.6)	1.9*	(0.6)	1.9*	(0.5)	1.7*	(0.3)	8.8*[a]	(1.6)	0.2	(1.2)	2.6	(2.1)
Ulcer	1.9*	(0.6)	2.3*	(0.7)	1.1	(0.7)	1.7*	(0.4)	1.5	(1.1)	4.0*	(1.6)	1.0	(2.3)
Sleep problems	2.6*[a]	(0.5)	2.1*	(0.5)	0.5	(0.4)	0.9*	(0.3)	2.1*	(0.8)	−0.4	(1.3)	8.9*[a]	(1.7)
Autoimmune/ neurological disorders	−0.4[a]	(0.9)	4.2*	(0.8)	4.0*	(0.7)	2.3*	(0.5)	1.1	(1.4)	5.7*	(2.6)	0.9	(2.9)
Major depression	2.4*	(0.5)	1.3*	(0.5)	1.6*	(0.4)	1.8*	(0.2)	−0.1[a]	(1.0)	1.1	(1.2)	2.5	(1.6)
Generalized anxiety disorder	1.7*	(0.9)	1.7*	(0.8)	2.3*	(0.8)	1.9*	(0.4)	−2.6	(3.1)	4.1	(2.2)	−2.2[a]	(2.7)
Drug dependence	2.8*	(1.2)	1.1	(0.8)	2.5*	(0.8)	2.2*	(0.5)	—	(—)[b]	4.3	(2.7)	−1.8	(3.5)
Hernia	1.6*	(0.7)	1.8	(1.1)	1.2	(0.7)	1.1*	(0.5)	1.8	(1.0)	2.2	(1.8)	−2.4[a]	(2.7)
Other lung problems	1.8*	(0.7)	0.6	(0.8)	1.3	(0.7)	0.7	(0.4)	1.2	(1.3)	−0.7	(1.6)	1.8	(2.6)
Bladder problems	1.6*	(0.4)	1.0*	(0.5)	0.6	(0.4)	0.8*	(0.2)	1.5*	(0.7)	1.8	(1.1)	0.5	(1.8)
Hypertension/stroke	1.1*	(0.4)	2.2*	(0.4)	1.1*	(0.4)	0.7*	(0.2)	0.8	(0.6)	3.0*[a]	(0.9)	1.6	(1.5)
Asthma	1.6*	(0.5)	0.9*	(0.5)	0.6	(0.4)	1.2*	(0.2)	0.6	(0.9)	1.2	(1.2)	−0.4	(1.9)
Arthritis	1.6*	(0.4)	1.5*	(0.5)	0.2	(0.4)	0.9*	(0.2)	−0.1	(0.7)	1.1	(1.2)	5.4*[a]	(1.8)
Migraine headaches	0.8	(0.5)	1.2*	(0.5)	0.7	(0.4)	0.3*	(0.2)	2.0[a]	(1.1)	2.3*	(1.3)	2.0	(1.8)
Back problems	0.7	(0.4)	2.0*	(0.4)	0.8*	(0.3)	1.1*	(0.2)	0.4	(0.8)	0.5	(1.1)	0.5	(1.6)
Number of conditions														
2	−1.8*	(0.5)	−2.6*[a]	(0.5)	−1.0*	(0.4)	−1.2*	(0.3)	−1.2	(0.9)	−1.4	(1.2)	−1.3	(2.0)
3	−1.9*	(0.7)	−3.7*[a]	(0.7)	0.1	(0.6)	−1.8*	(0.4)	0.1	(1.3)	−2.5	(1.7)	−1.2	(2.5)
4+	3.1*	(1.1)	−2.6*	(1.2)	0.1	(1.0)	−1.7*	(0.6)	−2.4	(2.0)	−2.8	(2.3)	1.9	(3.9)
	$F_{18,1163} = 12.6$ $p < .001$		$F_{18,920} = 12.9$ $p < .001$		$F_{18,872} = 13.4$ $p < .001$		$F_{18,2179} = 23.3$ $p < .001$		$F_{17,388} = 4.3$ $p < .001$		$F_{18,170} = 3.5$ $p < .001$		$F_{18,200} = 7.0$ $p < .001$	

Note: "Work-impairment days" are defined as a weighted sum of work-loss days plus 50% of work-cutback days. For example, a person with three work-loss days and four work-cutback days has five work-impairment days, since $3 + (.5 \times 4) = 5$. The per capita number of days is defined as the mean number of work-impairment days accumulated during the preceding thirty days by all respondents in the specified category, including those who reported no work impairment. The coefficients and standard errors were estimated using linear regression, controlling for the sociodemographic predictors in table 10.4 (b = nonstandardized regression coefficient; SE = standard error of the nonstandardized regression coefficient).

[a] Indicates that the slope for the particular category is significantly different than the norm category (i.e, male and age 55–74).

[b] None of the respondents reported this condition with these sociodemographic predictors.

*Significant at the .05 level, two-sided test.

Discussion

Limitations

Three limitations are important to note. First, the comparatively low response rate of the MIDUS survey mandates caution in generalizing the findings. Second, errors in respondent retrospective self-reports about work impairments could lead to additional bias in estimates. In particular, some respondents with mental disorders may have overestimated their impairments; there is evidence that some types of mental disorders lead to distorted and pessimistic perceptions about personal self-worth (Coyne and Gotlib 1983). This might help explain the finding that the reported work impairments due to mental disorders are generally higher than those due to physical disorders. Third, the use of respondent self-reports to classify medical conditions could introduce error due to recall bias, a misunderstanding of the true nature of the disorder, or an unwillingness to report stigmatizing conditions. Because mental disorders are among the most stigmatizing of medical conditions, we attempted through the design of the instrument to mitigate the impact of respondents' unwillingness to report them by augmenting the conditions checklist with symptom screening scales. This is admittedly only a partial solution.

Consistency of Results with Previous Research

Within the context of these limitations and to the extent that comparative data exists, the MIDUS results are quite similar to those found in previous surveys. The MIDUS estimate of 1.8 days of total work limitation (work loss plus work cutback) per month per capita is close to the estimated 1.6 days in the most recently published data from the CDC Behavioral Risk Factor Surveillance System, or BRFSS (CDC 1998). The MIDUS estimate of 1.1 days of work loss per month per capita is equivalent to approximately 4 million lost productivity years in the population as a whole. This projection is close to the 4.5 million lost productivity years estimated in the most recently published data from the U.S. National Health Interview Survey, or NHIS (Hoffman, Rice, and Sung 1996). Finally, the finding that 78.1% of MIDUS respondents reported one or more chronic conditions is very close to the estimate of 77.8% in another recent national survey (Eisenberg et al. 1998).

The MIDUS finding that chronic conditions are associated with

substantial work impairment is also consistent with previous research (Verbrugge and Patrick 1995). Regrettably few prior studies examine the rank ordering of condition-specific work impairments. The most relevant data on these relationships come from a recent eight-state investigation of univariate condition-specific thirty-day activity limitations that was a component of the BRFSS (CDC 1998). Two of the five conditions associated with the greatest impairments in that survey are comparable to two of the top five most often associated with work impairment in MIDUS, as reported in the last column in table 10.3: "Depression, anxiety, or some other emotional problems" make up the most impairing set of conditions in the BRFSS survey. This is consistent with the top ranking of GAD in the MIDUS data as well as with the fact that panic is among the top five MIDUS conditions in terms of work impairment and with the finding in tables 10.6 and 10.7 that mental disorders are associated with consistently high impairment across MIDUS subsamples. "Lung or breathing problems" are the fourth most impairing set of conditions in the BRFSS survey. This is consistent with the ranking of lung problems in the top five most impairing MIDUS conditions. There is no agreement, however, on the other conditions in the top five of the two surveys. The other top-ranked BRFSS conditions are high blood pressure and stroke (which are combined into a category of "hypertension/stroke" in MIDUS) and back problems (comparable to the MIDUS category of "sciatica, lumbago, or recurring backaches"). None of these was found to be associated with comparatively high impairment in the MIDUS data, nor were the other top MIDUS conditions (ulcer and varicose veins) found to be among those with the highest impairments in the BRFSS data.

The MIDUS study's documentation of lower average effects of some conditions among younger adults than among older adults is consistent with the finding of Verbrugge and Patrick (1995). Conversely, the MIDUS study finding that a number of conditions are associated with a higher rate of any impairment among women than men is not. Verbrugge and Patrick's failure to find meaningful variation in condition-specific impairment by sex (other than for ischemic heart disease) may be attributable to the smaller number of chronic conditions examined in that study (seven) compared to the MIDUS study (twenty-nine). We found no previous research that investigated variation in condition-specific impairments by level of educational attainment or employment status.

Implications

The enormous magnitude of the work impairments associated with illness in general, and with chronic conditions in particular, must be considered in the current debate on universal health insurance. The present cost of lost productivity due to chronic conditions should be calculated and measured against the cost of aggressive outreach and treatment, which could reduce or eliminate some currently undertreated conditions. The resultant cost savings in increased work may substantially outweigh the increased costs of treatment (Berndt et al. 1997) and therefore should be factored into calculations of the total cost of expanding health insurance coverage.

The MIDUS finding that work-cutback days are as common as work-loss days is consistent with data from other recent surveys (Kessler and Frank 1997). This is important from an employer cost perspective for at least two reasons. First, most previous research on the workplace costs of specific illnesses ignores cutback days (Greenberg et al. 1993) and therefore substantially underestimates productivity loss due to illness. Second, work-cutback days often represent hidden costs that are extremely difficult for employers to control, unlike work-loss days that are visible and manageable by caps on paid sickness leave and by disability insurance. For employers, this intangibility means cutback days actually pose greater risks than work-loss days.

The clear evidence that mental disorders are among the most impairing conditions, especially for people in the labor force, is especially important and is also consistent with previous empirical studies (CDC 1998; Hays et al. 1995; Ormel et al. 1998) and with the clinical experts' ranking of the comparative effects of disorders in the World Health Organization's Global Burden of Disease Study (Murray and Lopez 1996). Epidemiological evidence shows that work impairments associated with mental disorders no longer exist among people with remitted mental disorders (Kessler and Frank 1997). This indirect suggestion that successful treatment of the disorders removes these impairments makes these findings noteworthy. The small amount of existing experimental research in this area supports this tentative conclusion. Clinical trials for mental disorders, which most often deal with depression, have documented significant effects of treatment on increased work performance (Mintz et al. 1992).

These results suggest that mental disorders represent an especially

attractive target for aggressive intervention and treatment in the workplace. Two additional observations support this conclusion. First, mental disorders are highly prevalent. Comprehensive epidemiological surveys estimate that as many as one in every four adults in the United States meets criteria for at least one mental disorder in a given year (Kessler et al. 1994). Second, unlike the proportions for a number of other chronic conditions, only a small minority of people with mental disorders obtain treatment (Kessler et al. 1999). This means that aggressive outreach efforts to detect and treat people with attended mental disorders not only could have a very high benefit-cost ratio but also could greatly reduce the total indirect costs of illness associated with reduced workplace performance. Additionally, the current low rate of treatment means that these employees most likely would continue indefinitely to work at impaired levels without employer intervention in the potential treatment.

Quality assurance standards are less developed for the treatment of mental disorders than for many other chronic conditions. A substantial proportion of the people who obtain treatment for mental disorders are treated inappropriately (Katz et al. 1998; Wells et al. 1994). While high rates of inappropriate treatment also can be found for some physical disorders (Kogan et al. 1994; Mainous, Hueston, and Clark 1996; Meijler et al. 1997), mental disorders present unique difficulties because precise standards for the evaluation of psychotherapy do not exist.

These concerns highlight the need for improved quality assurance protocols for the implementation of mental disorder workplace outreach and treatment programs. A number of model quality assurance systems are already in use in the United States to monitor overall quality of medical care (Felt-Link and St. Peter 1997; Jencks 1995; National Committee for Quality Assurance 1997), but most include fairly superficial evaluations for mental healthcare (National Committee for Quality Assurance 1997). Focused systems to monitor quality of care for specific commonly treated mental disorders must be developed. A number of such systems already exist for specific physical conditions and medical procedures (e.g., Chassin, Hannan, and DeBuono 1996; Schneider and Epstein 1996). There is good evidence that some of these systems led to improvements in quality of care (e.g., Hannan et al. 1994; Korn et al. 1997), and the same likely would be true of systems developed to treat mental disorders.

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